ENVIRONMENTAL IMPACT STATEMENT

TO ACCOMPANY DRAFT AMENDMENT NO.6 TO D'ENTRECASTEAUX CHANNEL MARINE FARMING DEVELOPMENT PLAN FEBRUARY 2002

Glossary

ADCP	Acoustic Doppler Current Profiler
AGD	Amoebic Gill Disease
ASC	Aquaculture Stewardship Council
BAP	Best Aquaculture Practices
BEMP	Broadscale Environmental Monitoring Program
CAMBA	China-Australia Migratory Bird Agreement
CEO	Chief Executive Officer
COBP	Code of Best Practice
CSER	corporate, social and environmental responsibility
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFF	Depart of Agriculture, Fisheries and Forestry
dBA	A-weighted decibels
DMB	Dry matter basis
DO	dissolved oxygen
DPIW	Department of Primary Industries and Water
DPIPWE	Department of Primary Industries, Parks, Water and the Environment
EDO	Environmental Defenders Office
ENGOs	environmental non-governmental organisations
EIS	Environmental Impact Statement
EMS	Environmental Management System
EPA	Environmental Protection Authority
EPBCA	Environmental Protection and Biodiversity Conservation Act 1999
FCR	Feed Conversion Ratio
FHMP	Fish Health Management Plan
FSANZ	Food Standards Australia New Zealand
g	gram
GAA	Global Aquaculture Alliance
ha	hectare
HAB	Harmful Algal Bloom
HOG	head on gutted
HVN	Huon Valley News
IALA	International Association of Lighthouse Authorities
IMAS	Institute of Marine and Antarctic Studies

JAMBA	Japan-Australia Migratory Bird Agreement
kg	kilogram
km	kilometre
L	litre
LED	light-emitting diode
m	metre
mm	millimetre
MAST	Marine and Safety Tasmania
MFDP	Marine Farming Development Plan
MFPA	Marine Farming Planning Act 1995
MIC	Marine Inspector Cleaner
ML	megalitre
ppm	parts per million
ppt	parts per thousand
PST	Paralytic Shellfish Toxin
RSPCA	Royal Society for Prevention of Cruelty to Animals
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
ROV	remote operated vehicle
s	second
SBP	Selective Breeding Program
SCAT	Southern Coastcare Association of Tasmania
SCUBA	Self-Contained Underwater Breathing Apparatus
SEP	Tassal's Stakeholder Engagement Program
SGS	Summer Gut Syndrome
SOMV	Salmon Orthomyxovirus
t	tonne
TAC	Tasmanian Abalone Council
TARA	Tasmanian Aquaculture Reform Alliance
TARFish	Tasmanian Association for Recreational Fishing
TPDNO	Total Permissible Dissolved Nitrogen Output
TRLFA	Tasmanian Rock Lobster Fishermen's Association
TSGA	Tasmanian Salmonid Growers Association
TSIC	Tasmanian Seafood Industry Council
TSPA	Threatened Species Protection Act 1995
W	watts

WH&S	workplace health and safety
WIP	Wildlife Interaction Plan
WWF	World Wildlife Fund for Nature
WWTP	Waste Water Treatment Plant

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2 Executive Summary

Introduction

This summary focuses on the most material items contained in the following Environmental Impact Statement (EIS) document; it is not a comprehensive summary of all sections of the EIS and should not be a substitute for reviewing the entire document.

Tassal is a vertically integrated aquaculture company based in Tasmania. This proposal will support the increased demand for Atlantic salmon while sustaining and increasing economic and social benefits to local communities and regional Tasmania. Tassal's mission of continued commitment to environmental and social best practice is demonstrated through its ongoing partnership with WWF and internationally recognised certification.

2.1 Proposed Amendment Description

To meet growing consumer demands, Tassal proposes to amend and instate Zone 25 East of Lippies Point (Lippies). It is proposed that the lease will be operated in addition to the current Tassal farming operations in Dover. Under the proposed amendment, individual year classes will be introduced to Lippies as smolt (approximately 80-100 g) for grow out to harvest (approximately 4.5 kg).

The proposed development would establish a maximum of 28 cages to the lease area (14 cages per year class); add 38.51 ha to the existing lease area and add 326 ha to the existing zone area. Following the proposal, Lippies zone and lease will be 1 km and 1.45 km to the shore at their closest point respectively.

2.2 Stakeholder Consultation

Tassal has developed and initiated an adaptive stakeholder engagement program (SEP) to ensure that there are ample opportunities for communities, interest groups and other stakeholders to engage in a range of consultative processes and discussions in relation to the proposed amendment of Lippies.

Tassal's ongoing SEP assists in raising community awareness and working towards the development of effective solutions.

2.3 Existing Environment

The proposed zone and lease are located in the southern D'Entrecasteaux Channel on the coast between Scott Point and Tower Bay. The proposed zone is dominated by saline oceanic waters with some freshwater influences from the Huon River system flowing south out of the D'Entrecasteaux Channel. As the proposed zone is situated in the open channel, the effects of severe weather from the south west are not moderated by land. Water depths across the area are relatively deep and vary slightly, ranging from 35 to 50 m. The lease area is dominated by silty sand substrate.

A number of listed threatened and migratory species (under the EPBCA and TSPA) are known to occur in and around the southern D'Entrecasteaux Channel. An assessment of the known risks to these species has determined that the proposed amendment does not pose any significant impact to these species or require additional mitigation measures to be implemented.

A number of Giant kelp beds occur in the southern D'Entrecasteaux Channel along the Tasmanian coastline (including Labillardiere Peninsula on Bruny Island). Existing beds within this area have been mapped as part of this assessment, and while these Giant kelp beds may potentially meet the EPBC criteria of a threatened ecological community, the proposed amendment is considered to be far enough away from these beds to not cause any adverse or significant impact.

There are no marine reserves within the region and the area is mainly used by boats transiting from the sheltered waters of the D'Entrecasteaux Channel and Port Esperance to Southport and beyond to Recherche Bay.

2.4 Potential Effects and Their Management

The proposed amendment intends to build upon Tassal's existing record of environmental best practice & certification and global best practice for fish health management. The new proposed farming region will result in 22 new operational jobs which will generate over $1.3 million in fulltime annual salaries plus benefit packages. Based on a conservative 1:3 multiplier ratio of supporting positions, these 22 operational jobs will easily translate to over 60 full time jobs in Tasmania. In addition, $1.4 million is expected to be injected annually into the economy for goods and services. This investment does not include feed; Tassal purchases over 90% of its salmon diets locally from Skretting's Cambridge plant.

Although the existing lease has not been developed in its current dimensions, the proposed amendment relates to approved leases described in the current D'Entrecasteaux Channel MFDP Area. This MFDP is regulated through a total permissible dissolved nitrogen output (TPDNO), which remains in place and will not be compromised by the proposed amendment at Lippies.

The proposed lease at Lippies is located adjacent to monitoring sites included in the Broad Scale Environmental Program (BEMP), so there is sufficient baseline information with which to compare any potential effects from finfish farming and ensure that impacts are managed sustainably. In addition, Tassal will regularly monitor benthic health as part of the State regulatory framework and to maximize the effectiveness of sediment recovery through routine and systematic fallowing programs.

Marine vegetation communities are relatively abundant in south eastern Tasmania, and the potential for the proposed amendment to significantly impact on macroalgal assemblages is considered low. The proposed lease area is considered to be located far enough away from these communities not to adversely or significantly impact on their ecological structure and function.

Depositional modelling was undertaken as part of this EIS to assess the potential depositional enrichment impacts for the proposed lease over the course of a full production cycle. The results of this modelling suggest that the benthic impacts associated with the proposed amendment will be within acceptable levels of organic enrichment and well within regulation parameters.

Marine farms can have general impacts on birds ranging from habitat modification to entanglement. Tassal has stringent bird protocols with an aim of mitigating interactions with birds around its marine operations. Additionally, it is expected that seal interactions will occur at the proposed lease and will be managed through active exclusion measures and approved deterrents.

Relatively few chemicals are used at Tassal's marine sites, and have ceased using anti-foulant paint on all netting at all its marine operations. Procedures have been implemented to manage

the use of all chemicals, prevent spills and respond to incidents should they occur, including the effective use of on-site spill kits.

In 2012, Tassal developed and implemented an Escape Prevention and Response Protocol that is used company wide. Escapes due to this proposed amendment are not anticipated to occur and thus no impact is expected.

Amoebic Gill Disease is the main fish health issue associated with salmon farming and is an industry wide issue that has periodic yet significant impacts on fish survivorship in south-eastern Tasmania. It is proactively managed by Tassal through their program of continuous surveillance and freshwater bathing practices. Harmful algal blooms (HAB) and jellyfish presence are also constantly monitored through daily algal trawls and associated observational on-ground surveillance at each of Tassal's marine farms.

The introduction of fish cages and marine farming infrastructure will create a visual impact. A full visual assessment has been conducted by a third party consultancy as part of the amendment process and is included in this document. All structures and nets will comply with marine farming licence conditions in order to minimise impacts to the visual amenity within the surrounding landscape. Following discussions with MAST and Tasports, navigation impacts are considered to be low and will be managed by regulatory compliant lease markers and lighting on site.

Noise levels are not expected to be a significant issue as a result of the proposal. Tassal has established a noise mitigation program in conjunction with a third party consultancy to determine suitable equipment specifications, farm site modelling and stakeholder response management.

2.5 Conclusions

This amendment is being proposed to support the sustainable ongoing operation of Tassal's marine farming operations and compliment the transition to offshore aquaculture operations in the state. In Tassal's opinion this proposal creates minor additional impacts to the marine environment while supporting the sustainable development of Tassal's operations and the creation of jobs and economic value on a regional and state level.

3 Proposed Amendment Description

3.1 Proposal Overview

3.1.1 Proponent Details

Tassal Operations Pty Ltd (Tassal), 30 Waterworth Drive, Margate TAS 7054.

Tassal is a vertically integrated company that includes freshwater hatcheries, saltwater aquaculture, primary processing and value adding. Tassal is committed to being the industry leader in sustainable aquaculture production in Australia. Tassal currently produces approximately 20 000 tonne of Atlantic salmon (*Salmo salar*) per annum, with all of the stock produced in Tasmania. Tassal is the largest producer of Atlantic salmon in Australia and is a publicly listed company on the Australian Stock Exchange.

Tassal was established in 1986 with the installation of marine infrastructure in Port Esperance and the development of a hatchery in Tasmania's Central Highlands. The company's first harvest was in 1987 and yielded 53 tonne of Atlantic salmon. Tassal now contributes 70% of Australia's total Atlantic salmon harvest each year, and employs over 800 staff, 90% of whom are based in Tasmania.

Tassal is committed to the transparency of all its operations, and has voluntarily released three sustainability reports. This will continue on an annual basis; Tassal's third sustainability report became available for public viewing early 2014 (see Appendix 1 for current sustainability report). Tassal has certified all of its marine farming regions and its primary processing facility to Global Aquaculture Alliance's (GAA) Best Aquaculture Practices (BAP) (see Appendix 2).

Tassal is in the second year of a partnership with WWF Australia (World Wildlife Fund for Nature). This partnership underpins Tassal's mission to continually improve environmental practices throughout its operations, with the company currently working towards certifying all operations to the Aquaculture Stewardship Council's ASC Standard.

Tassal currently holds licences in six marine farming regions in four different marine farming development plan (MFDP) areas within the State.

3.1.2 Rationale / Need for the Proposal

Zone 25 and Marine Farming Lease 78 East of Lippies Point (Lippies) are an existing zone and lease that are not currently used for farming operations. This lease has not been used as its current size does not provide for the configuration or moorage assemblies which are required for cost-effective, modern farming operations.

This proposal will allow Tassal to meet long term strategic targets for sustainable growth in order to meet increasing consumer demand. Tassal anticipates Lippies to be a strong performing lease which will support optimal fish health and growth performance as this site is considered to have high water quality and exposure to well mixed oceanic conditions.

Stock input will be in addition to current operations in the localised area, and will be utilised as a full production cycle grow out site; smolt input grown to harvest size. The use of this site as part of Tassal's south east operations will remain within the current TPDNO (Total Permissible Dissolved Nitrogen Output) as determined by the Secretary DPIPWE.

3.1.3 Proposed Development

While the existing lease in Zone 25 could be used to house stock and farming infrastructure in its current configuration, it is not commercially viable to farm using modern techniques and best farming practices. For the purpose of this EIS, however, it is assumed that the proposed amendment is commencing from zero emissions (i.e. new development).

The proposed amendment is for an increase in size of Zone 25, from approximately 85 ha (as currently described in the D'Entrecasteaux Channel MFDP 2002) to approximately 411 ha (see Figure 3.1). This would enable the establishment of a herring bone mooring system with the capacity of 28 pen bays.

Initially, Tassal was seeking to amend both Zones 25 and 26 (East of Lippies and East of Browns, respectively). However, following extensive stakeholder consultation, it was decided to only retain Lippies on the basis that this lease is a far more desirable site for salmon aquaculture whilst maximising distances from potentially sensitive receptor groups. As such, Zone 26 will be deleted in any future review of the D'Entrecasteaux Channel MFDP.

The existing Browns lease, that will be sacrificed, is approximately 38 ha, and as the proposed amendment of Lippies is for 38.51 ha, the net increase to the total area of marine farming in the Lippies and Browns area will be less than 1 ha.

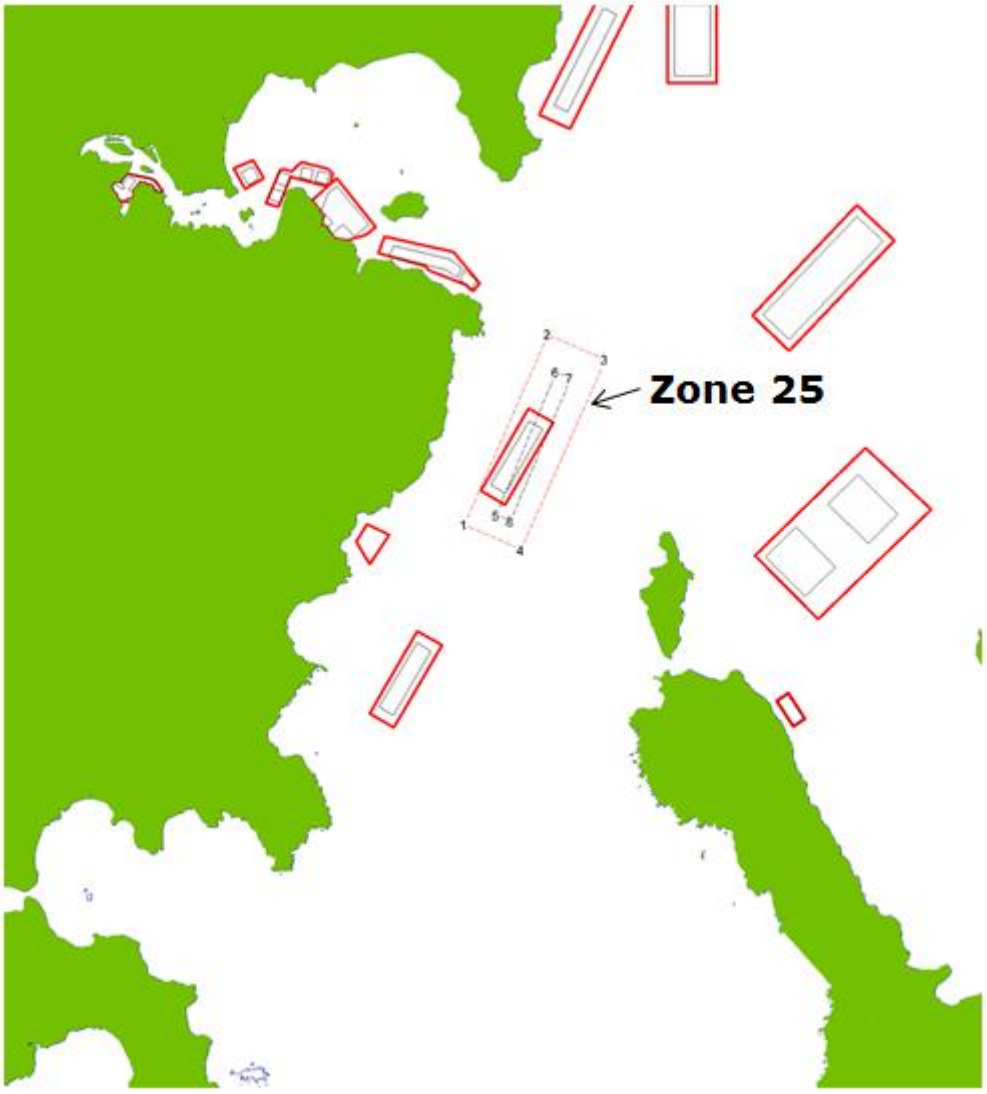

Figure 3.1. Location of the existing (solid lines) and proposed zone and lease (broken red and black lines, respectively) in the southern D'Entrecasteaux Channel

3.1.4 Anticipated Establishment Costs

Tassal will be required to purchase mooring infrastructure for the proposed amendment, the costs associated with this are estimated to be approximately $7.86 million (see Table 1).

Table 1. Approximate costs predicted with the proposed amendment to Lippies

Item/Infrastructure	Cost (AUD)
Pens	1,730,000
Nets	3,000,000
Bird Net Stands	221,000
Moorings	610,000
Feed System	2,300,000
Total	7,861,000

3.1.5 Existing and Likely Markets for Product

Demand for seafood and farmed salmon consumption has been growing globally and nationally for over a decade. Tassal's annual sales have reflected this growth and market research indicates continued demand for its products well into the future; sales volumes are predicted to double by 2020.

The majority of Tassal's product is exported interstate (see Figure 3.2) and increased demand has resulted in the need for increased production.

Tassal Atlantic salmon is available in fresh and frozen whole fish, fillets, sliced hot and cold smoked portions, value added portions and canned product. Tassal products can be found in fresh fish shops and Coles and Woolworths supermarkets throughout Australia.

Tassal has an experienced sales and marketing department and operates two successful dedicated salmon shops in Hobart and Melbourne.

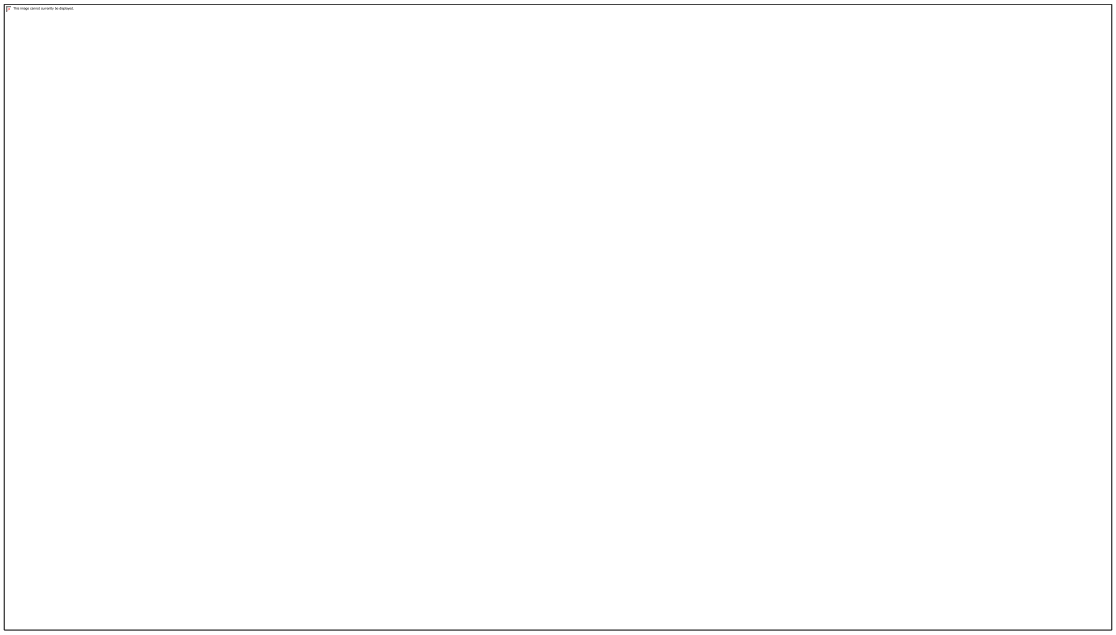

Figure 3.2. Tassal's annual salmon sales volume ('000 Head on Gutted [HOG] kg)

3.1.6 Relationship to other Proposals/Developments

The proposal is to increase the size of Zone 25 and the corresponding undeveloped Lippies Marine Farming Lease.

This proposed amendment does not directly relate to any other proposals or developments; for more detail, see section 3.1.3.

3.2 Proposed Zone and Lease Details

3.2.1 Location of Proposed Zone

Zone 25 (Lippies) consists of all that area bounded by a line being from points defined by Australian Mapping Grid Zone 55 (AMGZ GDA 94) coordinates (see Figure 3.1):

Point		Easting	Northing
1	Lease	504498.31	5196093.04
2		505991.97	5199479/63
3		507009.00	5199031.07
4		505515.33	5195644.48
5	Zone	505070.87	5196264.10
6		506135.41	5198808.95
7		506391.54	5198701.81
8		505327.01	5196156.93

The existing and proposed zone is approximately 1 km from the shoreline at its closest point. The proposed amendment will result in the Lippies lease being approximately 1.45 km from the shoreline at its closest point.

Land-based infrastructure at Meads Creek is 6 km by water from Lippies.

The closest existing marine farming zone is Zone 20 at Tower Bay, located approximately 2.5 km from the proposed Zone 25. This lease is not affiliated with Tassal's operations.

The closest active marine farming lease area to Zone 25 is Marine Farming Lease 244 at Stringers Cove operated by the Huon Aquaculture Company.

3.2.2 Proposed Zone Area

The existing Zone 25 has an area of 85 ha, and an existing maximum leasable area of 38 ha. The proposed amended zone size will be 411 ha, and the maximum leasable area will be 76.51 ha.

These changes will result in:
- Approximately 384% size increase of the zone; and
- Zone length and width change of 2004 m and 610 m respectively.

The area proposed for the amended zone is required to accommodate a mooring system which is adequate to secure the proposed 28 pen bay mooring system for the prevailing weather conditions. For more detail, see section 3.3.1.

3.2.3 Location of Proposed Lease

The proposed lease will have an orientation of north east, running parallel to the adjacent shoreline.

The proposed maximum leasable area will be 38.51 ha larger than the existing lease area at Lippies, as stated in section 3.2.2, with the new lease dimensions being 277 m in width and 2761m in length. As previously stated, these new dimensions are required to house the proposed 28 pen bay herring bone mooring system.

These changes will result in:
- Approximately 201% size increase of the lease, and
- Lease length change of 1436 m and decrease in width of 2 m.

The location of the proposed lease can be seen in Figure 3.1.

3.3 Infrastructure and Servicing

3.3.1 Mooring and Grid system

The proposed mooring arrangement will be a new herringbone system to cater for the future needs of the lease.

Plastic Fabrications will install the 28 pen bay mooring system in the proposed lease. The proposed system has undergone engineering design based on a technical report by Aquastructures in accordance with NS 9415:2003, an internationally recognised standard for mooring system infrastructure design.

Through this process, the environmental variables at the site are used for calculations within the report including maximum significant wave height, current and swell information. The dynamics between the cages, nets and mooring system are also used to determine the requirements of the overall configuration.

Appendix 3 shows a diagram of the 28 pen bay mooring system to be used at the proposed zone with side and end elevation of the grid mooring system.

3.3.2 Size and Configuration of Sea Pens/Netting

Tassal intends to utilise 168 m circumference plastic cages for the growout phase at the proposed Lippies lease. Initially stock will be input to 10 cages, and from here, biomass splits will occur to a further four cages for each year class (i.e. maximum of 14 cages per year class, and a maximum of two year classes stocked to Lippies at any one time). This year class overlap will only occur for a small amount time in each production cycle, as one year class is in its juvenile stage, the other will be harvested.

The 168 m nets will have a side wall of 8 m, and the deepest part of the net is approximately 15 m, giving a total volume of approximately 20 615 m^3.

Wildlife exclusion is an important aspect of contemporary marine farming practice in Tasmania. Tassal's exclusion technology of choice includes a combination of seal proof bird nets and Kikko constructed cage nets. In addition, all cage netting is heavily weighted to strengthen the configuration to provide protection against seal predation. The above surface portion of each cage is covered by a bird net with a mesh size of less than 115 mm.

As with all Tassal leases, copper antifoulant will not be used on cage nets.

The proposed maintenance regime for this equipment is detailed in section 3.3.5.

3.3.3 Construction Aspects

Construction associated with the installation of the new herringbone mooring system into the proposed lease area is expected to be approximately ten weeks, weather permitting. The proposed plan is for Lippies moorings to be installed in early 2016 should the draft amendment be approved.

During installation, buoyed trip lines marking mooring blocks would be deployed in the buffer area between the lease and zone boundaries. A Notice to Mariners would be issued to advise of any hazard that may occur associated with this activity and lease corner makers would be temporarily deployed to mark the zone corners.

Mooring deployment would require the use of a large company workboat with a crane to lift and place mooring blocks into position.

Cages are constructed by Plastic Fabrications, or Mitchell Plastic Welding. Assembly of the cages takes place onshore at a site near the lease area. Once assembled, they are towed to the marine farm. Biosecurity and introduced marine pest risks will be managed through existing company protocols during the construction phase and movement of cages, as discussed in section 3.3.5.1.1.

As the mooring system will comprise of a herringbone arrangement, pen bay positions will be alternated (known as mooring system 'flip-flop') to allow for rotational stocking and fallowing options at the lease. As with other Tassal leases that utilise a herringbone mooring systems, the ability to adaptively manage stocking and fallowing cycles at each lease will be

undertaken following monitoring survey results and depositional modelling. This takes into account feed inputs and stocking pressures in the previous production cycles.

3.3.4 Servicing the Proposed Zone

Servicing of the amended lease would follow the same pattern as for other leases currently operating in the southern D'Entrecasteaux Channel.

Work crews will access the site from the land base at Meads Creek in Port Esperance. On a typical day the site could be accessed by up to five vessels, including work barges, the dive vessel, and general purpose/works crew vessels. The type of vessels accessing the site is generally depicted by the work scheduled at the site on a given day. It is very unlikely that all vessels used at the newly developed lease would be at any one site simultaneously.

Working hours for the site would be 0600 to 1900 in the summer and 0700 to 1700 in the winter. Security patrols may visit the site outside of these hours and spot lights may be used during these patrols.

The number of trips and types of vessels to be used are detailed in Table 2. *Please note that the harvest vessel frequency is strictly dependent on the production cycle.

Table 2. Vessels to be used by Tassal to service the amended lease in Zone 25

Vessel Type/Activity	Frequency
Feeder Tender	7 days/week
TO Works	5 days/week
Dive Vessel	5 days /week
Feed Delivery	1-2 days/week
Wildlife Management	1 day / week
Net Cleaning	3-4 days/week
Heavy Works Vessel	5 days/week
Harvest Vessel	1 day/week*
Farm Works	5 days/week
Farm Works	5 days /week
Farm Works	5 days/week

The equipment and infrastructure in the newly developed and amended lease would be similar to that found currently onsite at other Tassal leases in the area. The size and

specifications of infrastructure does differ from site to site, but generally one feed barge, coupled with feeding infrastructure, cages and a bathing barge are deployed within the lease area.

A feed barge will be permanently moored on the lease. This would be of either steel or concrete construction with a feed silo storage capacity of 180-200 tonnes. The barge would contain a centralised feeding system, feed storage, a generator and amenities for the work crew. Facilities would consist of an operator station and a small mess area, with kitchen and toilet facilities; there will be no overnight accommodation on the barge. The barge will normally operate during daylight hours; i.e. working hours as listed previously.

The purpose built feed barge used to service the proposed lease will be customised with additional sound proofing to mitigate noise emissions from the generator and the feeding system. The on-board generator will be housed in a specifically designed room within the feed barge. Noise mitigation apparatus are designed and built to exceed marine farming licence conditions, lessening the level of noise reaching receptors within the surrounding areas. With any application for the deployment of a newly constructed feed barge in a marine farming lease, DPIPWE requires noise modelling to be undertaken to ensure compliance with regulatory provisions prior to deployment.

The feed barge may also house a venturation compressor that is used to oxygenate the sea water to address issues with low dissolved oxygen and/or harmful jellyfish and algae. This may be used throughout the warmer months of the year as required.

Tassal has engaged a third party to undertake an independent noise level survey of their operations, and has determined that all equipment utilised in day to day activities within their leases have an average L_{eq} (sound pressure level) >55 dBA at 30 m. Noise levels are modelled to be 24 dBA at the nearest residence at Lady Bay, well within the EPA night time noise requirement of 32 dBA. A more detailed assessment of noise impacts from the proposed amendment is described in section 6.2.6.

Lease boundary markers are a regulation requirement (special markers), and will be deployed as at all operational Tassal leases as boundary corner markers. These markers will also have yellow intermittently flashing navigational lights permanently affixed to the apex of the corner markers.

Waste from the amenities is pumped to a holding tank on the barge, which is then collected by the service vessel for appropriate disposal onshore.

The salmon stock at the proposed lease would periodically require bathing in freshwater to control gill amoebae. Bathing would involve towing cages filled with freshwater contained in a tarpaulin liner, most likely from a fill station at Stringers Point to the lease area. The bathing process is usually concluded by 1500 on the day.

It has been observed that bathing frequency has decreased over time as a result of the Selective Breeding Program (SBP) (see section 3.4.3).

Typically each year class of salmon is required to be bathed approximately 8-10 times during its seawater growth, this equates to approximately 180 ML of freshwater per annum for bathing per lease.

As Tassal now uses in-situ Marine Inspector Cleaner (MIC) technology for washing of nets, much of the pressure has been relieved from the land based facility used for net maintenance. This technology is also regularly used for net and rigging inspections.

Smolt are delivered in purpose built tankers which are designed to reduce stress as they are introduced to the marine environment. Generally, the tankers are then transported to

leases on-board customised barges or large vessels and then transferred into the moored pens.

Harvesting of the salmon at the proposed lease would occur onsite using one of Tassal's harvest vessels. These operate between the hours of 0700 and 1800.

3.3.5 Infrastructure Maintenance

Minor cage and net maintenance is carried out onsite, with major work conducted at Dover and at Port Huon.

Routine vessel maintenance will be undertaken at Meads Creek, with larger projects carried out in Margate or Hobart.

Cage nets are inspected by divers at least once a week and during routine in-situ net cleaning operations. Bird nets are inspected daily. Moorings are subject to periodic surface inspection by works crews and subsurface inspection by divers and/or remote operated vehicle (ROV), and additional inspections may be instigated following storm events.

Tassal recently gained third-party certification of their systems and operations; this includes maintenance/storage and disposal of farm supplies. Certification and auditing such as this ensures that the highest standard is met regarding the storage and disposal of farm supplies (fuels and lubricants included). It also requires that waste is disposed of in a responsible manner, including recycling programs and waste reduction plans.

3.3.5.1.1 Disease management and equipment translocation

Tassal has implemented a Farm Disease and Biosecurity Protocol covering all aspects of marine operations for the company. The protocol includes two biosecurity statuses: normal and red; red is full damage control in response to a major fish loss due to infectious disease. A red status results in all resources being mobilised to reduce fish fatality and control the spread of disease to naïve stocks or regions. This is characterised by timely and responsive mitigation actions and mortality disposal encompassing the legislative notifiable requirements as defined in AQUAVETPLAN (DAFF 2014[1]).

The Tassal Farm Disease Management and Biosecurity Protocols include farm hygiene instructions where all hand and cage nets, cages, feeding barges and harvesting equipment must be disinfected prior to translocating to another biosecurity zone. This disinfection can be through the use of proprietary branded disinfection products or thorough cleaning and air drying of all equipment. Cross-contamination in transit and storage must also be managed under these protocols when moving or storing equipment across discrete biosecurity zones.

3.3.5.1.2 Life span of on-site equipment

Moorings	5 - 6 year replacement
Nets	5 - 6 year replacement
Cages	8 - 9 year replacement

[1]DAFF (2014) AQUAVETPLAN http://www.daff.gov.au/animal-plant-health/aquatic/aquavetplan date accessed 05-Mar-2014

3.4 Stock Husbandry Aspects

3.4.1 Fish Size / Stocking Density

The species to be cultivated at the proposed lease will be Atlantic salmon (*Salmo salar*). Stocking activities within the proposed zone/lease will occur within the provisions of the D'Entrecasteaux Channel MFDP management controls.

The plan is to stock the proposed lease in 2016 with smolt (80 -100 g) and rear these fish at this lease through to harvest size (approx. 4.5 kg).

The proposed amendment would provide an enhanced capacity for fallowing and stock rotation options for Tassal's operations in the southern D'Entrecasteaux Channel area, allowing adaptable management to optimise benthic condition, fish health and performance. Tassal will continue to determine the location of smolt inputs based on the environmental performance and substrate condition of the lease based on the results of routine environmental monitoring and compliance surveys coupled with depositional modelling. The maximum permitted stocking density under the D'Entrecasteaux Channel MFDP is 25 kg/m^3; however, Tassal's internal policy is restricted to 15 kg/m^3.

3.4.2 Fish Feeding

The fish will be fed commercially extruded salmon pellets. Projected monthly feed amounts vary according to water temperature, fish size, fish health, and harvest profile.

Projected biological Feed Conversion Ratio (FCR) for the grow-out cycle is 1.35.

Feeding will occur through centralised feed systems, with the operator (located in the office within the feed barge) controlling and monitoring feeding by camera feedback on multiple displays. Fish are fed strictly during daylight hours. During summer months, feeding occurs between 0600 and 1900, while in winter, a more contracted feeding period occurs between 0700 and 1700.

The benthic environment has been identified as a significant environmental aspect within the Tassal Environmental Management System (EMS). Numerous controls are in place to ensure that excess farm emissions are managed in a manner that allows the benthic environment to assimilate these loadings. It is a requirement that ROV surveys are conducted annually under pens that receive highest feed input. If impacts are perceived as high, stocking of these sites is restricted and a follow up survey may be sought at the discretion of the DPIPWE.

The independent third party audits of Tassal's systems and processes (BAP and ASC) incorporates marine operations and compliance reporting on the environmental effects of salmon farming on substrates and fauna within and outside of lease areas.

3.4.3 Fish Health

As the proposed lease is not in operation, fish health aspects for the neighbouring Dover Farming Region (currently Tassal's southernmost farming region) are discussed. The Dover farming region operates MF 201 Redcliffs Lease, which can be used somewhat as an analogue for the proposed Lippies lease. In the Dover Farming Region, Amoebic Gill Disease (AGD) is the most important fish health challenge. However it is well managed within Tassal's program of continuous surveillance, minimising stress on stock, and proactive freshwater bathing frequency. Tassal does not use chemicals or antiparasitics to manage AGD. Since

2006, Tassal has been participating in a selective breeding program to select and breed a more robust fish exhibiting a natural resistance to the attachment of the endemic amoeba to the gills.

Future AGD management strategies are focused on reducing the use of freshwater by the application of new technologies, coupled with the gains from the selective breeding program. Bathing frequency has been reduced by 20% in the latest year class across the company. Figure 3.3 shows days from input to bathes across the production cycles for the two most recent harvested year classes in Tassal's south eastern farming regions. The fish harvested in 2013 received two less bathes than those harvested in 2012, which can be attributed to advances in the SBP.

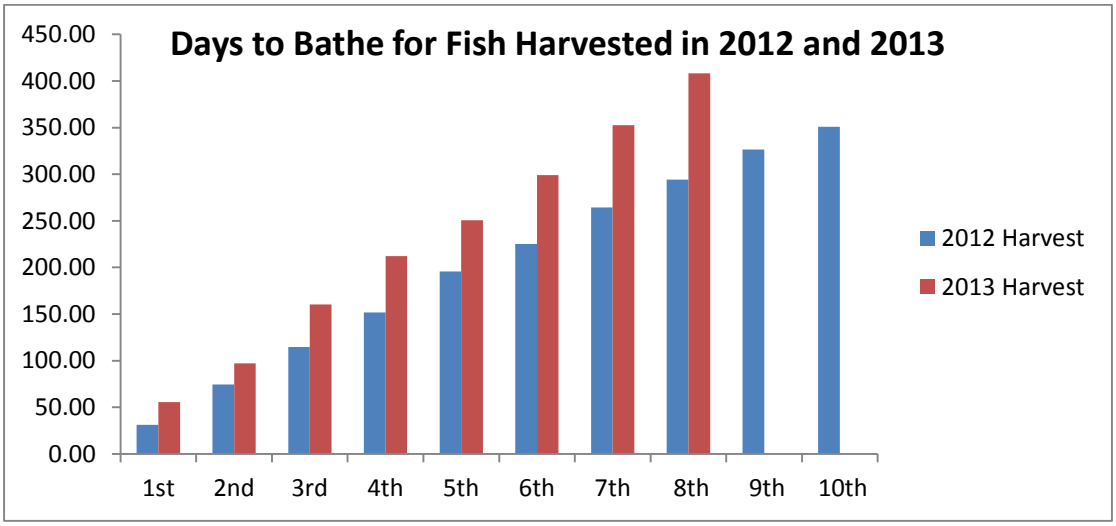

Figure 3.3. Days to bathe for the production cycle of fish harvested in 2012 and 2013. Note that fish harvested in 2013 received two less bathes than the previous year class

Harmful algal blooms (HAB) and jellyfish presence are constantly monitored through daily algal trawls and associated observational on site work. Tassal organises and conducts both in-house and external training covering algal identification, fish health and biosecurity.

Salmon Orthomyxovirus (SOMV) was isolated and associated with mortality in the 2012 year class of smolt at MF 209 Stringers Lease (Port Esperance). Investigations into SOMV and vaccine development in collaboration with DPIPWE are on-going. SOMV was not detected in 2013 in the Dover Farming Region.

Bacterial infection by *Tenacibaculum maritimum* in smolt after transfer caused skin lesions and some mortality in 2012 and 2013. Other diseases found in the Dover Farming Region prior to 2012 were Yersiniosis, Enteric Vibriosis (SGS), and Rickettsiosis. However, these diseases have not posed any fish health issues in the Dover Farming Region in recent times and are not considered to pose a current threat to fish stocks in the region.

The Dover Farming Region received one antibiotic treatment in 2013 totalling 10.0 kg:

Date	Treatments	Volume kg	Disease
18/02/2013	Chlortetracycline	10.0	Skin lesions / *Tenacibaculum maritimum*

Future use of medication will be in line with Tassal's internal policy – always under veterinary prescription. Antibiotics are never used prophylactically or for growth promotion. Any salmon that are treated with antibiotics undertake a lengthy withdrawal period of 1000 degree-days minimum (average water temperature X number of days = degree days (or Accumulated Thermal Units – ATU's) therefore 10 days at 10°= 100 degree days) to ensure all residues are cleansed from their system. Any group intended for harvest which falls within a period of twice the stated withdrawal period will undergo flesh testing for antibiotic residue. This complies with the Australia New Zealand Food Standards Code for residue levels (FSANZ 2013[2]).

The reliance on medication for farmed fish has seen a marked decrease in the last five years. This has been achieved through a greater focus on improving knowledge and research activities targeting specific fish health issues. The reliance on medication to treat diseased fish is not expected to increase in the Dover Farming Region, or be required at the proposed lease.

Tassal's Farm Disease Management and Biosecurity Protocol is designed to limit the transmission of existing or exotic pathogens between or within control regions as well as develop a proactive 'hygiene culture'. The Protocol is based on a two-tiered system of alert depending on the disease status of individual pens, leases or regions, with prioritised actions and monitoring processes systematically adopted as formal procedures.

Tassal has also implemented a South East Fish Health Management Plan (FHMP) which is a combination of best practice, compliance, and regulation through management controls and Marine Farming licence conditions. The FHMP addresses detailed standard operating procedures to prevent disease from entering the region, to prevent the spread and impact of disease in farming regions and to respond to emergency disease situations. The FHMP is scheduled to be reviewed at least annually and will be expanded to encompass the proposed farming region.

Tassal's focus on disease monitoring and early detection places a high importance on incorporating stock inspections into routine farming activities such as mortality collection and classification, weight checks and harvests. Tassal is also actively involved in the Tasmanian Salmonid Health Surveillance Program, which is a joint program between the Tasmanian Salmonid Industry and the Tasmanian Government. This program provides passive and active disease surveillance through regular submission of fish diagnostic samples and testing for specific disease agents of concern.

Risk of disease transfer between farmed Atlantic salmon and wild abalone

Diseases significant to abalone are listed on the Department of Agriculture, Fisheries and Forestry (DAFF) website and include Withering Syndrome, Perkinsosis and Abalone Viral Ganglioneuritis.

- Withering syndrome is exotic to Australia.
- Perkinsosis is present in Australia but not in Tasmania
- Abalone Viral Ganglioneuritis is present in Tasmania.

Tassal has been actively involved in the DPIPWE Fish Health Surveillance Program since 1993. The FHSP involves the submission of fish samples for bacterial, virological and

[2]FSANZ (2013). Australia New Zealand Food Standards Code - Standard 1.4.2 - Maximum Residue Limits (Australia Only). http://www.comlaw.gov.au/Details/F2013C00733 - date accessed 14-Feb-2014

histological assessment on a regular basis. At no time during the running of the program has a disease of significance to abalone been reported.

In addition, historically, Tassal are not aware of any impact on wild abalone stocks due to salmon farming activities. There is no report of any salmon disease or salmon infectious agent that can affect wild abalone in Tasmania. Tassal are also not aware of any salmon disease affecting wild fisheries in general.

3.4.4 Predator Control

Australian and New Zealand Fur Seals are predators of salmon in marine farms. The primary means of controlling seal predation is through exclusion, by means of heavily weighted, tensioned, and stiffened cage nets. Tassal will invest in new Kikko net technology for the proposed lease. These nets have been in use in Great Taylors Bay and Port Esperance farm sites for 12 months with extremely promising results, representing a significant improvement in wildlife management. Net barriers may also be required above the handrails to prevent seals from jumping onto bird nets and breaking through into the cages.

Tassal is committed to passive seal deterrents and continues to investigate and trial new exclusion and deterrent technologies. Under DPIPWE's seal management protocols, Tassal can apply to the Department to relocate problem seals.

Effective management of seal interactions is a matter of crucial importance for Tassal, as seal interaction with the company's farms has the potential to impact on employee safety, Tassal's environmental management practices, and seal and fish welfare. To this end, Tassal has created a second Wildlife Management Officer position. This increased wildlife surveillance has proven very effective and has led to improved practices on farms, improved exclusion techniques, and an improved understanding of the seal population and behaviour. Tassal is aiming to reduce its number of seal entries into cages and the number of relocations significantly in the 2014 season from the continued rollout of Kikko nets and improved exclusion methods.

Marine mammals have been identified as a significant environmental aspect within the Tassal EMS. As a result, numerous operational controls are in place to ensure that seal exclusion measures and wildlife management protocols are followed to limit potential impacts on these species.

Properly designed and supported bird nets will also restrict access to birds and limit their interaction with the proposed marine farms.

For further information, see section 6.1.6.

3.5 Waste Management

3.5.1 Solid Waste

3.5.1.1 Harvest Waste

Solid waste and bloodwater from the harvest process is contained in the harvest vessel during the harvest and delivered to the primary processing plant at Dover.

Solid wastes from processing fish and reject fish are sent to an approved land-based rendering facility for further processing.

Refer to section 3.5.2 Liquid Waste for bloodwater disposal.

3.5.1.2 Fish Mortalities

Mortalities from the lease will be collected in sealed fish bins and returned to the shore base where they are held in a refrigerated container until they are collected, at least once a week, for removal to an approved land-based facility for beneficial reuse (composting or rendering/oil extraction). Tassal strives to improve fish health and reduce mortalities; this proposal in particular is expected to result in decreased mortalities as the proposed lease is located in a more optimal environment for rearing Atlantic salmon.

3.5.1.3 Feed Waste

Uneaten feed is minimised through the use of video camera feedback systems and additional tools such as pellet catching panels. Any pellets that do fall through the cages are detected in routine video surveys, and the information is used to continuously improve feed management. Feed wastage (uneaten feed, fines, chippage and dust) at the proposed lease is forecasted to be approximately 1.5% of the total feed input. This has been determined from feed waste calculations obtained for similar operations in the D'Entrecasteaux Channel and through third party audit requirements from manufacturer to fish.

3.5.1.4 Fish Waste

Fish faeces fall through the bottom of the fish cages to the sea bed. Video survey work coupled with depositional modelling enables Tassal to demonstrate that there is very little spread beyond the immediate vicinity of the cage (see section 6.1.2.3.3). The cage locations are routinely fallowed to allow the biological processes in the sediment to assimilate the organic matter, and for the sediments to recover. Herringbone mooring systems allow for flip-flop fallowing, i.e. essentially doubling the fallowing options and allowing for rotational stocking (see section 3.3.2).

3.5.1.5 Net Waste

Tassal now uses in-situ MIC technology for washing of nets, which has considerably reduced the need for land based net cleaning and maintenance. This technology is also utilised for net and rigging inspections on a regular basis.

Copper antifoulant is no longer applied to nets used by Tassal and will therefore not be used on cage nets deployed at the proposed lease.

The progressive introduction of Kikko nets has resulted in a 2/3 decrease of in-situ net washing. This has also reduced the need for land based net maintenance as these nets remain in the water for the entirety of their serviceable life.

As previously stated, the proposed lease will utilise Kikko nets.

Land based cleaning will take place on the decommissioning of the Kikko nets prior to entering into a planned plastics recycling program. As the biofouling from the nets will be uncontaminated, it will also be recycled for agricultural use where possible.

3.5.2 Liquid Waste

3.5.2.1 On-Farm Generated Wastewater

Black and grey water from amenities on the feed barge will be collected in a waste tank which is routinely emptied by the service vessel. Typically the barge would be emptied of 600 L on a monthly basis. The waste is stored on the service vessel until a bulk load can be removed on-shore. Veolia Environmental Services collect and transport the waste to an approved waste water treatment plant (WWTP).

3.5.2.2 Harvest Bloodwater

Bloodwater combined with ice water and rinse water is retained on the harvest vessel and discharged during delivery of the harvest to the Dover processing plant where it is treated by the plant's approved WWTP. The quantity can be between 10,000 L and 20,000 L per harvest.

3.5.2.3 In-Situ Net Cleaning Waste

In-situ net cleaning is carried out in line with Net Cleaning Best Practice Guidelines (Appendix 4), and waste from this is deposited below the cages; any impact is monitored as part of routine video monitoring. The volume of waste produced during in-situ cleaning is highly dependent on the location, season, and frequency of cleaning.

3.5.2.4 On-Shore Net Cleaning Waste

As Kikko nets are only cleaned on-shore at the end of their serviceable life, the generation of net wash waste water will be minimal, particularly given that the nets can be cleaned in-situ prior to being brought ashore. Tassal maintains a land based operation at Dover for net cleaning that treats all associated water solids prior to further treatment at the Dover WWTP.

Marine biofouling removed from the Kikko nets at the end of their serviceable life will be segregated and made available for land spreading or composting.

Minimal water is used during the net washing operation, approximately 2000 L per net, as several nets are washed at the same time in recycled water. Nutrient rich net wash water and rainwater from the net washing operation will be treated at the net cleaning facility to remove high solids content before discharge to the Dover WWTP.

3.5.3 Environmental Monitoring

Tassal's non-regulatory water quality monitoring is primarily conducted to benefit fish health and includes daily measuring of temperature, dissolved oxygen, salinity and turbidity. Jellyfish and harmful algal monitoring is also conducted at least daily. Tassal has initiated a microalgae response protocol, which includes the implementation of on-site microscope cameras, allowing unknown or potentially harmful microalgal species to be digitally imaged and emailed to recognised taxonomic experts for identification and verification purposes.

Tassal's Quality Control Department also conducts a bimonthly water sampling and program testing for thermotolerant coliforms, an accepted indicator of potential faecal contamination, and thus water quality (ANZECC 2000).

The environmental monitoring program in place for Tassal's marine operations will be implemented for the new lease area, including but not limited to:

- Annual benthic video monitoring will be required for the proposed lease under Schedule 3V of the Marine Farming Licence.
- In-house video monitoring additional to that required by Schedule 3V carried out as part of Tassal's lease management and fallowing program.
- Daily environmental monitoring for fish health as stated previously.
- Quality Control bimonthly water quality sampling as stated previously.

The Broadscale Environmental Monitoring Program (BEMP) of the D'Entrecasteaux Channel and Huon Estuary includes a water quality and sediment monitoring site adjacent to the proposed lease; the water quality site (W9) is approximately 1.8 km from Lippies and the sediment sampling site (B9) is approximately 0.8 km from the lease boundary. The BEMP sampling protocols are included as a schedule to marine farming licences for finfish growing operations located within the D'Entrecasteaux Channel and the Huon River & Port Esperance Marine Farming Development Plan areas.

The BEMP is aimed at assessing the broadscale effects of finfish farming and monitors water quality and sediment health at a number of sites neighbouring finfish marine farms in the D'Entrecasteaux Channel, the Huon Estuary and Port Esperance, and compares them to a control site in Recherche Bay (W15 in Figure 3.4). The monitoring program was triggered by the recommendations of previous studies undertaken in these waters by the CSIRO, which investigated the cumulative effects on the aquatic environment and potential effects from finfish aquaculture operations.

A total of 15 sites are included in the monitoring program - monitoring sites W1-9 are located within the D'Entrecasteaux Channel MFDP, Sites 10-14 in the Huon River MFDP and the control site W15 is located in Recherche Bay (see Figure 3.4). The sampling covers the entire extent of the D'Entrecasteaux Channel and Huon Estuary, from North West Bay to south east of the proposed Lippies lease.

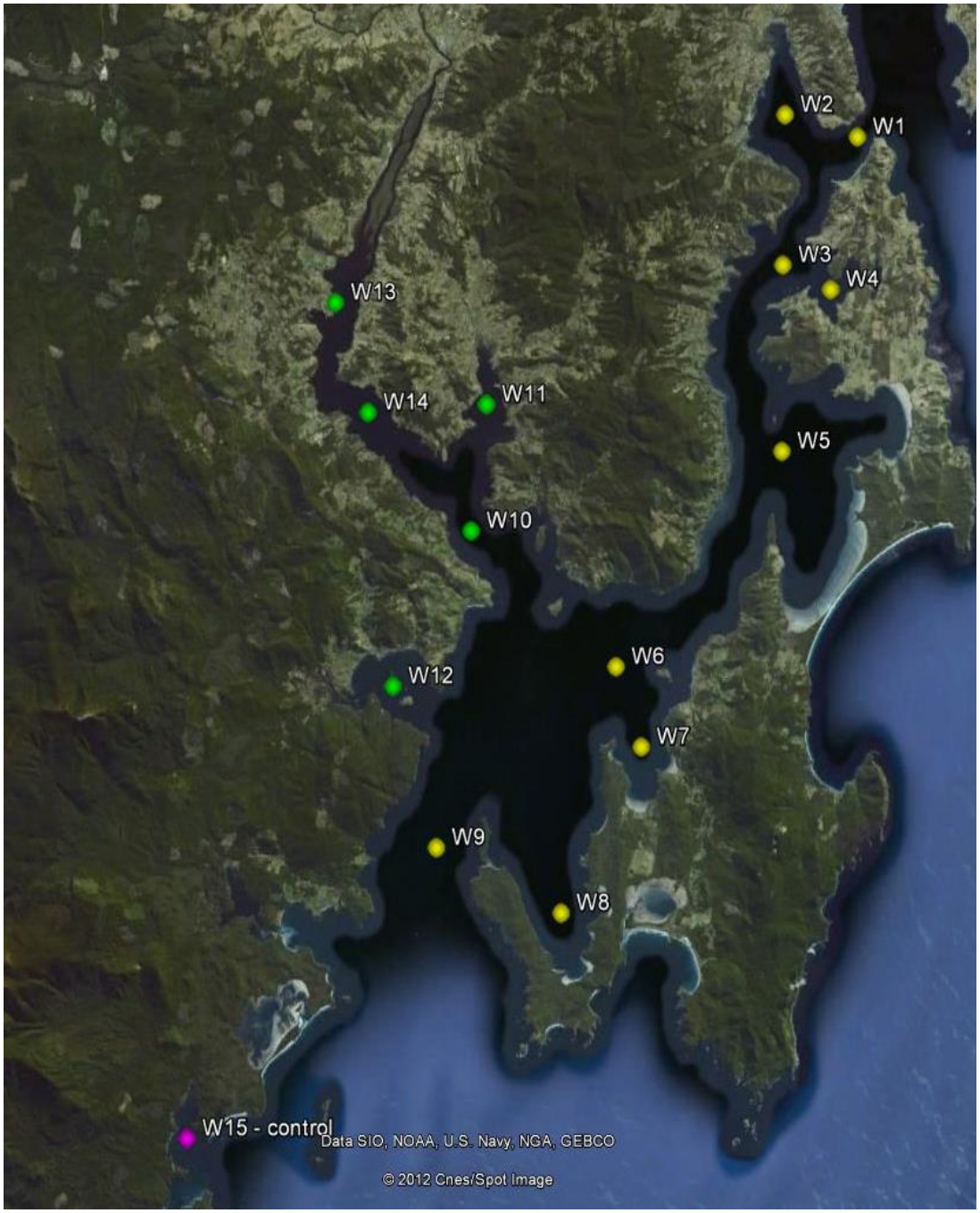

Figure 3.4. Broadscale Environmental Monitoring Program (BEMP) Monitoring Sites W1-W15

Independent monitoring occurs bi-monthly (February-April) and monthly (May-January) at each of the 15 sampling sites within the D'Entrecasteaux Channel and Huon Estuary. To date, over 85 sampling events have been conducted, representing the collection of over four consecutive years of environmental data with which to investigate seasonal or yearly trends in water quality and sediment health, and their response to a range of natural (i.e. oceanic) and anthropogenic (i.e. agriculture, sewage, aquaculture) sources of nutrients.

The monitoring program has two components - a water quality component (surface and bottom water) and a sediment component (sediment biology and chemistry).

Water Quality Parameters:

Analyses on samples are undertaken for nutrients: total nitrogen, total phosphorous, ammonia, nitrate, phosphate, and silicate.

Integrated depth samples are taken of the water column (top 14 m) to measure species composition and abundance of phytoplankton species, chlorophyll *a* concentrations and pigments.

Physical water quality measurements are taken for salinity, dissolved oxygen, pH and temperature.

Sediment Health:

Sediment samples (grabs) are taken to determine the abundance and type of benthic invertebrates living in the sediments.

Sediment samples (cores) are taken to measure redox potential, sulphides and stable isotopes, and to carry out visual and particle size analyses.

The Tasmanian Salmon Industry funds these expensive sampling and analysis regimes.

3.6 Decommissioning and Rehabilitation

As the proposed development is for a previously unused area, there is no retiring of farmed seafloor associated with this proposal.

When the proposed lease is no longer in use, Tassal will remove all mooring and associated subsurface infrastructure to allow any organic enrichment existing in the retired lease space to be metabolised by biological assimilative processes. Any impacts from farming would be remediated by these means.

The costs and timeframes associated with this work are difficult to predict. However, Tassal is committed to its responsibilities and obligations in respect of decommissioning and rehabilitation in line with marine farming license conditions.

4 Stakeholder Consultation

Tassal has identified social sustainability as a key operational pillar for the company.

Tassal takes stakeholder consultation and feedback very seriously and uses it as a catalyst for change that is built into strategy development and executive planning processes within the company. Tassal's stakeholder engagement model is benchmarked against national and international salmon and other food industry producers, retailers, and Australian resource industries.

In 2014 Tassal was ranked number one in the world's top salmon farming companies by Seafood Intelligence for transparency in corporate, social and environmental responsibility (CSER) reporting. In addition, Tassal's 2012 Sustainability Report was identified as one of the top three Sustainability Reports in Australasia for the reporting year.

Underpinning communication and engagement is the transparency of operations, an area where Tassal has steadily improved over the past five years. With the release of a third Sustainability Report in 2014, Tassal has encompassed the entire scope of their operations from hatchery through to processing. Tassal has also upgraded its website to improve access to information, current and historical, for interested parties.

The recent ASC Stakeholder engagement highlighted the importance of transparency and the need for continuous improvement processes. Environmental certification is an important tool for the transparency and accountability of operations and the third party audit process ensures that the company is achieving best practice and exhibiting continual improvement (see section 3.1.1). Tassal has certified all of its marine farming regions and primary processing facility to Global Aquaculture Alliance's (GAA) Best Aquaculture Practices (BAP – see Appendix 2). The Aquaculture Stewardship Council (ASC) certification builds on this with a comprehensive social audit component and the facilitation of coordinated stakeholder consultation. The transparency of audit findings is unique to the ASC Standard. As of August 2014, Tassal has certified four of its farming regions, with the audits for all remaining regions complete and awaiting notification.

At the local level, Tassal is actively engaged in the communities in which it operates. Tassal has a dedicated Community Engagement Officer, a role that invests time in the community, coordinates community activities, partnerships and research collaborations and liaises with non-government organisations and advisory forums. Community and stakeholder engagement is an overarching and ongoing activity within Tassal. Fostering an engagement culture in the company supports transparency and allows freedom for all employees to engage on issues important to them. Community engagement activities occur regularly throughout the year and are not necessarily tied to any specific project or proposal. Through this approach Tassal has contributed to over 30 community organisations within the Dover and Bruny Island areas alone in the past 18 months, including schools, arts groups, sports clubs and cultural festivals.

Of particular relevance to the stakeholder engagement program is Tassal's founding member status and ongoing engagement with the D'Entrecasteaux Channel Project ("The D'Entrecasteaux and Huon Collaboration") with the Kingborough and Huon Valley Councils and also Tassal's engagement with IMAS's *Your Marine Values* project (Ogier and Macleod 2013). Both of these initiatives improved community understanding of salmon aquaculture in the waterway.

For this specific proposal, Tassal has undertaken an integrated approach to stakeholder and community engagement to enhance and support communication linkages. Once potential

stakeholders were identified, Tassal developed a stakeholder engagement plan (SEP) (see page 15-18, 2013 Sustainability Report - Appendix 1) – to provide information to the local community relevant to the proposed amendment and to provide the means for interacting with stakeholders. Initial stakeholder discussions were held regarding the amendment to both existing Lippies and Browns leases. The ongoing program continues to provide a coordinated approach to stakeholder engagement and assists in the management of emerging issues, keeping stakeholders informed and maintaining relationships and open dialogues. The SEP continues to be a dynamic document; being updated or modified based on stakeholder interactions and feedback as new information emerges. It has provided an opportunity for individuals and organisations to be notified of the proposed amendment, understand the potential impacts and how it may affect them. Ongoing engagement will occur following the submission of this EIS. Tassal has informed stakeholders of the statutory processes associated with the amendment, including timelines and the opportunity to provide formal representations during the public representation and comment periods of the EIS. All information gathered during these consultations has been used in the development of this EIS.

In response to stakeholder feedback during this consultation period, Tassal has chosen to relinquish the Browns lease to the Crown, solely focussing this proposal on amending the Lippies lease. This modified proposal has involved shifting the lease further north and amending its proposed size and location on two separate occasions as a result of stakeholder consultation. Tassal views this as an offset to the broader southern D'Entrecasteaux Channel community and sees this as an integral part of the working relationship they value with such stakeholders.

Stakeholders that have been identified include, but are not limited to:

- Huon Valley Council
- Marine and Safety Tasmania (MAST)
- TasPorts
- Tasmanian Seafood Industry Council (TSIC)
- Tasmanian Abalone Council (TAC)
- Tasmanian Rock Lobster Fishermen's Association (TRLFA)
- Tasmanian Association for Recreational Fishing (TARFish)
- local boating & yachting clubs
- local residents, shack/landowners & investment groups
- Aboriginal Heritage Tasmania
- local tourism operators
- local surrounding communities.

In developing the stakeholder engagement strategy for the proposed amendment, Tassal made a conscious decision to consult prior to the statutory requirements and where necessary, consult often in order to;

1. provide stakeholders with adequate time to understand the proposal

2. provide stakeholders with the opportunity to work with Tassal to modify/adapt the proposal to minimise negative impact

3. to educate stakeholders about Tassal's farming practices

4. to educate stakeholders about the environmental impacts of salmon aquaculture practices in general.

All engagement was managed by Tassal staff, and external consultants were employed to assist and provide independent expertise based advice and assistance as required.

Information was provided as required to ensure accurate information was available and that stakeholders understood the nature of the amendment (in response to individual enquiries resulting from widespread availability of information regarding the proposal); this was an overarching intention.

Table 3 details all engagement undertaken;

Table 3. Summary of specific engagement undertaken by Tassal in chronological order including stakeholder groups engaged

Date	Engagement method	Stakeholder Group
12/12/2013	Verbal advice (as part of separate meeting)	Huon Aquaculture, Tasmanian Salmonid Growers Association (TSGA)
12/12/2013	Verbal advice (as part of separate meeting)	Environment Tasmania, Environmental Defenders Office, Tasmanian Aquaculture Reform Alliance
Feb 2014 ongoing	Website content	All interested stakeholders
3/2/2014	Briefing meeting	Yacht clubs (9 clubs represented)
12/2/2014	Briefing meeting	Tasmanian Seafood Industry Council
18/2/2014	Briefing meeting (#1)	Tasmanian Abalone Council
Feb 2014	Briefing Phone Call	Tourism Operators
22/2/2014	Boat Tour of region	Southern Huon Valley community and other interested stakeholders
8/2 & 15/2 & 5/2 & 19/2	Advertisements Mercury & Huon Valley News	Huon Valley community & interested stakeholders
17/2/2014	Briefing emails	Tasmanian Rock Lobster Fisherman's Association, Southern Coastcare Association of Tasmania (passed on to members via SCAT network), Huon Valley Councillors

Week prior to information day	Notice local shopping centre local grapevine	Dover community
22/2/2014	Dover Information Day	Southern Huon Valley community and other interested stakeholders
26/2/2014	Article Huon Valley News	Huon Valley community
5/3/2014	Presentation and Q&A Session	TAC Executive & approximately 60 TAC members
mid-March	Mailout (Australia Post – unaddressed mail service) Dover area & Southport area	Dover, Southport, Lady Bay and Sisters Bay community
13/3/2014	Briefing email	Environment Tasmania, Environmental Defenders Office, Tasmanian Aquaculture Reform Alliance – via TSGA
mid-March onwards	Phone conversations with numerous stakeholders plus site visit	Dover, Southport, Lady Bay and Sisters Bay community & other interested stakeholders
8/4/2014	Briefing meeting	TARFish Executive & Board
11/4/2014	Placement of 4 corner markers and one empty representative salmon pen and bird net on the existing Browns Lease (off Lady Bay)	Southport, Sisters Bay & Lady Bay community
16/6/2014 & 28/7/2014	Briefing meeting (s)	MAST
7/2/2014, 16/6/2014 & 16/7/2014	Briefing email (s)/meeting	TASPORTS
14/4/2014	2nd briefing meeting with TAC	TAC Executive
7/5/2014	3rd briefing meeting, Q&A session & exploration of shared research interests	TAC and IMAS
April/May 2014	Article Fishing Today Magazine (April May edition)	Tasmanian Commercial Seafood Industry

Week prior to Information Session	Notice in Southport Shop – local grapevine – phone calls to numerous contacts	Southport, Sisters Bay & Lady Bay community
30/4/2014	Southport Information Session	Southport, Sisters Bay & Lady Bay community
14/5/2014	Meeting & presentations	Lady Bay Holdings, Environment Tasmania, other landholders in Southport, Sisters Bay & Lady Bay community
Late May	Mail out to rate payers in Southport area	Rate payers in Lady Bay, Sisters Bay, Southport area
17/6/2014	Workshop, Presentations and Q&A – Tassal, consultants & IMAS presentations	TAC Executive & approx. 40 TAC members and TSGA Executive and other interested stakeholders
18/6/2014	Southport Community Meeting – presentations and Q&A	Southport & Lady Bay community, Environment Tasmania representative & other interested stakeholders
19/6/2014	Meeting (navigational risk assessment for D'Entrecasteaux Channel)	MAST, TASPORTS, Huon Aquaculture
8/7/2014	Meeting (navigational risk assessment for D'Entrecasteaux Channel)	MAST, TASPORTS, Huon Aquaculture
9/7/2014	Meeting	TAC Board Member
Feb - August	Email & phone briefings	WWF Australia
22/7/2014	Meeting re. offsets	TARFish Executive
11/9/2014	Meeting	TAC Executive

In addition to the Engagement listed in Table 3, Tassal established an online information page which provides relevant contact information for anyone who has a question, concern or wishes to obtain more information or discuss the project (Tassal Community Webpage).

Stakeholders known to Tassal will be notified of the public exhibition and comment period once statutory timelines are known.

4.1 Stakeholder Engagement Activities

4.1.1 Local Residents/Community Members

Table 4. Summary of specific community based engagement undertaken by Tassal in chronological order

Date	Engagement method	Stakeholder Group
8/2 & 15/2 & 5/2 & 19/2	Advertisements Mercury & Huon Valley News	Huon Valley community & interested stakeholders
22/2/2014	Boat Tour of region	Southern Huon Valley community and other interested stakeholders
17/2/2014	Briefing emails	Southern Coastcare Association of Tasmania (SCAT) (passed on to members via SCAT network), Huon Valley Councillors
Week prior to information day	Notice local shopping centre local grapevine	Dover community
22/2/2014	Dover Information Day	Southern Huon Valley community and other interested stakeholders
26/2/2014	Article Huon Valley News	Huon Valley community
mid-March	Mail out (Australia Post – unaddressed mail service) Dover area & Southport area	Dover, Southport, Lady Bay and Sisters Bay community & other interested stakeholders
mid-March onwards	Phone conversations with numerous stakeholders plus site visit	Dover & Southport community & other interested stakeholders
11/4/2014	Placement of 4 corner markers and one empty representative salmon pen and bird net on the existing Browns Lease (off Lady Bay)	Southport, Sisters Bay & Lady Bay community
Week prior to Information Session	Notice in Southport Shop – local grapevine – phone calls to numerous contacts	Southport, Sisters Bay & Lady Bay community
30/4/2014	Southport Information Session	Southport, Sisters Bay & Lady Bay community

14/5/2014	Meeting/presentations	Lady Bay Holdings, Environment Tasmania, other landholders in Southport, Sisters Bay & Lady Bay community
Late May	Mail out to rate payers in Southport area	Rate payers in Lady Bay, Sisters Bay Southport area
18/6/2014	Southport Community Meeting – presentations and Q&A	Southport & Lady Bay community, Environment Tasmania representative & other interested stakeholders
	Web based information	All interested Stakeholders

4.1.1.1 Dover Information Day

An Information Day was held at the Dover District High School on 22 February 2014 to provide interested community members and stakeholders the opportunity to enquire and/or seek information relating to the proposed amendment and salmon aquaculture in general. The Information Day's scope covered the initial proposal to amend Lippies and Browns leases and zones, and was promoted in the following ways;

- notice in the classified section in the Huon Valley News (HVN) (5-Feb-2014 & 19-Feb-2014)
- article in HVN (5-Feb-2014)
- Notice placed in the Hobart Mercury
- Word of mouth – local community via school
- Follow up article in HVN (26/2/2014).

See Appendix 5

Tassal employees present at the Information Day were:

- Fiona Ewing (Community Engagement Officer)
- Linda Sams (Head of Sustainability)
- Matt Barrenger (Senior Environmental Officer)
- Sam Kruimink (Environmental Officer)
- Daniel Smith (Fish Health Field Officer)
- Alistair Brown (Tassal contract veterinarian)
- Malcolm Cummins (Senior Environmental Officer)
- Depha Miedecke (Senior Manager Farming)

- Grant Purdon (Farm Manager, Huon Region)

Other relevant persons present were:

- Graham Woods (Marine Farming Branch, DPIPWE)
- Tony Thomas (Marine Farming Branch, DPIPWE)
- Sean Riley (Aquenal)
- Laura Smith (Marine Solutions)

Figure 4.1. Tassal Information Day, Dover District High School

Approximately 25 local people attended the Information Day (Figure 4.1) which included boat tours. Boat tours to the site of the proposed amended lease were available to attendees of the Dover Information Day. Approximately 15 people participated in guided boat tours as part of the Dover Information Day. Attendees were taken to Butlers lease on the western side of Great Taylors Bay, where they were shown an example of a working smolt lease and had the opportunity to ask questions regarding lease operations in relation to the proposed amendment. The locations of the Lippies and Browns leases were pointed out in transit to and from Great Taylors Bay.

The display included a number of identical display areas each comprising specific information relating to the initial proposal including:

- maps (before and after proposal)
- proposal summary document (additionally provided to all attending) (see Appendix 5)
- Tassal is Planning for a Sustainable Future document (see Appendix 5)
- photographs taken from key viewpoints – before proposed amendment and after (superimposed visual representation)

- additional informational displays were set up in relation to:
- sea cage (pen) construction
- environmental monitoring:
    - in and out of lease underwater ROV video footage
    - water sampling
    - benthic sampling
- wildlife interactions and mitigation measures (Kikko nets)
- The DPIPIWE display and information regarding the regulation of marine farming in Tasmania

4.1.1.2 Mail outs

On advice from a local community member, a mail-out was undertaken to the Dover, Southport and Lady Bay communities during March 2014. A brief letter and the document "Lippies & Browns Proposal Summary for Stakeholders_Final" (Appendix 5) was included in the mail-out along with Tassal staff contact details.

Following feedback received, a subsequent mail out was conducted to the Southport area including Lady Bay and Sisters Bay in late May 2014. This mail out used the Huon Valley Council's rate payer database in order to not only capture residents, but landholders and shack/land owners for the area. These people were sent the document "Lippies & Browns Proposal Summary for Stakeholders_Final" (Appendix 5) as well as an invitation to an information session to be held at the Southport Community Hall on the 18th June 2014.

4.1.1.3 Direct Feedback

Feedback was received from Southport Community members requesting further information regarding the proposed amendment and information about salmon farming in general. This feedback prompted the distribution of additional information to those that requested it, and a face to face meeting with one particular resident of Lady Bay.

4.1.1.4 Southport Information Session

An Information Session was held at the Southport Community Hall on 30th April 2014 to provide stakeholders with the opportunity to ask questions and/or seek information relating to the proposed amendment and salmon aquaculture in general. The Information Session was promoted via the local community noticeboard and strategic contact with local community members. The format of the session was virtually identical to the Dover Information Day described in section 4.1.1.1 although additional fact sheets had been developed and were available to take away (Appendix 5e, "Fact Sheets 1-6").

Tassal employees present at the Information Day were:

- Fiona Ewing (Community Engagement Officer)
- Linda Sams (Head of Sustainability)
- Matt Barrenger (Senior Environmental Officer)

- Sam Kruimink (Environmental Officer)
- Depha Miedecke (Senior Manager Farming)
- Geoff Dobson (Farm Manager, Dover Region)

Other relevant persons present were:

- Graham Woods (Marine Farming Branch, DPIPWE)
- Tony Thomas (Marine Farming Branch, DPIPWE)
- Sean Riley (Aquenal)
- Sam Ibbott (Marine Solutions)

4.1.1.5 Meeting – residents and landowners and other interested parties

On the 14th May 2014, a meeting was held at Tassal Head Office in Hobart with representatives from groups with various interests in the Lady Bay, Sisters Bay area. Representatives from Lady Bay Holdings, local tourist operators, individual landholders, and stakeholders attended the meeting.

Tassal staff present at this meeting were;

- Fiona Ewing (Community Engagement Officer)
- Linda Sams (Head of Sustainability)
- Matt Barrenger (Senior Environmental Officer).

Other relevant persons present were:

- Steve Carter (Environmental Dynamics) – noise & visual impact specialist
- Sean Riley (Aquenal)
- Sam Ibbott (Marine Solutions).

The meeting covered a range of topics including (but not limited to);

- Potential impact of proposed lease changes on amenity (visual noise)
- An overview of current environmental monitoring
- General information regarding salmon aquaculture
- Information regarding the environmental impact of salmon aquaculture at the fine spatial scale
- Potential impact of proposed lease changes on the land (shore base, truck and vehicle movements)
- Commercial impact on value of property and Lady Bay Holdings interests.

4.1.1.6 Southport Community Meeting

On the 18th June 2014, an independently facilitated community meeting was held at Southport Community Hall. This meeting was attended by a broad spectrum of stakeholders.

Tassal staff present at this meeting were;

- Fiona Ewing (Community Engagement Officer)
- Linda Sams (Head of Sustainability)
- Matt Barrenger (Senior Environmental Officer)
- David Kiemele (Head of Farming).

Other relevant persons present were:

- Sean Riley (Aquenal)
- Sam Ibbott (Marine Solutions).

Information was presented by Tassal, Aquenal and Marine Solutions regarding the proposed amendment, compliance, the marine farming approvals process, and local and broadscale environmental research and monitoring. This community meeting followed a question and answer approach and was intended to expand upon the information provided during the preliminary consultation process (see Appendix 5). Minutes were kept detailing points raised throughout the meeting and were used to facilitate Tassal's formal follow up.

The meeting covered a range of topics including (but not limited to);

- Potential impact of proposed lease changes on amenity (visual noise)
- General information regarding salmon aquaculture
- Information regarding the environmental impact of salmon aquaculture at the fine spatial scale
- Potential impact of proposed lease changes on the land (shore base, truck and vehicle movements)
- Specific questions regarding Tassal
- Specific questions regarding the marine farming planning process and the regulation of marine farming in Tasmania
- Broadscale environmental monitoring programs
- Desire to understand what opportunities may be available for the local area should the proposed amendment moves ahead (jobs, tourism opportunities, investment in the region)
- Commercial impact on value of property and Lady Bay Holdings interests
- Commercial impact on value of proposed accommodation and tourism ventures.

4.1.2 Consultation with yacht and boating clubs

Yachting and boating clubs located in Tasmania's south east were contacted and supplied with documentation regarding the proposed amendment (see Appendix 5).

An information session was held at the Derwent Sailing Squadron (DSS) club rooms on the 3rd February 2014. Representatives from yachting clubs attended and those that were absent were contacted individually. All attendees and email contacts resulting from this meeting were supplied with the information regarding the initial proposal (see Appendix 5):

Attendees who provided contact addresses were supplied with minutes of the meeting as well as referral to the DPIPWE Aquaculture web pages.

At this meeting, attendees were provided with the opportunity to provide feedback regarding salmon aquaculture in general and the South East Optimisation project in particular. Operational, technical and executive staff from Tassal and consultancies attended this meeting in order to answer questions and provide supporting information regarding internal and external environmental monitoring activities, respectively. Information from this meeting was utilised in the development of this EIS.

4.1.3 Fishing Groups Consultations

An article detailing the initial proposal was included in *Fishing Today* - April/May 2014 edition. This publication is distributed across the Tasmanian Seafood Industry. Tassal appreciates that an economically and environmentally sustainable seafood sector contributes to the economy of Tasmania and is committed to working cooperatively with industry stakeholders towards this end.

4.1.3.1 Tasmanian Seafood Industry Council (TSIC)

Tassal met with TSIC Executive Officer to outline the proposal. The TSIC Executive Officer also attended the workshop held on 17 June 2014 discussed in section 4.1.3.4.2.

4.1.3.2 Tasmanian Association for Recreational Fishing (TARFish)

TARFish was provided with the initial proposal to amend Lippies and Browns and a subsequent meeting with the TARFISH Board was held on the 8th April 2014. Following this meeting, TARFISH consulted with its members.

4.1.3.3 Tasmanian Rock Lobster Fishermen's Association (TRLFA)

The TRLFA were provided with the relevant information on the proposed amendment. Representatives of the TRLFA attended the workshop held on 17 June 2014 (see section 4.1.3.4.2).

4.1.3.4 Tasmanian Abalone Council (TAC)

Table 5. Summary of specific engagement undertaken in chronological order by Tassal with the Tasmanian Abalone Council and members

Date	Engagement method	Stakeholder Group
18/2/2014	Briefing meeting (initial at TAC)	Tasmanian Abalone Council
5/3/2014	Presentation and Q&A Session	TAC Executive & approximately 60 TAC members
14/4/2014	2nd briefing meeting with TAC	TAC Executive
7/5/2014	3rd briefing meeting, presentation & Q&A session	TAC and IMAS
17/6/2014	Workshop, Presentations and Q&A – Tassal, consultants & IMAS presentations	TAC Executive & approx. 40 TAC members and TSGA Executive and other interested stakeholders
9/7/2014	Meeting	TAC Board Member
11/9/2014	Meeting	TAC Exective

Tassal has been actively engaging with the Tasmanian Abalone Council throughout the development of this EIS. Tassal recognises that the abalone fishery is an iconic Tasmanian wild fishery that has contributed significantly to the value of Tasmania's seafood production over many years.

4.1.3.4.1 Presentations

A TAC Executive has assisted Tassal to contact their members and provide the information required to better understand the proposed amendment. This includes information on Tassal's environmental performance, operational practices, local and broad scale environmental monitoring activities, compliance requirements, depositional and hydrodynamic modelling and further research.

Information was delivered to abalone council members on two separate occasions scheduled for maximum effect to coincide with TAC member meetings; the 5th March and the 17th June).

4.1.3.4.2 Workshops

There have been two workshops held with the TAC. The first involving TAC executive and research staff was held on 7th May 2014. Tassal employees present were:

- Linda Sams (Head of Sustainability)
- Matt Barrenger (Environmental Manager)

Other relevant persons present were:

- Sean Riley (Aquenal)
- Sam Ibbott (Marine Solutions)
- Catriona Macleod (IMAS)
- Craig Mundy (IMAS)
- Jeff Ross (IMAS)
- TAC Executive Group members – Avril Brown and Greg Woodham

The purpose of this workshop was to provide further opportunities to compare current and previous research studies; focussing on salmon aquaculture and the abalone wild fishery, and to identify potential areas of collaborative research to benefit both industry sectors and improve Tassal's understanding of TAC concerns regarding the proposed amendment.

Points of particular relevance include:

- Concern regarding harmful algal blooms
- Understanding that the Actaeon Island reef system supports a complex fishery and the potential effects of salmon farming on the fishery
- Effects of salmon farming on macro algal assemblages
- Drivers of broadscale environmental change over time
- Uncertainty about potential links between salmon aquaculture and toxic algal bloom events, and other risks to the wild abalone fishery
- Potential opportunities for cross sectoral research studies
- The development of a forward plan to facilitate dialogue and information between the TAC and Tassal.

The second workshop was independently facilitated involving members held on 17 June at IMAS and involved representatives of the TRLFA and TSIC, in addition to TAC.

Tassal employees present were:

- Linda Sams (Head of Sustainability)
- Fiona Ewing (Community Engagement Officer)
- David Kiemele (Head of Farming)
- Matt Barrenger (Environmental Manager)
- Alistair Brown (Tassal Veterinarian)

Other relevant persons present were:

- Sean Riley (Aquenal)
- Sam Ibbott (Marine Solutions)
- Catriona Macleod (IMAS)

- Craig Mundy (IMAS)
- Jeff Ross (IMAS)
- TAC Executive and approximately 40 TAC members attended.

The purpose of this workshop was to further discussions between the TAC and Tassal; presenting relevant information to a wider group of abalone fishery stakeholders and for Tassal to gain a more comprehensive understanding of potential areas of concern regarding the proposed amendment.

4.1.4 Tourism Operator Consultation

Tourism operators Pennicott Wilderness Journeys, Peppermint Bay Cruises, Tasmanian Air Adventures and Roaring 40°S Kayaking were contacted in February 2014, and informed of the initial proposal. Information was also garnered on regional use to characterise any potential conflict with existing tourism operators.

4.1.5 MAST and TASPORTS Consultations

As the proposal developed, regular briefings were conducted with Marine and Safety Tasmania (MAST) and TASPORTS to determine any potential impacts to recreational boating or commercial shipping of each new iteration of the proposal.

Additionally, MAST and TASPORTS have assisted the salmon industry with the development of a navigational risk assessment for the D'Entrecasteaux Channel, which may be used to develop a range of management controls to mitigate potential hazards to recreational and commercial boaters (see Appendix 5). This program is an ongoing process, and overlaps with a number of regulatory bodies, with the aim being to reduce confusion around the regulatory lighting of salmon aquaculture leases in the D'Entrecasteaux Channel. This has been developed as a baseline framework for industry to work with stakeholders on matters regarding this subject.

4.1.6 Other Consultation

Environment Tasmania, Environmental Defenders Office (EDO) and the Tasmanian Aquaculture Reform Alliance (TARA) were advised of the initial proposal at a Tasmanian Salmonid Growers Association (TSGA) meeting on 12 December 2013, with follow-up information being provided to these stakeholders directly from Tassal.

A number of organisations have been advised of the proposed amendment and also sent the Proposal Summary for Stakeholders (Appendix 5b), including;

- Huon Valley Council
- TasPorts
- Southern Coastcare Association of Tasmania (sent to SCAT membership via email)
- TARFish
- World Wildlife Fund for Nature (WWF) Australia.
- Environmental Defenders Office

- Environment Tasmania
- Southern Coastcare Association of Tasmania (SCAT)
- Tasmanian Aquaculture Reform Alliance
- Tasmanian Conservation Trust
- Notice in the classified section in the Huon Valley News
- A copy of the initial Lippies and Browns Proposal for Stakeholders was advertised at the Southport Shop.

4.2 Major outcomes of Stakeholder Engagement

As discussed earlier in section 4, Tassal made a determined effort to ensure that engagement with stakeholders was undertaken in a timely manner. This approach exceeded statutory requirements, but despite this improved level of engagement, a number of concerns continued to be expressed relating to potential impacts of the proposed amendment. The majority of these issues related to environment, visual amenity, and exclusion from a range of recreational and commercial activities.

As previously stated, the proposed amendment has been significantly modified on two occasions in order to take account of stakeholder concerns – the evolution of these modifications are detailed in the sections below.

4.2.1 Local Residents/Community Members

The ongoing engagement throughout the development of the EIS has provided opportunities to garner feedback from local residents and community members. A full list of local community stakeholder engagement activities is outlined in Table 6 in section 4.1.1.

The process of engagement has been iterative and flexible, and Tassal continues to conduct outreach into local communities, and identify new stakeholder groups. This has enabled Tassal to continue to refine its SEP, providing further information to a wider audience and creating additional opportunities for consultation.

Table 6 summarises the outcomes of each engagement activity undertaken.

Table 6. Outcomes of major community stakeholder consultation activities

Engagement Activity	Stakeholder Group	Summary of Outcomes
Dover Information Day & Boat Tour	Southern Huon Valley community and other stakeholders	• Article published in local newspaper • Mail out conducted • Positive feedback, issues & concerns communicated to Tassal • 25 community members actively engaged

Consultation with numerous stakeholders plus site visit (resulting from 1st mail out)	Dover, Southport, Lady Bay and Sisters Bay community & other stakeholders	• Information session in Southport • Site visit by Community Engagement Officer • Email & phone engagement with approx. 12-15 locals • Development of fact sheets • Placement of 4 corner markers and one empty representative salmon pen and bird net on the existing Browns Lease
Southport Information Session	Southport, Sisters Bay & Lady Bay community	• Delay submission of EIS • Modify lease configuration • Consultation with TASPORTS & MAST • Survey work • Modify lease configuration (2nd) • Further consultation TASPORTS and MAST • Additional meeting (Q&A Session) arranged in Hobart for Lady Bay Holdings
Meeting in Hobart	Lady Bay Holdings, Environment Tasmania, other landholders & tourism operators	• Mail out to Southport, Sisters Bay and Lady Bay ratepayers • Community meeting in Southport
Southport Community Meeting	Southport, Lady Bay & Sisters Bay community, Lady Bay Holdings, Environment Tasmania	• Delay submission of EIS • Modify lease configuration (3rd) • Written response covering aspects of salmon aquaculture, environmental impact and this lease proposal as per questions asked in meeting

The following are the main issues raised during consultation with local residents and community members:

- Marine Debris
- Environmental impact of salmon farming and nature of emissions
- Broadscale effects of salmon aquaculture on the marine environment
- Impact of escaped salmon on native fishes
- Visual and noise impacts
- Impacts to land values

All issues raised by local residents and community members and others are described in sections 4.2.2 – 4.2.6 below.

4.2.1.1 Feedback from Dover Information Day (22/2/2014)

The majority of feedback from local community members (attending the information day), regarding the proposal was positive with particular emphasis on the economic security of the aquaculture industry in the southern D'Entrecasteaux Channel area.

Most attendees were interested in the location of the proposed amendment and if it would impact their fishing and ability to navigate along the stretch of coastline immediately inshore of the proposed leases. Other issues included;

- The potential for environmental impacts
- The need to ensure all stakeholders are identified and contacted regarding the proposed amendment

The HVN subsequently published an article summarising the proposal further assisting the dissemination of information to stakeholders (26 February 2014).

4.2.1.2 Feedback from first (Southport/Dover) mail out

As the primary contact for stakeholders, Tassal's community engagement officer was contacted by a number of residents, land and shack owners in Lady Bay and Southport. The main issues raised include:

- Impacts on property value
- Potential impact of proposed amended leases on proposed eco-cabin/tourist ventures
- Impacts of salmon farming, both localised and broad scale
- Concern regarding possibility of shore base in Lady Bay and resultant traffic
- Acknowledgment of Tassal's contribution to the local economy.

Based on this feedback, Tassal decided to hold an information session in Southport, specifically to inform the Southport, Lady Bay and Sisters Bay communities. Additional (to that supplied at Dover Information Session) information fact sheets (Appendix 5) were provided on specific topics and made available to attendees of this information session.

A representative from Tassal conducted a site visit to Lady Bay, touring the property fronting onto the coast at Lady Bay. Four corner markers and one unstocked salmon cage were subsequently installed on the existing Browns lease. This was undertaken to aid the visual positioning of the proposed amendment to the stakeholders of the area.

Tassal has informed stakeholders of the process of EIS development and how representations may be made to the DPIPWE. Tassal has committed to notify stakeholders when the period for public representations is open. Ongoing meetings and discussions with local residents/community members will be held as required.

4.2.1.3 Feedback from Southport Information Session (30/4/2014)

- The majority of feedback from stakeholders (attending the information session), related to concerns on the impact of the proposed amendment to the visual amenity of existing dwellings and potential eco-tourism developments in the Lady Bay area. Issues raised included: Impact of proposed amended lease on property value

- Visual impacts (particularly regarding the Browns Lease)
- Noise impact
- Concern regarding the commercial impact on potential eco-cabins/tourism ventures
- Localised and broadscale environmental impacts
- Concern regarding possibility of shore base in Lady Bay
- Acknowledgment of Tassal's contribution to the local economy.

Note: The vast majority of concern raised by stakeholders at these sessions related to potential impact on the amenity of existing and proposed dwellings and prospective eco-tourism businesses. This largely stemmed from the proposed Browns amendment. A number of attendees requested that Tassal consider moving the proposed leases further north to mitigate the impacts to visual amenity.

Due to feedback received from the most affected stakeholders (in addition to feedback described previously) Tassal decided to delay the submission of the EIS and modify the proposed amendment. A second proposed lease configuration (Lippies and Browns) was developed (Figure 4.2) and subsequent survey work was undertaken. Following this survey and stakeholder discussions, the configuration was modified to provide adequate scope and distance from the shoreline south of Scott Point (Figure 4.3). Through Tassal's SEP, a fourth configuration is proposed in the EIS to appease concerns from stakeholders and incorporates a single 28 pen bay lease further to the north, see Figure 3.1.

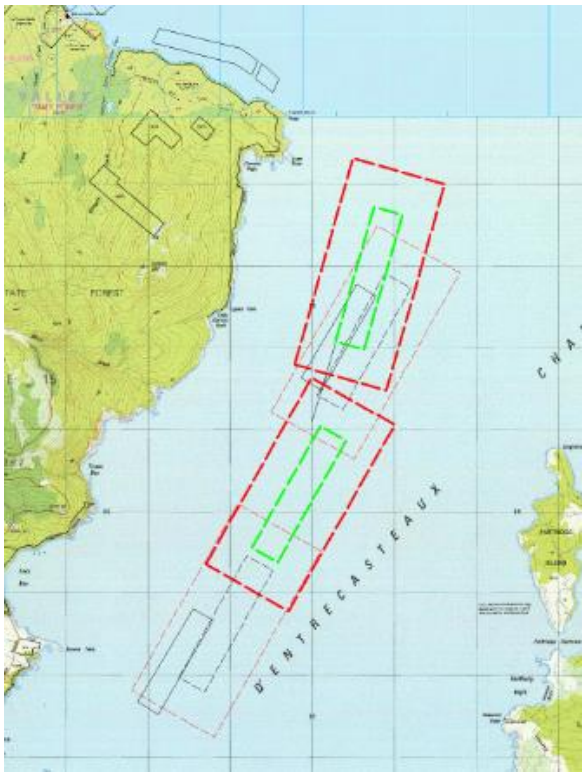

Figure 4.2. The second proposed lease configuration (Lippies and Browns)

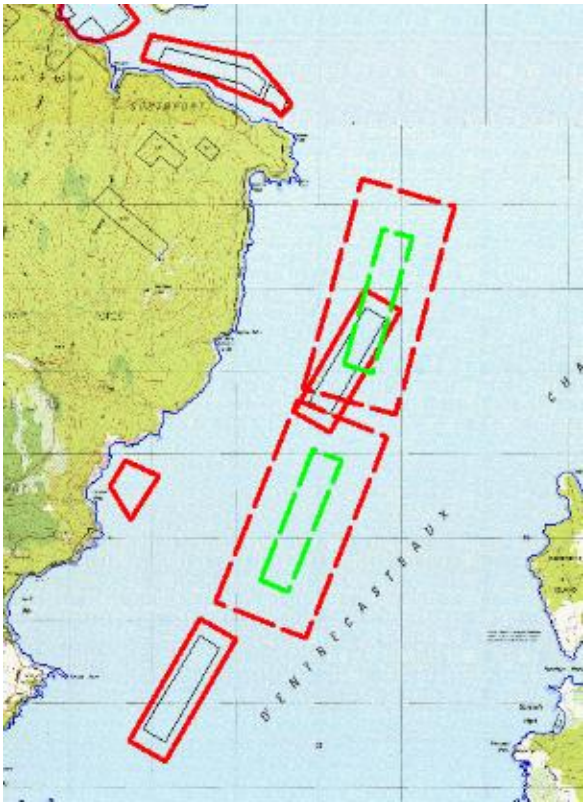

Figure 4.3. The modified lease configuration positioned to provide adequate scope and distance from fringing reef habitat

4.2.1.4 Feedback from Hobart Meeting (14/5/2014)

Feedback from this meeting related to the potential impact of the proposed amendment on the amenity of potential eco-tourism businesses in the Lady Bay area as well as environmental concerns regarding the impact of salmon aquaculture, both localised and broad scale.

- Potential impact of proposed amended lease on property value
- Visual impact (particularly the Browns Lease)
- Noise impacts (particularly Browns Lease)
- Concern regarding the commercial impact the proposed lease amendment may have on proposed eco cabins/tourism ventures
- The siting of the Browns Lease will impact on property values and eco experience of visitors to proposed eco-cabins
- Environmental concern relating to the impacts of salmon farming, both localised and broad scale
- Concern regarding possibility of shore based infrastructure situated in Lady Bay

Note: The majority of concern related to amenity impact on dwellings, and the proposed eco-tourism businesses. These were centred on the proposed Browns lease amendment, with a number of attendees stating that moving the leases further north would ameliorate

this impact and moreover omitting the proposed amended Browns lease would be an acceptable compromise.

4.2.1.5 Feedback from Southport Community Meeting (18/6/2014)

Feedback from this meeting regarding the proposed amendment mirrored feedback resulting from all engagement activities described above.

A complete list of questions was captured at this meeting and Tassal has responded to all attendees who indicated they were interested in receiving written responses to questions.

Tassal wrote to all attendees (who supplied contact details) providing copies of the presentations given at this meeting and undertook to contact all participants when EIS is due to be lodged and open for public consultation.

Due to feedback received from stakeholders at Lady Bay (and other stakeholder groups, see section 4.2.3.4), Tassal decided to investigate other potential lease orientations and configurations and thus agreed to delay the submission of this EIS and modify the proposed amendment. Additional benthic surveys were undertaken collaboratively by IMAS, CSIRO and Tassal. This survey work revealed consolidated substrate extending beyond the fringing coastal reef, which led Tassal to pursue a fourth proposed lease configuration (Figure 3.1).

4.2.2 Yachting and Boating Clubs

Consultation with yachting and boating clubs revealed that some recreational boaters have a broad range of concerns relating to salmon aquaculture in general (as opposed to this particular amendment). These include noise, visual impacts, navigation impediments (especially at night when lights from farms can be confusing), odour, restriction of access to anchorages, increased boat traffic and changes to the natural marine environment. Concerns directly relating to the proposed amendment of Lippies and Browns leases were limited to restriction of navigation through the southern D'Entrecasteaux Channel region.

Changes in the marine environment over a long period of time perceived to be caused by salmon aquaculture activities include the following:

- Changes in sediments in the D'Entrecasteaux Channel/Huon Estuary region.
- Changes in algal assemblages, particularly on rocky shores
- Impacts to native fishes from escaped salmon
- Impacts to natural ecosystems and the potential for introduced marine pests

There were no specific views (received by Tassal) expressed regarding the Lippies and Browns proposal by individuals involved in recreational boating.

As a result of consultation with yacht clubs, the Kettering Yacht Club has publicised the proposed amendment on their website[3].

[3]Kettering Yacht Club. TASSAL Southern Channel Expansion Plan http://www.kyc.yachting.org.au/assoc_page.cgi?client=0-10044-0-0-0&sID=299383&&news_task=DETAIL&articleID=28290641 – accessed 28-March-2014

Tassal has developed an internal navigational risk assessment framework for mitigating the impacts of marine farming operations and infrastructure to navigation (see section 4.1.5). Additionally, Tassal has also participated in an industry Navigational Risk Assessment for the entire D'Entrecasteaux Channel and Lower Huon Estuary (Appendix 5i & 5j), an ongoing program seeking to develop practical solutions to address community and industry concerns around navigation.

4.2.3 Fishing Groups

4.2.3.1 Tasmanian Seafood Industry Council (TSIC)

Tassal has consulted with the Tasmanian Seafood Industry Council, the Tasmanian Rock lobster Fisherman's Association, and the Tasmanian Abalone Council.

4.2.3.2 Tasmanian Association for Recreational Fishing (TARFish)

No formal feedback was received from the TARFish Board; however TARFISH consulted with its members regarding the proposed amendment.

4.2.3.3 Tasmanian Rock Lobster Fishermen's Association (TRLFA)

The TRLFA was contacted and provided with the relevant documentation on the proposed amendment. Tassal was advised that there were no issues for the TRLFA apparent with the proposal.

The TRLFA executive attended the workshop on the 17th June 2014 and is described in section 4.2.3.4.

4.2.3.4 Tasmanian Abalone Council

Tassal is developing a proposal for collaborative research program that will work to support the sustainability of 3 iconic Tasmanian industries being abalone, rock lobster and salmon

Table 7 summarises the outcomes of each of the major engagement activities held with the TAC.

Table 7. Outcomes from each major engagement activity undertaken with Tasmanian Abalone Council

Date	Engagement Activity	Outcome
18/2/2014	Briefing meeting (#1)	• Provision of information to Abalone Council • Presentation to group of TAC members • Information package (relevant to concerns) developed and supplied to the TAC
5/3/2014	Presentation and Q&A Session	• Agreement to develop a workshop with Tassal, consultants and IMAS
14/4/2014	Briefing meeting (#2)	• Provide written response to a series of questions • Provide relevant scientific papers as requested

		• develop collaborative meeting with TAS executive and IMAS researchers to further brief TAC executive and highlight knowledge/research gaps • Offer to provide plankton monitoring data to the TAC • Delay submission of EIS
7/5/2014	3rd briefing meeting, presentation & Q&A session	• Workshop agenda developed • Presentations developed and designed to answer specific questions
17/6/2014	Workshop, Presentations and Q&A – Tassal, consultants & IMAS presentations	• TAC Executive and members, TRLFA Executive and TSGA Executive • Independent Facilitation provided • Presentations supplied to TAC and posted on members section of website • Information package (relevant to concerns) developed and supplied to the TAC • Cross sectoral collaborative research proposal being developed • Decision to drop southernmost lease
9/7/2014	Closed containment meeting & Q&A	• Meeting with TAC representatives and IMAS researcher to discuss alternative rearing technology
11/9/2014	Meeting with TAC Executive	• TAC communicated position regarding proposed amendment

Tassal readily acknowledges the importance of the Actaeon reef system to the Tasmanian abalone fishery. Tassal has continued to engage with the Tasmanian Abalone Council throughout the development of the EIS and will continue to engage beyond the scope of this proposal.

Broadly, issues and concerns raised by TAC have been addressed by Tassal in the following ways;

- Organisation of workshops and presentations
- Facilitation of expert knowledge transfer
- Provision of information to TAC members
- Tassal is working on developing a proposal for collaborative research program that will work to support the sustainability of the abalone. rock lobster and salmon aquaculture industries
- Data sharing with TAC and expand the Tassal sampling program if useful to this group
- Reconfiguration of the proposed lease to maximise distance from areas of potential conflict with all stakeholders (southern edge of the proposed Lippies lease now 14 km from the Actaeon reef system).

In early October 2014, the Tasmanian Abalone Council released a document titled *Risks to the Tasmanian Abalone Fishery from further expansion of the Salmonid Industry.* Table 8 outlines Tassal's interpretation of the major issues raised in this document and where these points have been addressed in this EIS.

Table 8. Summary of issues raised by Tasmanian Abalone Council which are addressed in this EIS

Issue	Section addressed in EIS
Ecological and biosecurity risks of salmon farming to the marine environment	3.3.5.1.1
Impacts to amenity (i.e. noise and visual impacts)	6.2.1 & 6.2.6
Reduction in available waterway area (i.e. boating and navigational hazards)	6.2.2
Salmon farming relying on culture of an introduced species and uses artificial food in manmade structures	6.1.9 & 3.4.2
Effect on water quality and substrates in close proximity to farming	6.1.1 & 6.1.2
Broadscale and long-term environmental impacts of salmon farming are not well understood	3.5.3 & 6.1.3
General lack of research on the environmental impacts of salmon farming on inshore Tasmanian flora and fauna communities	6.1.3
Promotion of Harmful Algal Blooms through the eutrophication of the water column	3.4.3, 6.2.8, 6.1.1 & 6.1.10
Conflict of interest - lack of independence associated with environmental monitoring of benthic habitat	3.5.3 & 6.1.2.5.1
Lack of adequate hydrodynamic model of D'Entrecasteaux Channel	5.1.3 & 5.1.4

The gap in research identified by the Tasmanian Abalone Council regarding impact of salmon farming on rocky reef communities reinforces the importance of the seafood industry working together on a whole of ecosystem and catchment based approach to understand the drivers of productivity (and change) in these ecosystems.

4.2.4 Tourism Operators

Pennicott Wilderness Journeys, Peppermint Bay Cruises, Tasmanian Air Adventures and Roaring 40ºS Kayaking each advised Tassal that they have no objections to the proposed amendment. Each of these operators may periodically utilise the southern D'Entrecasteaux

Channel region, but none are currently operating tours through this region on a regular basis.

4.2.5 Other

MAST advised Tassal that the proposed amendment does not present any navigational concerns.

TasPorts advised that the proposed amendment does not pose any concerns for commercial shipping in the area.

As previously stated, MAST and TasPorts have both assisted in the development of the industry navigation risk assessment (see Appendix 5).

4.2.6 General

Consultation with stakeholders has also revealed a desire to know more about how they can input into the statutory process associated with the amendment to a marine farm development plan. Where possible, Tassal's community engagement officer has informed stakeholders of the process of EIS development and submission. A commitment has been made to Stakeholders known to Tassal that they will be notified of public representation and comment period as soon as possible once statutory timelines are known.

Meeting with stakeholders as described previously has developed a solid foundation for ongoing dialogue. Many questions have been addressed and information exchanged through this process.

4.3 Further Consultation/Engagement

Tassal is continuing to work with the Tasmanian Abalone Council and provide information regarding this and other proposed amendments. Tassal is also committed to collaborating on future research projects with the Tasmanian Abalone Council and other Tasmanian wild catch fishery sectors.

Where possible, Tassal has informed local residents and community members of the process of EIS development and submission. A commitment has been made to stakeholders and will be notified of public representation and comment period as soon as possible once statutory timelines are known.

The following environmental non-governmental organisations (ENGOs) will be contacted directly and notified when the proposed amendment is open for public representation:

- Tasmanian Conservation Trust
- Bruny Island Environment Network
- NRM South
- Environment Tasmania
- Environmental Defenders Office, Tasmania
- Tasmanian Aquaculture Reform Alliance (TARA)

- World Wildlife Fund for Nature (WWF) Australia
- Southern Coast Care Association Tasmania.

5 Existing Environment

5.1 Environmental Conditions

5.1.1 Bathymetry (IMAS survey and other where available)

5.1.1.1 Zone 25 – East of Lippies Point

An initial zone assessment was carried out in February 2014 by IMAS. Subsequent repositioning of the proposed amended lease at Lippies Point required this initial report to be amended in August 2014. The IMAS zone assessment reports including data collection methods are included in Appendix 6a and 6b.

The bathymetry for the proposed Zone 25 can be seen in Figure 5.1 where the solid black rectangle shows the proposed zone (see Appendix 6b). The majority of the area is flat, with less than 5° slope between the eastern and western boundaries.

The north and north eastern sections of the proposed zone are approximately 35 m with depth gradually increasing to approximately 45 - 50 m throughout the remainder of the proposed zone. These depths are consistent with the baseline survey conducted in 2004 (Aquenal 2004 – see Appendix 6d).

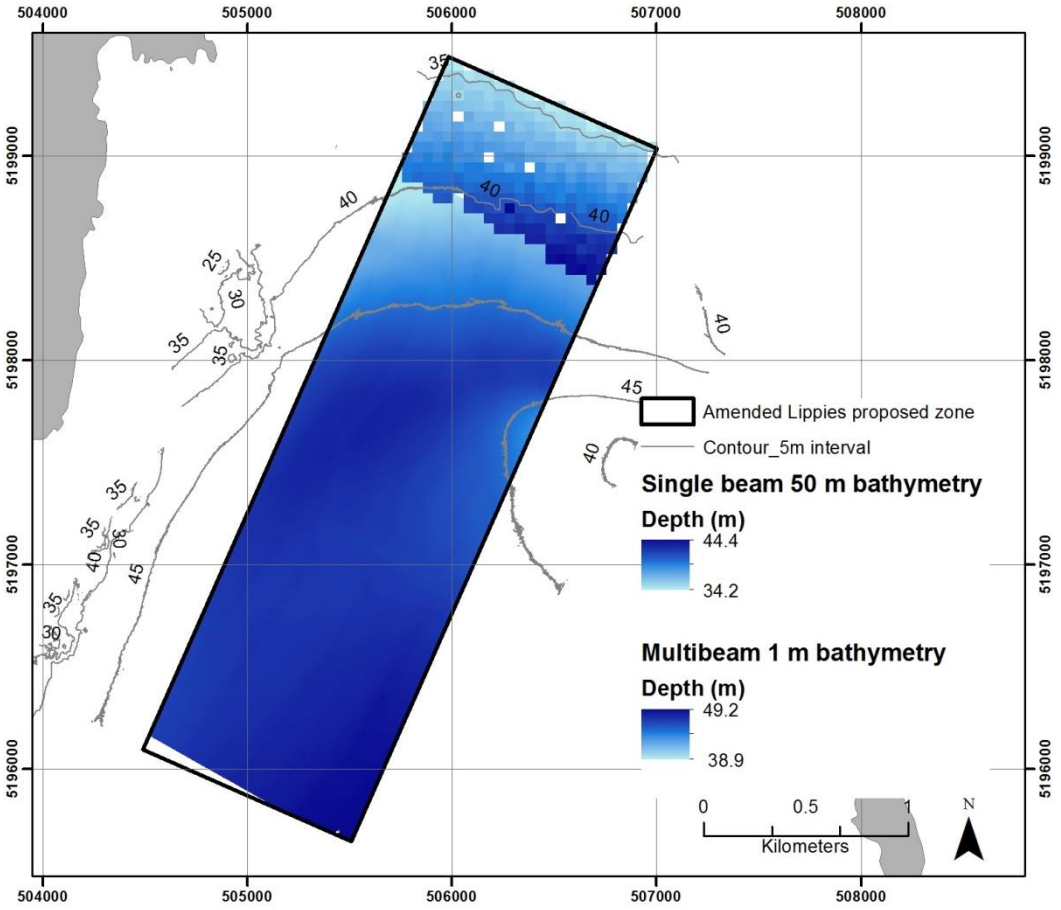

Figure 5.1. Bathymetry of the assessment area at East of Lippies Point (from Appendix 6)

The IMAS zone assessment report including data collection methods is included in Appendix 6.

Please note that Figure 5.1 was constructed using data collected on two separate occasions; the initial survey was conducted in February and was recorded using a multibeam echosounder and produced bathymetry data at a 1 m resolution, the remaining area was surveyed in August using a single beam echosounder resulting in a 50 m resolution.

5.1.2 Substrates (IMAS survey and other where available)

5.1.2.1 Zone 25 – East of Lippies Point

The substrates and benthic habitat for the proposed Zone 25 are shown in

Figure 5.2 where the solid black rectangle shows the proposed. The survey assessment area consisted of silty sand and sand substrate, in line with the 2004 baseline survey, indicative of moderate current movement (Aquenal 2004) (see Appendix 6a and 6b).

Figure 5.3 shows broader habitat mapping of the existing and proposed lease area (TAFI habitat mapping).

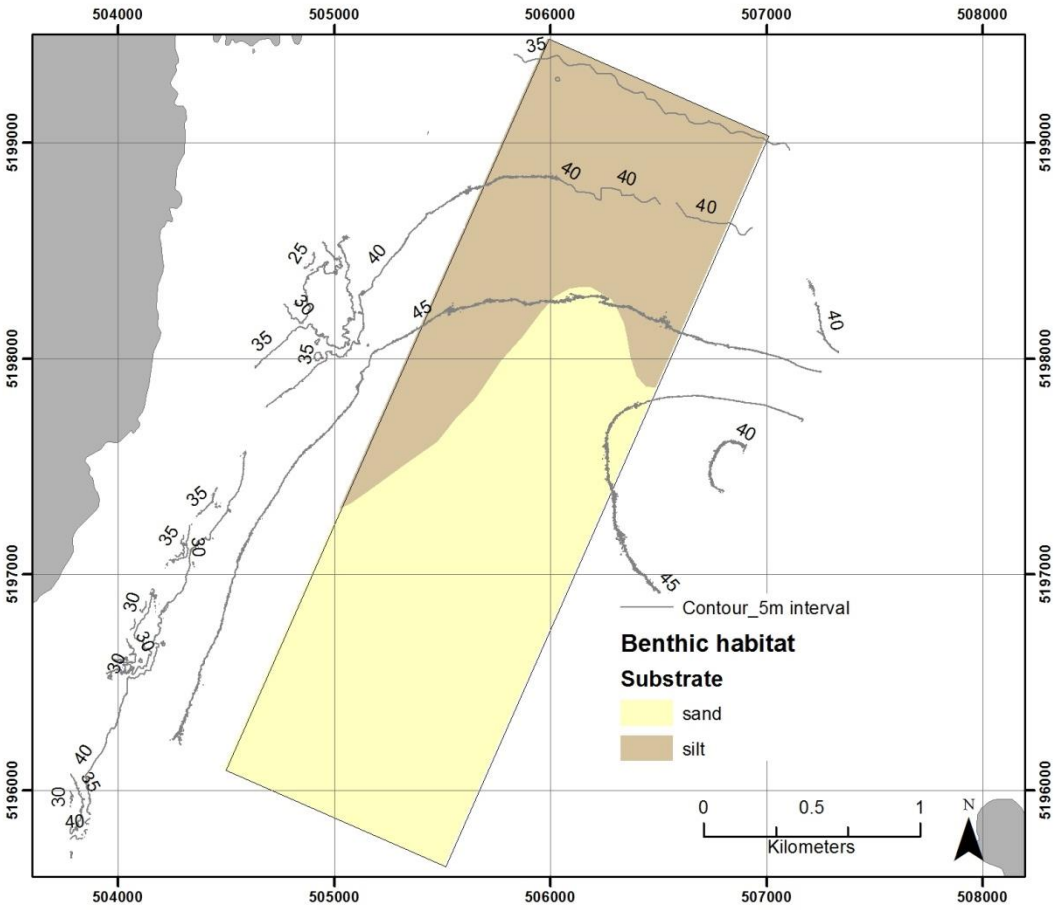

Figure 5.2. Benthic habitats of the assessment area at East of Lippies Point (from Appendix 6)

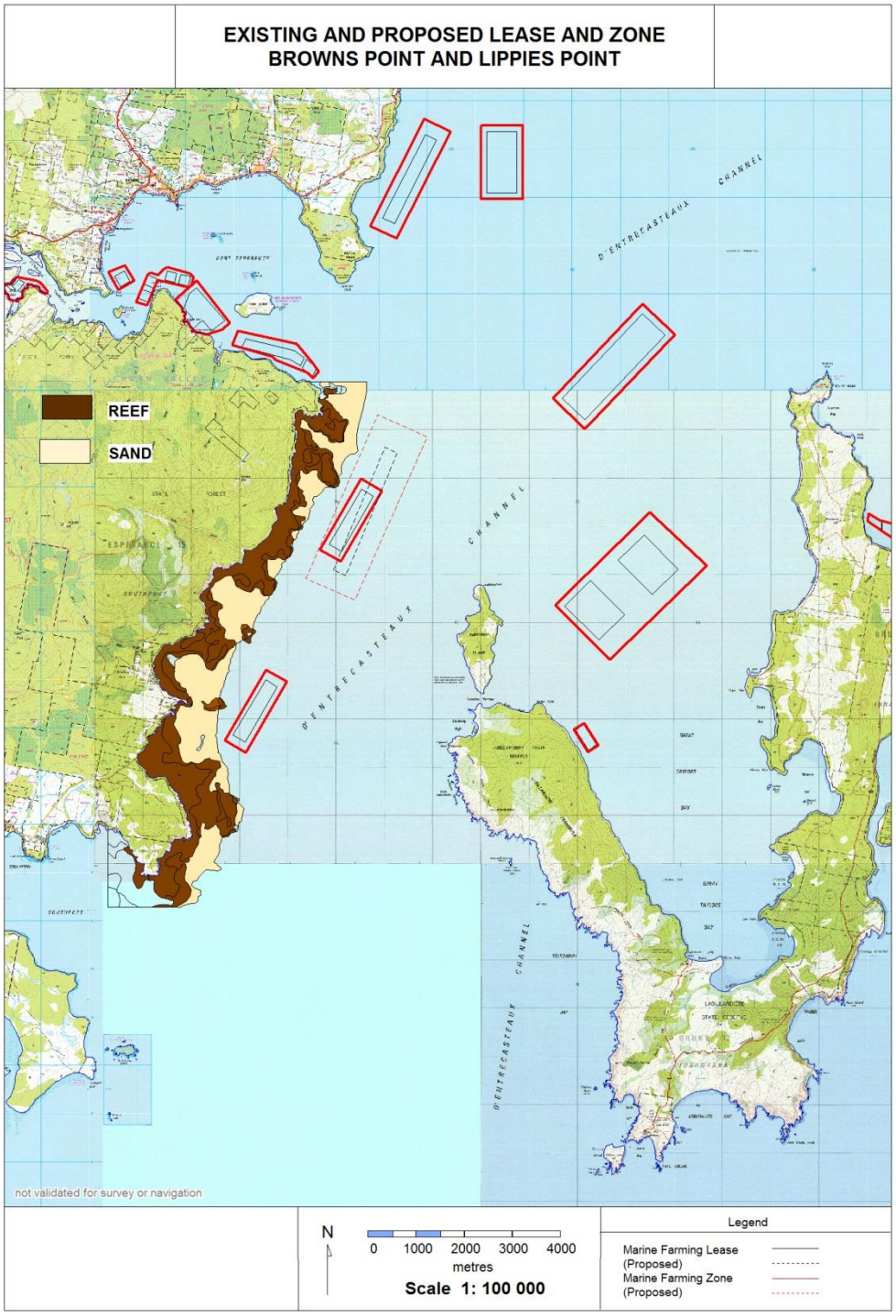

Figure 5.3. Existing and proposed zone and lease and TAFI habitat mapping (Barrett et al. 2001) showing reef and sand substrate to 40 m depth contour

5.1.3 Hydrology

The proposed zone is situated over a trough that is approximately 45 – 50 m at its deepest point, and forms the deepest section of water in the entire D'Entrecasteaux Channel/Huon

Estuary region (Parsons 2012). The average tidal range is 0.5 m, and therefore tidal velocities are low (~0.02 m s^{-1}) (Parsons 2012).

The proposed zone area is influenced by three major currents: the East Australian Current brings warm nutrient-poor water from the north; the nutrient-rich Antarctic Circumpolar Current circulates cold water from the south; and the Zeehan Current (an extension of the Leeuwin Current) contributes cool water from the north-west. The bulk movement of bottom water is from south of Partridge Island up the D'Entrecasteaux Channel, with surface currents are largely driven by wind (Herzfeld et al. 2005). Table 9 below, outlines flushing times for the D'Entrecasteaux Channel. The proposed zone, at the southern boundary of the D'Entrecasteaux Channel, is expected to have good flushing rates due to greater exchange with oceanic waters.

In order to characterise hydrology within the vicinity of the proposed amendment, an Acoustic Doppler Current Profiler (ADCP) was deployed off the coast north east of Lady Bay (Figure 5.4). The ADCP location was chosen to be representative of hydrological conditions experienced in the proposed zone. The ADCP measured current velocity and direction throughout the water column every 20 minutes over a period of 6 weeks. Data was composited into bins and summarised for average flow, minimum flow, maximum flow, percentage of flows less than 3 cm s^{-1}, percentage of flow less than 5 cm s^{-1}, and percentage of flow greater than 10 cm s^{-1} for each depth bin (Figure 5.5). Polar plots of current velocity and direction were prepared for each depth bin. Frequency histograms of current velocity (2 cm s^{-1} bins) and directional current roses (10 degree bins) were also prepared for each depth bin. These can be seen in Appendix 7 (refer to Appendix 7 Figures 1 to 10).

Table 9. Flushing time estimates for the D'Entrecasteaux Channel and Huon Estuary

Region	Flushing time estimate (days)		Reference
	Low flow	**High flow**	
Huon Estuary	5.6	2.5	Volkmann et al. (2009)
Huon Estuary (surface layer)	1.3	0.6	Volkmann et al. (2009)
D'Entrecasteaux Channel	7.5 (February)	8.8 (October)	Herzfeld et al. (2005)
D'Entrecasteaux Channel and Huon Estuary combined	~26 (based on neutrally buoyant particle)		Herzfeld et al. (2005)

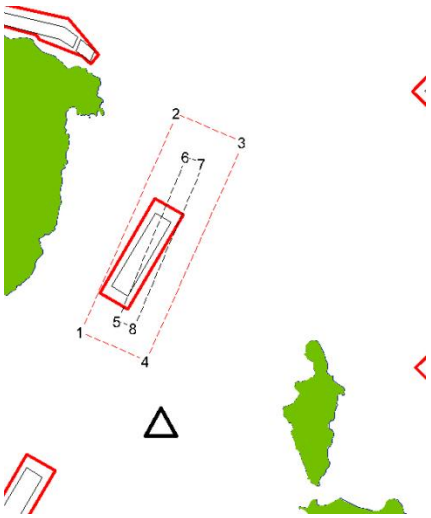

Figure 5.4. Map showing location of ADCP deployment (bold black triangle).

A negative correlation between depth and current velocity was observed, with the slowest average and maximum current velocities being found in the deepest water. The average current velocity in all but the surface water ranged from 4.6 cm s^{-1} to 6.3 cm s^{-1}. The average velocity of the surface water was 20.9 cm s^{-1}, which can be attributed to wind-driven surface current. Likewise, maximum current velocity was relatively consistent throughout all but the surface water. For this recorded bin, the maximum velocity was over three times that of any other velocity observed.

Current direction appears to be dominated by flow from the north - north east with water flows from the D'Entrecasteaux Channel. Conversely, bottom water (bin 10) is the only bin that experiences water flow from the south east. This data aligns with the model in Figure 5.6, from Herzfeld et al. 2005 (see section 5.1.4), where surface flows from the Huon Estuary, into the D'Entrecasteaux Channel and out beyond Partridge Island, while bottom current flows in the opposite direction, pushing up the D'Entrecasteaux Channel and the Huon Estuary.

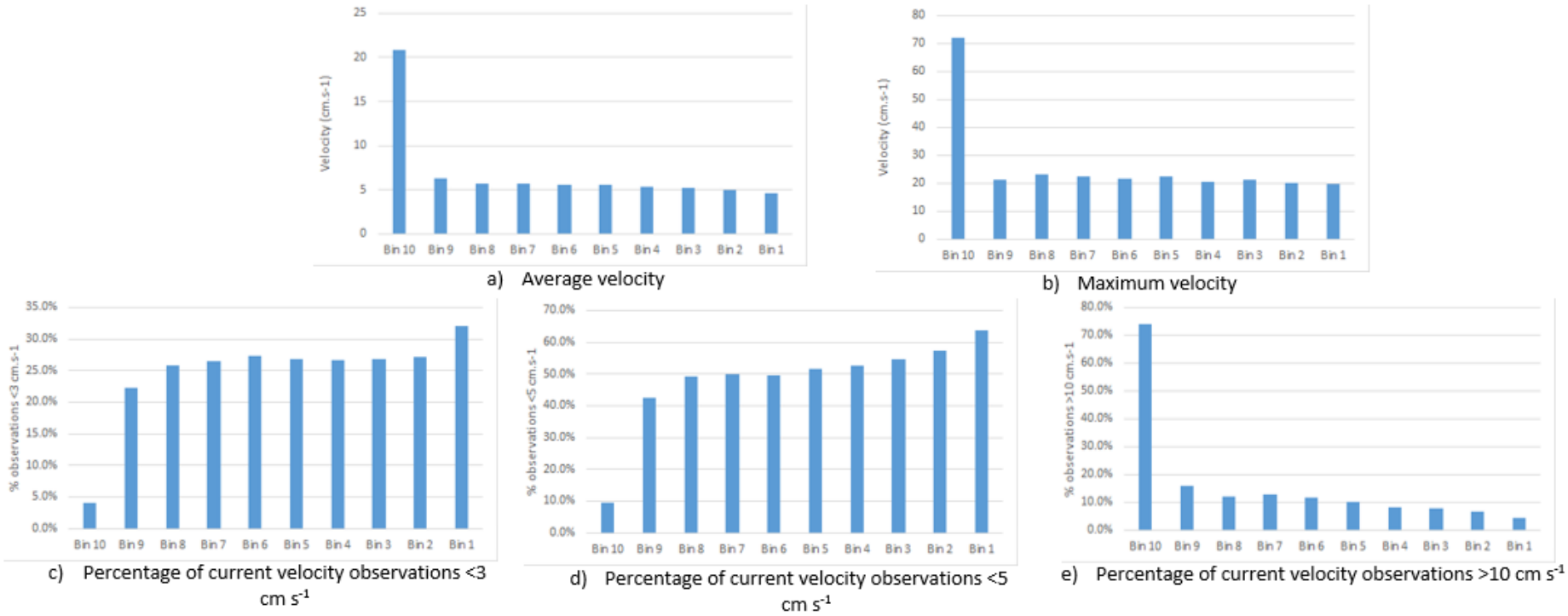

Figure 5.5. ADCP summary statistics

5.1.4 Water Quality

The D'Entrecasteaux Channel is naturally oligotrophic, with strong trophic coupling and nutrient cycling processes that result in very few algal blooms (cf. Huon Estuary) (Volkman et al. 2009).There is considerable exchange with offshore derived oceanic waters, including seasonal intrusions of warmer water from the East Australian Current in summer, and colder water from the Zeehan Current in winter.

The proposed amendment at Lippies is situated at the southern boundary of the D'Entrecasteaux Channel, and hence, trends in water quality are largely influenced by intrusions of oceanic water moving upstream as a salt wedge into the D'Entrecasteaux Channel and Huon Estuary. A small proportion of Huon River flow also exits in surface currents via the southern D'Entrecasteaux Channel. These features are well described in Herzfeld et al. 2005 (see Figure 5.6). The interaction between the denser oceanic derived water from the south and the more buoyant freshwater flows from the Huon River strongly influence the stratification, nutrient dynamics and primary productivity of these waters (RPDC 2006).

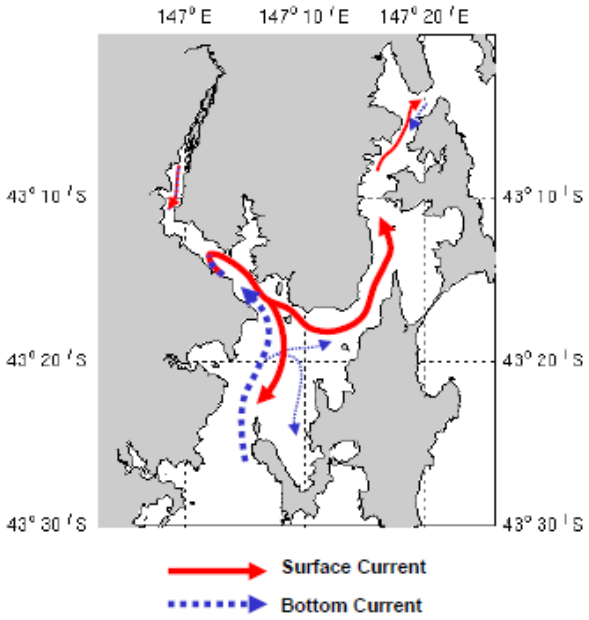

Figure 5.6. Residual circulation in the D'Entrecasteaux Channel and Huon Estuary (From: Herzfeld et al. 2005)

Comprehensive studies of the hydrodynamics and nutrient cycling in the D'Entrecasteaux Channel have been ongoing since 2002. The Whole of Ecosystem Assessment of Environmental Issues for Salmonid Aquaculture in the D'Entrecasteaux Channel and Huon Estuary (Volkman et al. 2009) contributed significantly to an understanding of the effects of salmonid aquaculture on the marine environment, especially within the context of the relative contributions of major external sources of nutrients to the system (i.e. fish farms, catchments, point source pollution discharges and oceanic intrusions).

Crawford et al. (2006) and Thompson et al. (2008) expanded upon this work to develop practical, cost-effective and scientifically robust methods for monitoring broadscale effects of salmon farming and suggested a range of ecological, physical and chemical indicators to determine the whole of ecosystem effects from increased nutrient loads. As a consequence, the Tasmanian salmonid industry established the Broadscale Environmental Monitoring

Program (BEMP) in 2009 to collect baseline environmental information on water quality and sediment health in the D'Entrecasteaux Channel and Huon Estuary (as described in section 3.5.3). The BEMP is a condition of licence for all companies undertaking salmon farming in the D'Entrecasteaux Channel and Huon Estuary.

The BEMP water quality monitoring site 9 (W9) is located approximately 1.8 km from the closest point to the proposed Lippies lease boundary (see W9 in Figure 3.4 in section 3.5.3 and Figure 5.12 in section 5.2.2). The water quality data included in this EIS cover 68 sampling events at site W9 from March 2009 – August 2013 and are representative of the background water quality characteristics within the area of the proposed amendment.

Table 10. Seasonal average values for salinity, temperature and dissolved oxygen taken at the surface and bottom at BEMP site W9 from March 2009-August 2013

	Autumn		Winter		Spring		Summer	
Analyte	**Surface**	**Bottom**	**Surface**	**Bottom**	**Surface**	**Bottom**	**Surface**	**Bottom**
Salinity (ppt)	35.5	35.6	35.1	35.3	35.3	35.9	35.4	35.4
Temperature (°C)	15.6	15.2	11.7	12.3	13.3	12.5	16.7	14.9
Dissolved Oxygen (% sat)	97.3	92.2	95.8	93.6	104.4	98.1	103.5	96.0
Dissolved Oxygen (mg/L)	7.8	7.4	8.3	8.0	8.8	8.4	8.1	7.8
No. of sampling events	24	24	15	15	12	12	15	15

Seasonal averages for salinity, water temperature and dissolved oxygen (for surface and bottom water) for sampling events 1-68 at W9 are shown in Table 10. The values suggest that the waters of the southern D'Entrecasteaux Channel are typically marine in nature and generally well mixed.

Salinity for both surface and bottom waters (45 m to 50 m depth) remains relatively consistent between seasons and there is little variation between the two, suggesting a relatively minor influence from Huon River derived freshwater surface flows. For surface water, seasonal average values range from 35.1 parts per thousand (ppt) in winter to 35.9 ppt in autumn. This range for bottom water is 35.3 ppt (winter) - 35.9 ppt (spring). The small variation in salinity between surface water and bottom water samples over the period is consistent with the Herzfeld et al. (2005) conceptual model of residual circulation in the D'Entrecasteaux Channel-Huon Estuary system and the predominantly marine nature of waters within the southern D'Entrecasteaux Channel region (Figure 5.6).

Surface water temperatures at W9 ranged from 11.7°C in winter to 16.7°C in summer, whereas a more contracted variation occurred for bottom water temperatures which ranged from 12.3°C in winter to 15.2°C in autumn, which, surprisingly, is 0.3°C higher than the summer seasonal average temperature.

Dissolved oxygen values at W9 are generally higher for surface water than bottom water. Seasonal average values for dissolved oxygen in surface water ranged from 104.4% saturation in spring to 95.8% saturation in winter. This range for bottom water is 98.1% saturation (spring) – 92.2% saturation (autumn).

Determinations of dissolved and total nutrients are shown below in Table 11.

Table 11. Nutrient concentrations for BEMP Site W9 taken from March 2009-August 2013

Analyte	Mean		Maximum		Minimum	
	Surface	Bottom	Surface	Bottom	Surface	Bottom
Ammonium (mg/L-N) **(n=63)**	0.001	0.005	0.006	0.024	0.000	0.000
Oxidised Nitrogen (mg/L-N) **(n=68)**	0.017	0.036	0.067	0.101	0.000	0.004
Phosphate (mg/L-P) **(n=68)**	0.007	0.010	0.015	0.017	0.002	0.003
Total Nitrogen (mg/L-N) **(n=68)**	0.261	0.268	0.520	0.400	0.120	0.090
Total Phosphorous (mg/L-P) **(n=68)**	0.028	0.030	0.051	0.054	0.010	0.010
Silicate (mg/L-S) **(n=68)**	0.091	0.069	0.300	0.200	0.000	0.000

Dissolved nutrient concentrations (ammonium, nitrate, phosphate and silicate) display a range of patterns related to seasonal influxes of Southern Ocean-derived nutrient rich water in winter (particularly nitrate), biological uptake of nutrients in the photic zone during summer (particularly ammonium), and processes of sediment remineralisation (particularly ammonium and phosphate) that occur throughout the year. This explains the observed differences between surface water and bottom water results. The values shown below are consistent with the range of nutrient concentrations observed at other BEMP sampling sites within the D'Entrecasteaux Channel.

Chlorophyll a results for W9 are shown separately because the environmental signature of algal bloom events is manifested by chlorophyll a concentrations that are significantly larger than background levels. This is shown in Figure 5.7, where a sharp spike in *chlorophyll a* concentration in April 2011 represents a significant algal bloom event in the southern D'Entrecasteaux Channel.

Chlorophyll a concentrations are an accepted indicator of phytoplankton biomass and are usually higher in the warmer months, but peaks in spring and autumn are known to occur in the D'Entrecasteaux Channel and Huon Estuary. Furthermore, large differences in *chlorophyll a* concentrations are known to occur between sites, and in some instances, algal bloom events are restricted spatially to individual bays or regions within the D'Entrecasteaux Channel and Huon Estuary. For example, in April 2011, the algal bloom event observed at

W9 was complemented by larger than usual *chlorophyll a* concentrations at Sites 7 (Little Taylors Bay), 8 (Great Taylors Bay) and 6 (Central Channel), and in the Huon Estuary, but remained at baseline levels at the Port Esperance and northern D'Entrecasteaux Channel BEMP sites.

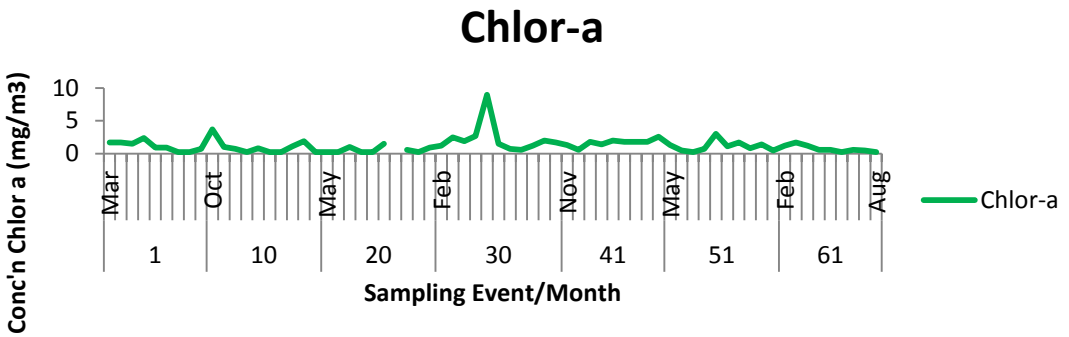

Figure 5.7. *Chlorophyll a* concentrations at BEMP Site W9 taken from March 2009-August 2013

A comprehensive assessment of the first three years of the BEMP was undertaken by IMAS to assess the ecological condition of the D'Entrecasteaux Channel and Huon Estuary, including environmental impacts from marine farming, wastewater treatment and industrial plants, and the effects from natural oceanic influences (Ross and Macleod 2013). This review provides a summary of water and sediment quality data collected from 2009-2012 and forms an important reference point for assessing ecological impacts at the whole of ecosystem level. It was suggested that the BEMP data set has the potential to inform and benefit a great many programs and environmental initiatives within the D'Entrecasteaux Channel and Huon Estuary systems.

5.1.5 Geoconservation Sites

A desktop search of LISTMap was undertaken and indicates there are no listed geoconservation sites located in the surrounding area of the proposed development. It must be noted that the Western blanket bogs and Conleys Beach Pleistocene Dune are approximately 12 and 10 km straight-line distance from the proposed lease, respectively (see Figure 5.8, LISTMap 4 August 2014). The Labillardiere Peninsula dolerite and Cloudy Bay Mid-bay Spit are identified in Figure 5.8, but are situated in locations not believed to be influenced by the proposed amendment. Impacts are therefore considered to be nil.

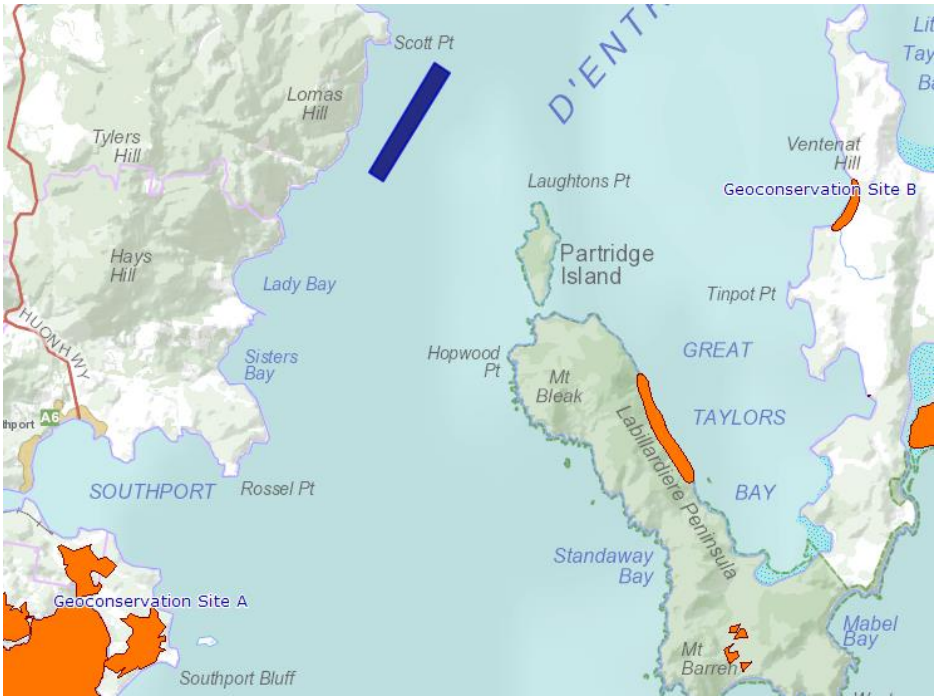

Figure 5.8. Geoconservation sites (highlighted in orange, with marine farm lease shown in blue) in the vicinity of the proposed Lippies Point lease. Please note that the lease location is illustrative only (LISTMap)

Western blanket bogs (Geoconservation Site A) is the most extensive organosol terrain in Australia and the Southern Hemisphere. These blanket bogs developed in response to high precipitation, high humidity and low evaporation. It also contains other significant features which include peat mounds and subfossils of Melaleuca.

This type of landform is easily destroyed by fire, with large areas on the west coast of Tasmania being stripped of blanket bog soils by anthropogenic firing (DPIPWE 2013[4]).

Conleys Beach Pleistocene Dune (Geoconservation Site B) is the only known location of a reasonably intact last interglacial coastal dune occurring at sea level; this indicates recent tectonic activity in the area. The highly bleached nature of surface sands and semi-lithified dune core suggest that it is most likely to be a recent interglacial feature.

Only very minor current day beach berms occur in front of the dune. This type of occurrence has not been described from other sites in the State but it appears there may be more subdued features just to the south at Tin Pot Bay.

This landform could be threatened by uncontrolled development of vehicle access points to the beach. Although semi-lithified and more resistant to erosion by wave action, sea level rise poses a longer term threat to these geological features (DPIPWE 2013[5]).

[4]DPIPWE (2013) Natural Values Atlas - Western blanket bogshttps://www.naturalvaluesatlas.tas.gov.au/pls/apex/f?p=200:60:2472622661220444::NO:RP,60:P60_GEOSITE_ID:2527 – date accessed 05-Feb-2014

5.1.6 Wind and Wave Conditions

The area of the proposed amendment is subject to varying degrees of wind-driven and swell-driven waves. Sea (or wind) waves are generated by the local prevailing wind and vary in size according to the length of time a particular wind has been blowing, the fetch (distance the wind has blown over the sea) and water depth. Swell waves are the regular longer period waves generated by distant weather systems.

Combined sea and swell is also known as total wave height, or significant wave height. The height of the combined sea and swell refers to the average wave height of the highest one third of the waves. In any given conditions, the maximum wave height may be up to twice the significant wave height, and may occur up to four times per day. King or rogue waves in excess of twice the significant wave height usually have a component of current flowing in the opposite direction to the wave activity.

The proposed lease area is protected from swell from all directions except south; at this location, southerly swells funnel between the Tasmanian coast and the Labillardiere Peninsula.

Approximations of fetches from various directions to the proposed site can be seen in Figure 5.9. There is a fetch of approximately 30 km from the north-east; however, strong sustained winds from this direction are unusual, and the refractive nature of waves combined with the complex coastline means a fully developed sea state is unlikely. The wooded shoreline to the west of the site provides shelter from north-westerly to south-westerly winds.

Figure 5.9. Approximations of the fetch from various directions to the area of the proposed lease

[5]DPIPWE 2013[b] Natural Values Atlas - Conleys Beach Pleistocene Dune https://www.naturalvaluesatlas.tas.gov.au/pls/apex/f?p=200:60:4418164882409095::NO:RP,60:P60_GEOSITE_ID:2206 date accessed 28-Oct-2013

Wind roses from Cape Bruny are shown in Figure 5.10, it is the closest weather station to the proposed lease. Northerly and westerly winds dominate in the mornings, with the northerly component being heavily influenced by cold air drainage from the Huon Valley, while prevailing winds from the westerly quadrant dominate in the afternoons.

The proposed zone is exposed to winds from most directions and is predicted to be considerably affected by sea breezes (Aquenal 2004). Weather patterns directing strong southerly winds and large swells onto southern Tasmania have the potential to generate damaging wave activity at the proposed lease site. In this instance, the infrastructure will be adequately engineered and moored to cope with the largest expected weather conditions (see section 3.3.1).

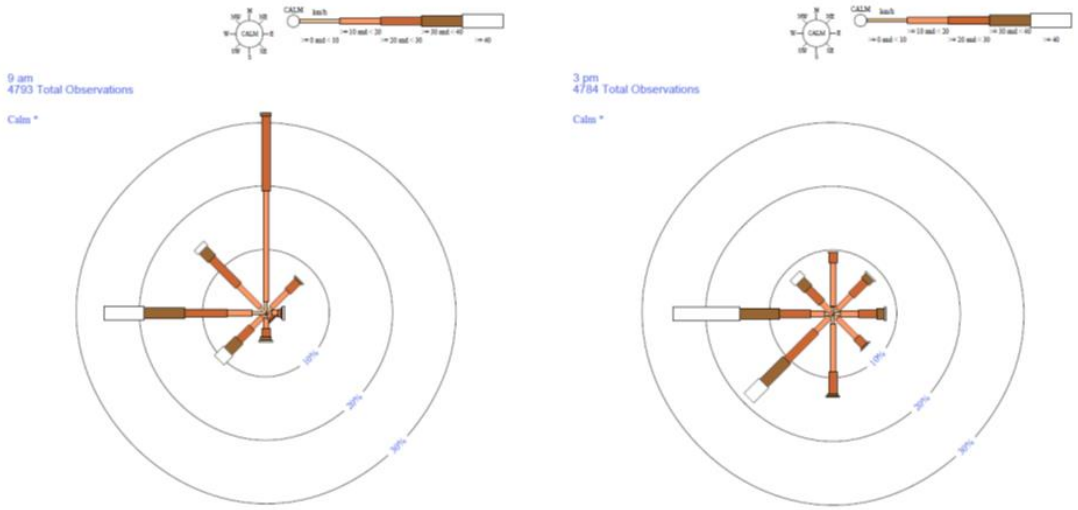

Figure 5.10. Summary wind roses from Cape Bruny 1997-2010, 9am (left), 3pm (right)

5.2 Flora and Fauna

5.2.1 Marine Vegetation (IMAS survey and other where available)

The fringing reef habitat that was found along the shoreline made up most of the marine vegetation throughout the survey assessment area; this area will not be subject to farming infrastructure. The survey completed by IMAS (see Appendix 6a) found the substrate directly beneath the proposed lease area to be dominated by sand and silt with little or no benthic vegetation.

The algal communities along the coastal fringing reef to the west of the proposed zone and along the Labillardiere Peninsula shore are typical of southern Tasmanian sub-maximally to maximally exposed reefs. This shoreline exhibits distinct depth zonation in algal distribution, with monospecific stands of bull kelp (*Durvillea potatorum*) dominating the upper sublittoral zone, beneath which the strap weed (*Lessonia corugata)* generally dominates between 3 m - 7 m depth. At slightly deeper reefs, kelps still dominate with cray weed (*Phyllospora comosa*)

and palm weed (*Ecklonia radiata*) forming a canopy, interspersed with Giant kelp (*Macrocystis pyrifera*).

Feathery red algae including *Plocamium sp* are also common, along with patches of *Caulerpa sp,* while encrusting corraline algae are present right throughout the depth range as a dominant understorey species. The presence of drifting and attached brown and green algae on sandy substrate was also noted in the 2004 baseline survey of the existing Lippies lease area (Aquenal 2004).

A targeted Giant kelp survey was conducted in March 2014 in the area surrounding the proposed amendment; the areas covered by Giant kelp and reef are detailed in Table 12, with locations shown in Figure 5.11.

As these Giant kelp communities were observed in waters ranging from 4 m to 12 m in depth, they are recognised as potentially meeting the criteria of a threatened ecological community under the EPBC Act. The assessment of impact is detailed in section 5.2.6.

Table 12.Reef and *Macrocystis pyrifera* surface canopy area as observed on the 2014 survey

Site	Reef area (ha)	Kelp area (ha)
Adjacent shoreline	246.10	64.43
Partridge Island	196.53	40.95

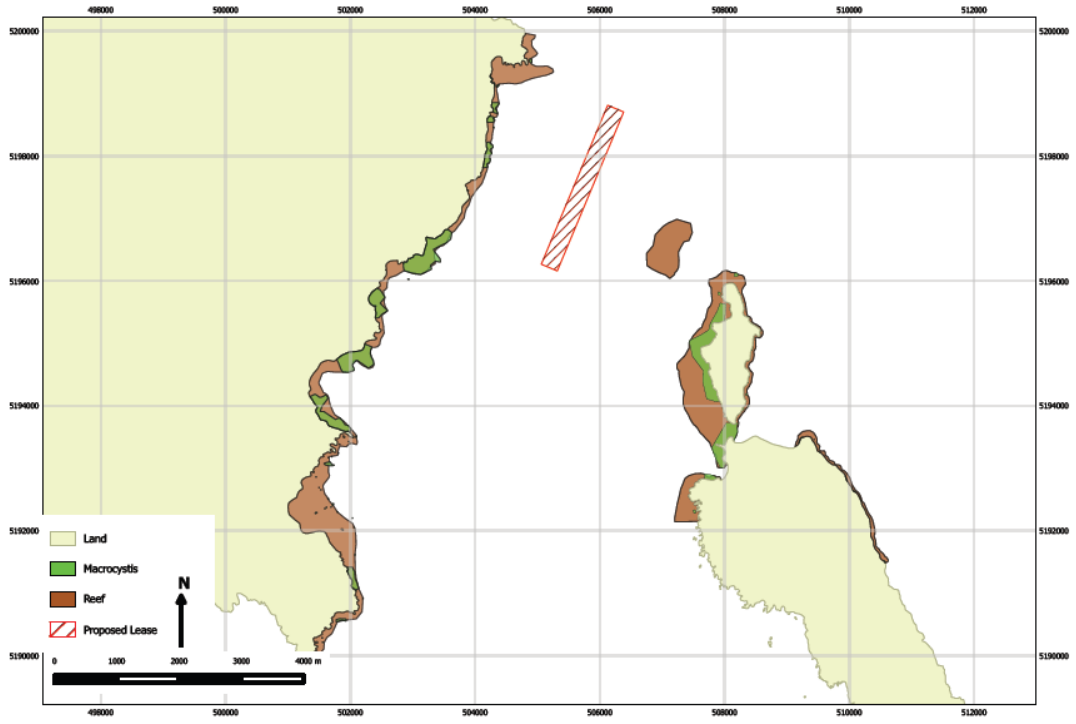

Figure 5.11. Reef and *Macrocystis pyrifera* surface canopy observed in the proposed amendment area

5.2.2 Benthic Fauna (IMAS survey and other where available)

The current BEMP includes a sediment biology component at 15 sites located in the D'Entrecasteaux Channel and Huon Estuary. One of these sites is located approximately 1.1 km from the closest boundary of the proposed lease. The sediment sampling site (B9) and the water quality sampling site (W9) are shown in Figure 5.12.

Figure 5.12. Approximate location of BEMP sediment and water quality monitoring sites (B9 and W9) in the relation to the proposed amendment (proposed lease indicated by solid yellow)

Commencing in 2009, annual benthic surveys have been undertaken during autumn at site B9. Infaunal samples were collected by triplicate Van Veen grabs in each sampling year. The animals were sorted from the collected material and subsequently counted and identified to species level.

In total, 4472 animals have been collected across the six sampling events, comprising 108 different infauna species (Table 13). There has been minor variation in abundance and diversity between sampling events, with abundance averaging 745 and the number of species averaging 58 per year (Table 13).

The macrobenthic invertebrate fauna in the region are considered diverse, with amphipod crustaceans the dominant taxa encountered (Table 14). Polychaete worms and molluscs were also relatively common, while other benthic taxa (e.g. other crustaceans, echinoderms, sipunculids) were rare (Figure 5.13).

The ampeliscid amphipod species *Byblis mildura* has been the dominant species across sampling events, comprising 55 % of the total numbers of individuals collected. A comprehensive species list for each sampling event is provided in Table 14.

Table 13. Summary of benthic infauna abundance and diversity across the six sampling events (based on pooled triplicates data).

Year	2009	2010	2011	2012	2013	2014	Total
Abundance	988	632	583	573	953	743	4472
Species Diversity (number of species)	58	57	48	57	67	63	108

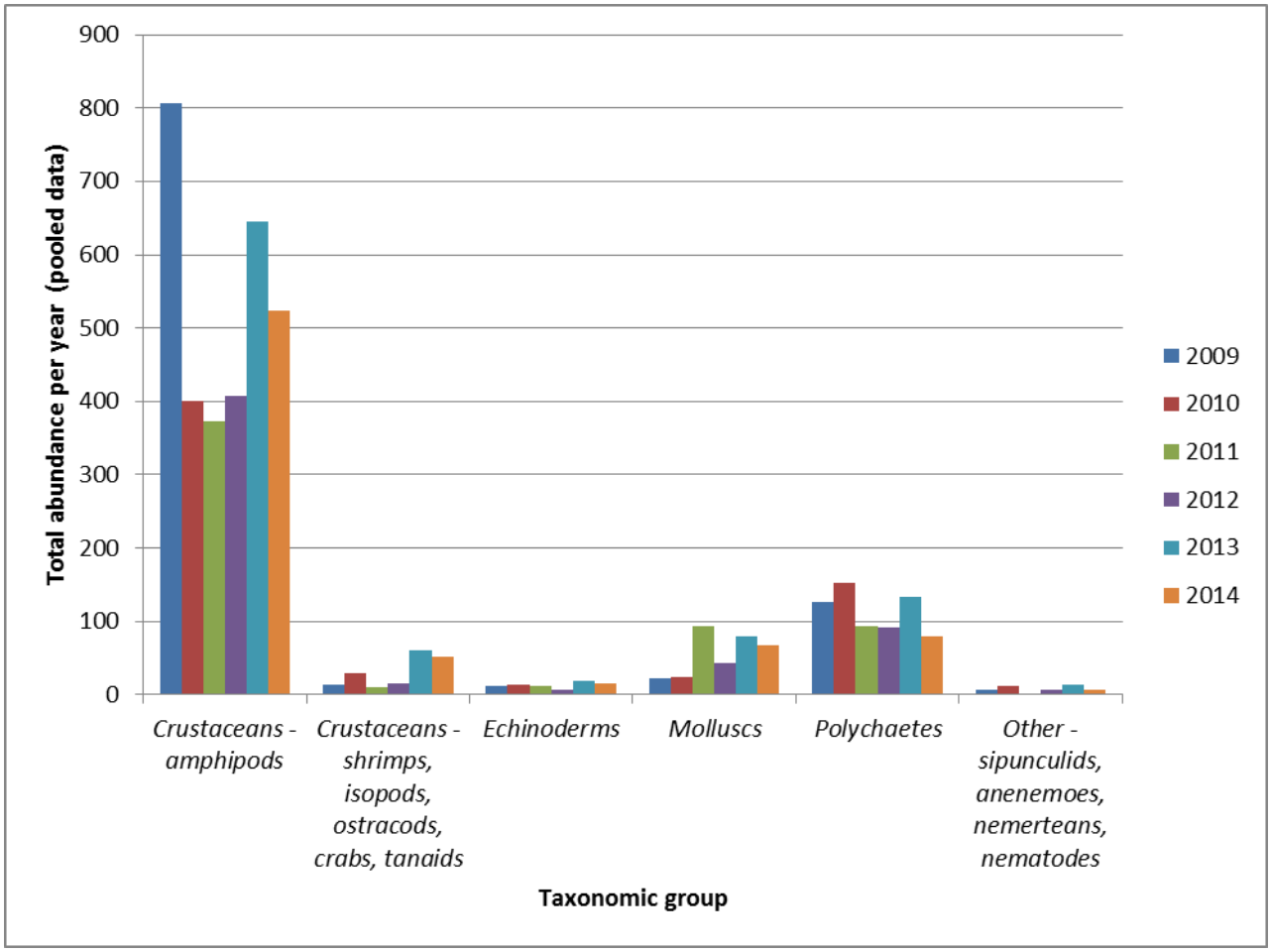

Figure 5.13. Patterns of benthic infauna for broad taxonomic groupings between 2009 and 2014 at Site B9 (based on pooled triplicate data).

Grab samples collected from the existing Lippies lease area as part of the 2004 baseline survey are consistent with the results of the BEMP sediment sampling program and also showed that the area supports diverse macrofaunal communities. From six sites (with triplicate grabs) a total of 4486 individuals were collected, with animals belonging to 77 families. Ampeliscid amphipods were by far the dominant taxa. Other common families included maldanid polychaetes, amphiurid ophiurioids, and the bivalve molluscs in the families Cardiidae and Thyasiridae (Aquenal 2004).

The key faunal indicator of impact (*Capitella* sp.) was not collected during the 2004 baseline survey, nor have they been recorded during the BEMP sampling program (Table 14). Two common introduced species were obtained during the 2004 baseline survey – the gastropod *Maoricolpus roseus* and the bivalve *Corbula gibba*. *Maoricolpus roseus* was present in high numbers, while only four *C. gibba* specimens were collected (Aquenal 2004). Comparably low densities of these introduced species were evident in the BEMP samples at site B9 (Table 14).

The 2014 IMAS survey assessments also noted the presence of *Maoricolpus roseus*, brittle stars, squat lobsters and polychaete worms in the sediment samples collected from a total of 40 sampling sites within and around the proposed zone at Lippies. For full details of the IMAS survey, see Appendix 6.

Table 14. Benthic infauna species identified each year between 2009 and 2014 at Site 9.

Species	Taxonomic group	Year					
		2009	2010	2011	2012	2013	2014
Ampelisca cf. australis	Crustacean - amphipod	6	28	33	25	128	36
Byblis mildura	Crustacean - amphipod	713	334	322	352	275	457
Ampeliscid sp.1	Crustacean - amphipod	23	1	0	0	195	4
Ampeliscid sp.2	Crustacean - amphipod	33	4	0	6	2	3
Paradexamine sp.	Crustacean - amphipod	1	0	0	0	3	0
Eusirid sp.	Crustacean - amphipod	1	1	0	0	0	0
Aorid sp.	Crustacean - amphipod	0	0	2	0	9	3
Isaeid sp.	Crustacean - amphipod	4	5	3	1	3	6
Photis sp.	Crustacean - amphipod	12	5	3	2	7	0
Lysianassid sp.1	Crustacean - amphipod	0	0	0	0	1	0
Lysianassid sp.2	Crustacean - amphipod	0	0	0	4	4	3
Parawaldeckia stebbingi	Crustacean - amphipod	0	2	0	0	1	4
Amaryllis macrophthalma	Crustacean - amphipod	1	1	0	2	2	0
Lysianassid sp.	Crustacean - amphipod	1	0	0	0	0	0
Ceradocus rubromaculatus	Crustacean - amphipod	0	0	0	2	0	0
Melitid sp.	Crustacean - amphipod	1	6	0	0	0	2
Limnoporeia woorake	Crustacean - amphipod	2	1	1	0	1	0
Brolgus tattersalli	Crustacean - amphipod	5	8	4	9	9	4
Tipimegus thalerus	Crustacean - amphipod	2	3	4	2	1	1
Aorid sp.1	Crustacean - amphipod	0	0	0	2	0	0
Aorid sp.2	Crustacean - amphipod	1	0	0	0	0	0
Oedicerotid sp.	Crustacean - amphipod	0	2	0	1	5	1
Dittosa undecimspinosa	Crustacean - crab	0	0	0	1	0	0
Hexapus granuliferus	Crustacean - crab	0	0	1	1	0	0
Processa sp.	Crustacean - shrimp	0	7	1	6	2	8
Palaemonid sp.	Crustacean - shrimp	2	0	0	0	0	1
Callianassa limosa	Crustacean - shrimp	1	0	0	1	1	3
Munida haswelli	Crustacean - shrimp	0	0	0	0	0	1

Species	Taxonomic group	Year					
		2009	2010	2011	2012	2013	2014
Cirolanid sp.	Crustacean - isopod	0	1	0	0	2	0
Gnathia sp.	Crustacean - isopod	0	1	0	0	0	0
Anthurid sp.	Crustacean - isopod	0	0	0	0	1	0
Sphaeromatid sp.	Crustacean - isopod	0	0	0	0	0	1
Mysid sp.	Crustacean - mysid	0	0	1	0	0	1
Ostracod sp.1	Crustacean - ostracod	0	0	2	1	0	0
Ostracod sp.2	Crustacean - ostracod	0	0	0	1	3	2
Euphilomedes sp.	Crustacean - ostracod	0	1	1	0	2	1
Ostracod sp.3	Crustacean - ostracod	0	1	0	0	0	0
Ostracod sp.4	Crustacean - ostracod	0	0	0	0	1	1
Ostracod sp.5	Crustacean - ostracod	0	0	0	0	2	2
Pagurixus handrecki	Crustacean - hermit crab	1	0	0	1	0	1
Apseudid sp.	Crustacean - tanaid	1	4	3	1	29	20
Apseudes sp.	Crustacean - tanaid	0	0	0	0	1	0
Kalliapseudes sp.	Crustacean - tanaid	9	13	1	3	15	9
Dimorphostylis sp.	Crustacean - cumacean	0	1	0	0	2	0
Echinocardium cordatum	Echninoderm - echinoid	0	0	1	0	0	0
Amphiura elandiformis	Echninoderm - ophiuroid	11	14	10	7	17	15
Ophiura kinbergi	Echninoderm - ophiuroid	0	0	1	0	2	0
Nassarius nigellus	Mollusc - gastropod	0	0	1	1	0	4
Garuleus sp.	Mollusc - gastropod	0	1	0	0	0	0
Maoricolpus roseus	Mollusc - gastropod	10	5	6	0	5	6
Falcidens chiastof	Mollusc - Chaetoderma	2	1	2	2	2	4
Amygdalum beddomei	Mollusc - bivalve	1	0	1	1	0	1
Myadora cf. complexa	Mollusc - bivalve	0	0	0	0	1	0
Poroleda ensicula	Mollusc - bivalve	1	0	1	0	0	0
Ennucula obliqua	Mollusc - bivalve	4	6	20	26	17	12
Tellina mariae	Mollusc - bivalve	0	0	0	0	1	0
Nemocardium thetidis	Mollusc - bivalve	0	3	59	7	38	30
Thyasira adelaideana	Mollusc - bivalve	4	3	2	5	8	6
Corbula gibba	Mollusc - bivalve	0	0	0	0	1	1
?Ungulinid sp.	Mollusc - bivalve	1	1	2	0	7	3
Cadulus sp.	Mollusc - scaphopod	0	4	0	1	0	0
Phascolion sp.	Sipunculid	1	0	0	0	0	0
Phascolosoma annulatum	Sipunculid	2	0	0	0	3	1
Edwardsia sp.	Anenome	0	6	0	0	2	0
Nemertean sp.	Nemertean	4	5	2	7	8	6
Nematode sp.	Nematode	0	0	0	0	1	0
Armandia sp.	Polychaete	2	8	0	4	13	1
Phyllodoce sp.	Polychaete	0	0	0	1	0	0
Mediomastus australiensis	Polychaete	1	2	0	2	4	1

Species	Taxonomic group	Year					
		2009	2010	2011	2012	2013	2014
Notomastus sp.	Polychaete	1	0	0	1	1	0
Inermonephtys sp.	Polychaete	11	11	1	1	2	2
Nephtys inornata	Polychaete	0	0	1	0	0	0
Flabelligerid sp.	Polychaete	0	0	0	0	0	1
Goniada sp.	Polychaete	7	4	4	6	3	3
Glycera sp.	Polychaete	0	1	0	0	0	0
Euchone sp.	Polychaete	0	1	0	1	1	0
Epidiopatra sp.	Polychaete	2	2	0	5	5	1
Oenone sp.	Polychaete	0	0	1	1	0	0
Lumbrineris sp.	Polychaete	2	5	2	3	1	1
Maldanid sp.	Polychaete	0	0	0	0	0	1
Rhodine sp.	Polychaete	4	3	2	1	1	4
Asychis sp.	Polychaete	2	4	6	8	3	3
Neanthes sp.	Polychaete	1	0	0	0	0	0
Phylo felix	Polychaete	0	1	0	0	0	0
Malacoceros sp.	Polychaete	0	0	1	1	1	0
Paraprionospio coora	Polychaete	9	4	3	8	6	2
Spiophanes wigleyi	Polychaete	0	0	0	0	1	0
Spiophanes kroeyeri	Polychaete	1	0	0	1	0	0
Prionospio cf Kulin	Polychaete	0	5	11	5	24	11
Prionospio ?wambiri	Polychaete	16	33	8	5	13	4
Prionospio multipinnulata	Polychaete	3	0	0	0	0	0
Paraonides sp.	Polychaete	1	4	1	4	1	1
Paraonid sp.	Polychaete	14	32	26	17	29	11
Aricidea sp.	Polychaete	1	0	0	0	2	1
Paraonid sp.	Polychaete	24	0	0	4	2	0
Chaetozone setosa	Polychaete	2	1	1	1	1	2
Syllid sp.	Polychaete	1	0	3	0	0	2
Nicolea sp.	Polychaete	1	0	0	0	0	0
Lysilla jennacubinae	Polychaete	0	1	10	0	0	0
Artachamella dibranchiata	Polychaete	1	2	0	0	0	2
Terebellides sp.	Polychaete	1	0	1	1	0	1
Amphicteis sp.	Polychaete	4	4	4	5	9	11
Ampharetid sp.	Polychaete	12	8	4	1	8	2
Pectinaria sp.	Polychaete	0	0	0	0	0	1
Phyllochaetopterus sp.	Polychaete	0	0	0	1	0	1
Sthenelais pettibonae	Polychaete	0	1	0	0	1	2
Scalibregmatid sp.	Polychaete	2	12	3	3	1	7
Oweniid sp.	Polychaete	1	4	0	1	0	0

5.2.3 Fish (IMAS survey and other where available)

Parsons (2012) lists 148 native fish species (including sharks and rays) recorded in the D'Entrecasteaux Channel, lower Huon Estuary and adjacent coastal streams.

The southern D'Entrecasteaux Channel region provides a range of different habitat types for many resident species (such as flathead, flounder, wrasses and leatherjackets), migratory pelagic species (such as Australian salmon, jack mackerel and blue warehou) and species (such as school and gummy sharks) that utilise sheltered coastal waters as nursery areas.

Table 15 below lists species of fish recorded during quantitative surveys undertaken in the lower D'Entrecasteaux Channel (including the Ninepin Point Marine Reserve area) between 1988-2013 (data provided by Dr Graham Edgar). The 2014 IMAS survey assessment also confirmed the presence of Butterfly perch, Rosy wrasse and the Common bullseye on the adjacent reefs (between 250 m and 500 m from the proposed zone boundary).

Many of these fishes are likely to be found on the reefs adjacent to the coastline (including the southern Bruny Island coast on the eastern side of the D'Entrecasteaux Channel). Additional demersal and pelagic species that are more likely to occur in the deeper, less complex habitat off Lippies has also been included to supplement the list of known reef inhabitants. In addition, the list also includes shark species (school shark, gummy shark, elephantfish and the seven gilled shark) that are known to feed, forage and use sheltered waters within the D'Entrecasteaux Channel as breeding and pupping areas.

Table 15. Fish species recorded in lower D'Entrecasteaux Channel (1988-2013)

Scientific Name	Common Name
Acanthaluteres spilomelanurus	Bridled leatherjacket
Ammotretis lituratus*	Spotted flounder
Ammotretis rostratus*	Longsnout flounder
Arnoglossus bassensis*	Bass Strait flounder
Aplodactylus arctidens	Marblefish
Apogon conspersus	Southern cardinalfish
Aracana aurita	Shaw's cowfish
Arripis trutta*	Australian salmon
Bovichtus angustifrons	Dragonet
Brachionichthys hisutus*	Spotted handfish
Caesioperca lepidoptera#	Butterfly perch
Caesioperca rasor	Barber perch
Caranx dentex	Silver trevally
Carcharadon carcharias*	White shark

Scientific Name	Common Name
Callorhinchus milii*	Elephantfish
Cephaloscyllium laticeps	Draughtboard shark
Cheilodactylus nigripes	Magpie perch
Cheilodactylus spectabilis	Banded morwong
Conger verreauxi	Southern conger eel
Cristiceps australis	Southern crested weedfish
Cyttus australis*	Silver dory
Dentiraja lemprieri*	Thornback skate
Dinolestes lewini	Long-finned pike
Diodon nichthemerus	Globe fish
Dipturus whitleyi*	Whitley's skate
Dotalabrus aurantiacus	Castelenau's wrasse
Forsterygion varium	Threefin blenny
Genypterus tigerinus	Rock ling
Gnathanacanthus goetzii	Red velvet fish
Heteroclinus johnstoni	Jonhnston's weedfish
Heteroclinus perspicillatus	Common weedfish
Heteroclinus tristis	Longnose weedfish
Hyporhamphus malanchir*	Southern garfish
Kathetostoma leave*	Common stargazer
Latridopsis forsteri	Bastard trumpeter
Latris lineata*	Striped trumpeter
Lepidotrigla papilio*	Spiny gurnard
Lepidotrigla Vanessa*	Butterfly gurnard
Lotella rhacinus	Largetooth beardie
Meuschenia australis	Brownstriped leatherjacket
Macruronus novaezelandiae*	Blue grenadier
Meuschenia freycineti	Sixspine leatherjacket

Scientific Name	Common Name
Mustelus antarcticus*	Gummy shark
Narcine tasmaniensis	Tasmanian numbfish
Nemadactylus macropterus	Jackass morwong
Neoodax balteatus	Little weed whiting
Neosebastes scorpaenoides	Common gurnard perch
Norfolkia clarkei	Common threefin
Nesogobius spp.	Goby
Notalabrus fucicola	Purple wrasse
Notalabrus tetricus	Bluethroat wrasse
Notorynchus cepidianus*	Seven gilled shark
Olisthops cyanomelas	Herring cale
Omegophora armillata	Ringed toadfish
Parablennius tasmanianus	Blenny
Paratrachichthys trailli	Sandpaper fish
Parequula melbournensis	Silverbelly
Parma microlepis	White-ear damselfish
Pempheris multiradiatus#	Common bullseye
Penicipelta vittiger	Toothbrush leatherjacket
Pentaceropsis recurvirostris	Long snouted boarfish
Pictilabrus laticlavius	Senator wrasse
Prototroctes maraena	Australian grayling
Pseudolabrus psittaculus#	Rosy wrasse
Platycephalus bassensis*	Sand flathead
Platycephalus richardsoni*	Tiger flathead
Pseudophycis bachus	Red cod
Pseudophycis barbatus	Bearded red cod
Pterygotrigla polyommata	Latchet
Rhombosolea tapirina*	Greenback flounder

Scientific Name	Common Name
Scorpaena papilosa	Southern red scorpioncod
Scorpis lineolatus	Sweep
Seriolella brama*	Blue warehou
Seriolella punctata*	Silver warehou
Siphonognathus beddomei	Pygmy rock whiting
Squalus acanthias*	White spotted dogfish
Sympterichthys sp.	Ziebell's handfish
Thamnaconus degeni	Bluefin leatherjacket
Trachinops caudimaculatus	Blotch-tail trachinops
Thymichthys politus*	Red handfish
Trachurus declivis	Jack mackerel
Thyrsites atun*	Barracouta
Urolophus cruciatus	Banded stingaree
Urolophus paucimaculatus	Sparsely spotted stingaree
Zenopsis nebulosus*	Mirror dory

Note: species highlighted with * are additional to those species recorded at Ninepin Point and the southern D'Entrecasteaux Channel region, and represent species that are likely to occur within and around the proposed amendment, including coastal reefs extending south from Scott Point to Southport Island. Species highlighted with # were identified in the 2014 IMAS zone assessment at Lippies and Browns.

5.2.4 Birds

The southern D'Entrecasteaux Channel supports a diverse range of bird species comprising waders, waterfowls, seabirds, woodland/forest birds, and raptors. Estuarine and coastal habitats are of importance within the D'Entrecasteaux Channel, especially for breeding and migratory shorebirds that inhabit exposed nearshore landforms (such as beaches, dunes and rocky outcrops) and littoral zones (such as mudflats and estuaries) for feeding, foraging and roosting (Bryant 2002, Parsons 2012).

Table 16 is a list of species identifications/observations obtained from the BirdLife Tasmania database for species observed within a 5 km radius of the proposed lease (centroids for queries positioned at E 505744, N 5197259 – Lippies). This list includes 71 species and is significant in that it represents just over 60% of all bird species recorded in the 2012 State of the D'Entrecasteaux Channel and the lower Huon Estuary Report (Parsons 2012) and includes eight of Tasmania's 12 endemic bird species. A full list of Tasmanian species under which international bilateral agreements exist (JAMBA/CAMBA/ROKAMBA) is provided in section 6.1.4.2 (Table 25).

Table 16.Bird species recorded within 5 km of proposed amendment (unpublished data provided by BirdLife Tasmania, 14 August-2014)

Scientific Name	Common Name	Status
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	
Acanthiza ewingii	Tasmanian Thornbill	**En**
Acanthiza pusilla	Brown Thornbill	
Acanthorhynchus tenuirostris	Eastern Spinebill	
Accipiter fasciatus	Brown Goshawk	
Anthochaera paradoxa	Yellow Wattlebird	**En**
Anthus novaeseelandiae	Richard's Pipit	
Aquila audax	Wedge-tailed Eagle	**Listed (EPBC & TSPA)**
Ardea ibis	Cattle Egret	**CAMBA, JAMBA**
Artamus cyanopterus	Dusky Woodswallow	
Cacomantis flabelliformis	Fan-tailed Cuckoo	
Calamanthus fuliginosus	Striated Fieldwren	
Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	
Carduelis carduelis	European Goldfinch	
Carduelis chloris	European Greenfinch	
Chrysococcyx basalis	Horsfield's Bronze-	

Scientific Name	Common Name	Status
	Cuckoo	
Colluricincla harmonica	Grey Shrike-thrush	
Coracina novaehollandiae	Black-faced Cuckoo-Shrike	
Corvus tasmanicus	Forest Raven	
Coturnix ypsilophorus	Swamp Quail	
Cuculus pallidus	Pallid Cuckoo	
Egretta novaehollandiae	White-faced Heron	
Eudyptula minor	Little Penguin	**C**
Falco berigora	Brown Falcon	
Haematopus fuliginosus	Sooty Oystercatcher	**C**
Haematopus longirostris	Pied Oystercatcher	**C**
Haliaeetus leucogaster	White-bellied Sea-Eagle	**Listed (TSPA)** **CAMBA**
Hirundapus caudacutus	White-throated Needletail	**CAMBA, JAMBA, ROKAMBA**
Hirundo neoxena	Welcome Swallow	
Hirundo nigricans	Tree Martin	
Larus dominicanus	Kelp Gull	
Larus novaehollandiae	Silver Gull	

Scientific Name	Common Name	Status
Larus pacificus	Pacific Gull	**C**
Lathamus discolor	Swift Parrot	**Listed (EPBC & TSPA)**
Lichenostomus flavicollis	Yellow-throated Honeyeater	**En**
Malurus cyaneus	Superb Fairy-wren	
Megalurus gramineus	Little Grassbird	
Melanodryas vittata	Dusky Robin	**En**
Melithreptus affinis	Black-headed Honeyeater	**En**
Melithreptus validirostris	Strong-billed Honeyeater	**En**
Morus serrator	Australasian Gannet	**C**
Myiagra cyanoleuca	Satin Flycatcher	
Pachycephala olivacea	Olive Whistler	
Pachycephala pectoralis	Golden Whistler	
Pardalotus punctatus	Spotted Pardalote	
Pardalotus quadragintus	Forty-spotted Pardalote	**En, Listed (EPBC & TSPA)**
Pardalotus striatus	Striated Pardalote	
Pelecanoides urinatrix	Common Diving-Petrel	
Petroica multicolor	Scarlet Robin	

Scientific Name	Common Name	Status
Petroica phoenicea	Flame Robin	
Phalacrocorax carbo	Great Cormorant	
Phalacrocorax fuscescens	Black-faced Cormorant	**C**
Phalacrocorax melanoleucos	Little Pied Cormorant	
Phalacrocorax sulcirostris	Little Black Cormorant	
Phylidonyris novaehollandiae	New Holland Honeyeater	
Phylidonyris pyrrhoptera	Crescent Honeyeater	
Platycercus caledonicus	Green Rosella	**En**
Poliocephalus poliocephalus	Hoary-headed Grebe	
Puffinus tenuirostris	Short-tailed Shearwater	**C** **JAMBA, ROKAMBA**
Rallus pectoralis	Lewin's Rail	
Rhipidura fuliginosa	Grey Fantail	
Sericornis humilis	Tasmanian Scrubwren	**En**
Stagonopleura bella	Beautiful Firetail	
Stercorarius parasiticus	Arctic Jaeger	
Sterna bergii	Crested Tern	**C**
Sturnus vulgaris	Common Starling	

Scientific Name	Common Name	Status
Thalassarche cauta	Shy Albatross	**Listed (EPBC & TSPA)**
Thinornis rubricollis	Hooded Plover	
Turdus merula	Common Blackbird	
Vanellus miles	Masked Lapwing	
Zosterops lateralis	Silvereye	

*Status: En = Endemic, Listed = Listed under either EPBC or TSPA, C = non-threatened high conservation value coastal bird, JAMBA, CAMBA, ROKAMBA = Protected under international bilateral agreements.

5.2.5 Marine Mammals

The southern D'Entrecasteaux Channel is known to host a range of marine mammals that reside, feed, forage and migrate within these sheltered and exposed waterways both regularly and intermittently. While some marine mammals (such as the Australian and New Zealand Fur-seals) may be considered as resident species, other species (such as the Southern Right and Humpback Whales) are seasonal visitors during their annual migration, and long-range visitors (such as Southern Elephant and Leopard Seals and the Australian Sea lion) occur unexpectedly on rare occasions (DPIPWE 2013[6]).

Australian and New Zealand Fur-seals have established haul out and breeding sites around the more remote, exposed locations along Tasmania's coast and offshore islands. The closest haul out site is located approximately 25 km from the proposed amendment area at The Friars, off the south coast of Bruny Island. Additional haul out sites for fur-seals are located in the more exposed locations off the south and west coasts of Tasmania, extending west from Mewstone. Whilst there are no established haul out or breeding sites within the D'Entrecasteaux Channel, fur-seals commonly occur in these waters to forage and feed (DPIPWE 20136).

Southern Elephant Seals, the largest of all seals, are rare visitors to Tasmanian coastal waters – their closest breeding area is Macquarie Island. However, there have been records of females with pups at Dover in 2000 and Bruny Island 2001. Each year in Tasmania an average of three elephant seals are reported (DPIPWE 20136).

[6]DPIPWE (2013) Mammals of Tasmania, http://www.dpiw.tas.gov.au/inter,nsf/ThemeNodes/ LBUN-5362ZN?open – date accessed 01-Feb-2014

Leopard Seals breed on the Antarctic pack ice and range from the Antarctic coast to the sub-Antarctic and sub-tropical seas. An average of five Leopard Seals visit the coast of Tasmania each year, but up to 18 have been sighted in a single year (1990) (DPIPWE 20136).

The Australian Sea-lion has a breeding range which extends from islands off Western Australia to islands east of Kangaroo Island (South Australia), they are also known to occur in Tasmanian waters on rare occasions. Documented records of their presence in Tasmanian waters are likely to be an underestimate of actual numbers because they are morphologically similar to local seal species (DPIPWE 20136).

Bottle-nosed Dolphins and Common Dolphins are the most frequently observed cetaceans in Tasmanian waters and are commonly seen feeding and foraging in the D'Entrecasteaux Channel and Huon Estuary. The Southern Right and Humpback Whales are migratory species that visit Tasmanian coastal waters on their way from the summer subantarctic feeding grounds. While the proposed site at Lippies has no history of sea cage aquaculture, this southern boundary of the D'Entrecasteaux Channel is likely to be an important transit point for marine mammals entering sheltered estuaries as part of their seasonal migration patterns. The extent of the southern zone boundary represents approximately 25% of the total distance across the southern D'Entrecasteaux Channel (from Tower Bay to Partridge Island).

Many marine mammals come sufficiently close to the coast to allow regular sightings from land and due to their large size, interactions with other recreational and commercial marine users require careful management (DPIPWE 20136).

Table 17 lists the marine mammal species that are known to occur within the proposed zone and surrounding area, or where their preferred habitat also occurs.

Table 17. Marine mammals that may be found in the waters of the southern D'Entrecasteaux Channel

Scientific name	Common name
Eubalaena australis	Southern Right Whale
Megaptera novaeangliau	Humpback Whale
Delphinus delphis	Common Dolphin
Tursiops truncatus	Bottlenose Dolphin
Arctocephalus pusillus	Australian Fur-seal
Arctocephalus forsteri	New Zealand Fur-seal
Hydrurga leptonyx	Leopard Seal
Mirounga leonina	Southern Elephant Seal
Neophoca cinerea	Australian Sea-lion

5.2.6 Threatened Species (IMAS survey and other where available)

Listed threatened and migratory species under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC) and TSPA recorded within the area of this

proposal or where the species, or species habitat may occur in areas surrounding the area of the proposed amendment are provided in Table 18. These species have been selected on the basis of their inclusion in:

- the Australian Government's online EPBC Protected Matters Report
- the Tasmanian Government's Natural Values Atlas
- the Tasmanian Government's online list of Threatened Species.

For both the EPBC Protected Matters Report (see Appendix 8) and the report generated using the Tasmanian Natural Values Atlas (see Appendix 9), a buffer of 6375 m was generated from the centroid GDA94 505712, 5197474. This centroid is located in the middle of the proposed Lippies lease and includes a buffer of 5 km from each of the four corner markers. This ensured adequate coverage across the proposed amendment and similar habitats where migratory species are likely to inhabit, or where listed threatened or migratory species are known to forage for food or transit during migration periods.

Terrestrial plants, reptiles, insects, and mammals have been excluded from this list on the basis that the proposed amendment is restricted to activities below the high water mark and is unlikely to negatively impact on these species.

Table 18. Listed Threatened and Migratory species and communities under the EPBCA and TSPA extending 6.375 km from the centroid GDA94 505712, 5197474.

Threatened Ecological Communities				
Name		**EPBC Status**		**Type of Presence**
Giant Kelp Marine Forests of South East Australia		Endangered		Community likely to occur within area
Listed Threatened Species				
Birds				
Species	**Common Name**	**EPBC Status**	**TSPA Status**	**Type of Presence**
Accipiter novaehollandiae	Grey Goshawk	Not Listed	Endangered	Not specified
Aquila audax fleayi	Wedge-tailed Eagle (Tasmanian)	Endangered	Endangered	Breeding likely to occur within area
Botaurus poiciloptilis	Australian Bittern	Endangered	Not Listed	Species or species habitat likely to occur within area
Ceyx azureus diemenensis	Tasmanian Azure Kingfisher	Endangered	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora sanfordi	Northern Royal Albatross	Endangered	Endangered	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora epomophora	Southern Royal Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans (sensu lato)	Wandering Albatross	Vulnerable	Endangered	Foraging, feeding or related behaviour likely to occur within area

Diomedea exulans antipodensis	Antipodean Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans exulans	Tristan Albatross	Endangered	Not Listed	Species or species habitat likely to occur within area
Diomedea exulans gibsoni	Gibson's Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Fregetta grallaria grallaria	White-bellied Storm-Petrel	Vulnerable	Not Listed	Species or species habitat likely to occur within area
Haliaeetus leucogaster	White-bellied Sea Eagle	Not listed	Vulnerable	Not specified
Halobaena caerulea	Blue Petrel	Vulnerable	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor	Swift Parrot	Endangered	Endangered	Breeding likely to occur within area
Macronectes giganteus	Southern Giant-Petrel	Endangered	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli	Northern Giant-Petrel	Vulnerable	Rare	Species or species habitat likely to occur within area
Pachyptila turtur subantarctica	Southern Fairy Prion	Vulnerable	Endangered	Recorded in Natural Values Atlas Report
Pardalotus quadragintus	Forty-spotted Pardalote	Endangered	Endangered	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera	Gould's Petrel	Endangered	Not listed	Not specified
Pterodroma mollis	Soft-plumaged Petrel	Vulnerable	Endangered	Species or species habitat likely to occur within area
Thalassarche bulleri	Buller's Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta cauta	Shy Albatross, Tasmanian Shy Albatross	Vulnerable	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta salvini	Salvin's Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi	White-capped Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma	Grey-headed Albatross	Endangered	Endangered	Species or species habitat likely to occur within area
Thalassarche melanophris	Black-browed Albatross	Vulnerable	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris impavida	Campbell Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area

***Tyto novaehollandiae castanops* (Tasmanian population)**	Masked Owl (Tasmanian)	Vulnerable	Endangered	Species or species habitat likely to occur within area
Fish				
Species	**Common Name**	**EPBC Status**	**TSPA Status**	**Type of Presence**
Brachionichthys hirsutus	Spotted Handfish, Spotted-hand Fish	Critically Endangered	Endangered	Species or species habitat likely to occur within area
Brachiopsilis ziebelli	Ziebell's Handfish	Vulnerable	Not Listed	Species or species habitat likely to occur within area
Protroctes maraena	Australian Grayling	Vulnerable	Vulnerable	Species or species habitat likely to occur within area
Thymichthys politus	Red Handfish	Critically Endangered	Not Listed	Species or species habitat may occur within area
Mammals				
Species	**Common Name**	**EPBC Status**	**TSPA Status**	**Type of Presence**
Balaenoptera musculus	Blue Whale	Endangered	Endangered	Species or species habitat may occur within area
Eubalaena australis	Southern Right Whale	Endangered	Endangered	Breeding likely to occur within area
Megaptera novaeangliae	Humpback Whale	Vulnerable	Vulnerable	Species or species habitat may occur within area
Arctocephalus forsteri*	New Zealand Fur Seal	Not Listed	Rare	Not recorded in Natural Values Atlas Report, but likely presence
Mirounga leonina	Southern Elephant Seal	Vulnerable	Endangered	Recorded in Natural Values Atlas Report
Other				
Species	**Common Name**	**EPBC Status**	**TSPA Status**	**Type of Presence**
Gazameda gunnii	Gunn's screwshell		Vulnerable	Species or species habitat may occur within area
Parvulastra vivipara	Tasmanian Live-bearing Seastar	Vulnerable	Vulnerable	Species or species habitat may occur within area
Sharks				
Carcharodon carcharias	Great White Shark	Vulnerable	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species				
Marine Birds				
Species	**Common Name**	**EPBC Status**	**TSPA Status**	**Type of Presence**
Apus pacificus	Fork-tailed Swift	Not Listed	Not Listed	Species or species habitat likely to occur within area

Diomedea exulans antipodensis	Antipodean Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans exulans	Tristan Albatross	Endangered	Not Listed	Species or species habitat may occur within area
Diomedea epomophora epomophora	Southern Royal Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans (sensu lato)	Wandering Albatross	Vulnerable	Endangered	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans gibsoni	Gibson's Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora sanfordi	Northern Royal Albatross	Endangered	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus	Southern Giant-Petrel	Endangered	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli	Northern Giant-Petrel	Vulnerable	Rare	Species or species habitat may occur within area
Puffinus carneipes	Flesh-footed Shearwater	Not Listed	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri	Buller's Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta cauta	Shy Albatross, Tasmanian Shy Albatross	Vulnerable	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma	Grey-headed Albatross	Endangered	Endangered	Species or species habitat may occur within area
Thalassarche melanophris	Black-browed Albatross	Vulnerable	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris impavida	Campbell Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta salvini	Salvin's Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi	White-capped Albatross	Vulnerable	Not Listed	Foraging, feeding or related behaviour likely to occur within area
Listed Migratory Marine Species				
Species	**Common Name**	**EPBC Status**	**TSPA Status**	**Type of Presence**
Balaenoptera musculus	Blue Whale	Endangered	Endangered	Species or species habitat may occur within area
Caperea marginata	Pygmy Right Whale	Not Listed	Not Listed	Species or species habitat may occur within area

Carcharodon carcharias	Great White Shark	Vulnerable	Vulnerable	Species or species habitat may occur within area
Eubalaena australis	Southern Right Whale	Endangered	Endangered	Breeding likely to occur within area
Lagenorhynchus obscurus	Dusky Dolphin	Not Listed	Not Listed	Species or species habitat may occur within area
Lamna naus	Porbeagle, Mackerel Shark	Not Listed	Not Listed	Species or species habitat likely to occur within area
Megaptera novaeangliae	Humpback Whale	Vulnerable	Not Listed	Species or species habitat may occur within area
Orcinus orca	Killer Whale, Orca	Not Listed	Not Listed	Species or species habitat may occur within area
Listed Migratory Terrestrial Species				
Species	**Common Name**	**EPBC Status**	**TSPA Status**	**Type of Presence**
Haliaeetus leucogaster	White-bellied Sea-Eagle	Not Listed	Vulnerable	Species or species habitat known to occur within area
Hirundapus caudacutus	White-throated Needletail	Not Listed	Not Listed	Species or species habitat likely to occur within area
Myiagra cyanoleuca	Satin Flycatcher	Not Listed	Not Listed	Species or species habitat known to occur within area
Listed Migratory Wetland Species				
Species	**Common Name**	**EPBC Status**	**TSPA Status**	**Type of Presence**
Ardea alba	Great Egret, White Egret	Not Listed	Not Listed	Species or species habitat likely to occur within area
Ardea ibis	Cattle Egret	Not Listed	Not Listed	Species or species habitat likely to occur within area
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	Not Listed	Not Listed	Species or species habitat may occur within area

Gunn's Screw Shell (*Gazameda gunnii)*

Species description

Gazameda gunnii is a member of the benthic infauna community (i.e. living within sediments rather than occurring visibly on the surface of the seabed). Commonly referred to as Gunn's Screwshell, *Gazameda gunnii* is a turritellid gastropod which is endemic to Australia. Its distribution has been recorded from Cape Moreton (Queensland) southwards to northern and eastern Tasmania. *Gazameda gunnii* is a relatively small gastropod with a size range commonly between 30-40 mm, but has been measured up to 69 mm in length. It has been recorded at depths ranging from 8 to at least 140 m, and lives in muddy and gravelly sand.

Gazameda gunnii is listed as vulnerable in the TSPA, and a field assessment (as specified by the DPIPWE) is required to determine whether this species occurs within benthic infaunal assemblages where development activities are proposed (Aquenal 2012).

Survey results

Individuals of Gunn's screw shell (*Gazameda gunnii*) were not recorded in the IMAS Environmental Zone Assessments for Lippies (IMAS 2014, see Appendix 6).

In 2004 a dedicated *Gazameda gunnii* survey was undertaken at the existing Lippies lease and unconfirmed shell fragments were found. As a result the sampling intensity was doubled to ensure no live specimens were present at this site (see Appendix 6).

5.3 Reservations

5.3.1 World Heritage Areas

There are no World Heritage Areas within the proposed amendment zone or surrounding area.

5.3.2 Ramsar sites

There are no Ramsar Sites within the proposed amendment zone or surrounding area.

5.3.3 Marine Reserves

There are no Marine Reserves within the proposed amendment zone or surrounding area.

The closest Marine Reserve is Ninepin Point Marine Nature Reserve located in the D'Entrecasteaux Channel over 13 km away near the mouth of the Huon River.

5.3.4 National Parks

The proposed amended zone lies approximately 4.5 km to the west of the Labillardiere Peninsula, part of the South Bruny National Park. Coastal tracks for bushwalkers extend around the perimeter of the Labillardiere Peninsula and on Partridge Island (dark green in Figure 5.14). Partridge Island can only be accessed by water.

South Bruny National Park

As stated in the *South Bruny National Park, Waterfall Creek State Reserve, and Green Island Nature Reserve - Management Plan 2000*[7] the South Bruny National Park contains high historic, cultural and natural values that include the following:

- Threatened and priority flora, plant communities with Comprehensive, Adequate and Representative (CAR) values and communities of conservation significance, National Estate flora values, and natural flora diversity.
- Threatened and priority fauna species, habitats of conservation significance, National Estate fauna, natural fauna diversity.
- Contains one of the largest colonies of the Forty-spotted Pardalote.
- Natural landscapes and sites of geoconservation.
- Sites, objects and places of Aboriginal Heritage significance.
- National Estate significance sites such as Cape Bruny Lightstation.
- Evidence of early European exploration and early whaling activities (Jetty Beach).

The coastal fringes of the Park on the peninsula are designated 'Recreational Zone' in the *South Bruny National Park, Waterfall Creek State Reserve, and Green Island Nature Reserve - Management Plan 2000 (DPIWE 2000),* under which the park is managed.

There are public recreational facilities including toilets and camping areas at Lighthouse Jetty Beach and at Cloudy Bay (see Figure 5.14). Please note that further information on the South Bruny National Park from Parks and Wildlife Service (2014[8]).

[7]Parks and Wildlife Service (2014).Summary of South Bruny National Park, Waterfall Creek State Reserve, Green Island Nature Reserve Management Plan 2000 http://www.parks.tas.gov.au/index.aspx?base=6282 date accessed 20-Feb-2014

[8]Parks and Wildlife Service (2014).Summary of South Bruny National Park, Waterfall Creek State Reserve, Green Island Nature Reserve Management Plan 2000 http://www.parks.tas.gov.au/index.aspx?base=6282 date accessed 20-Feb-2014

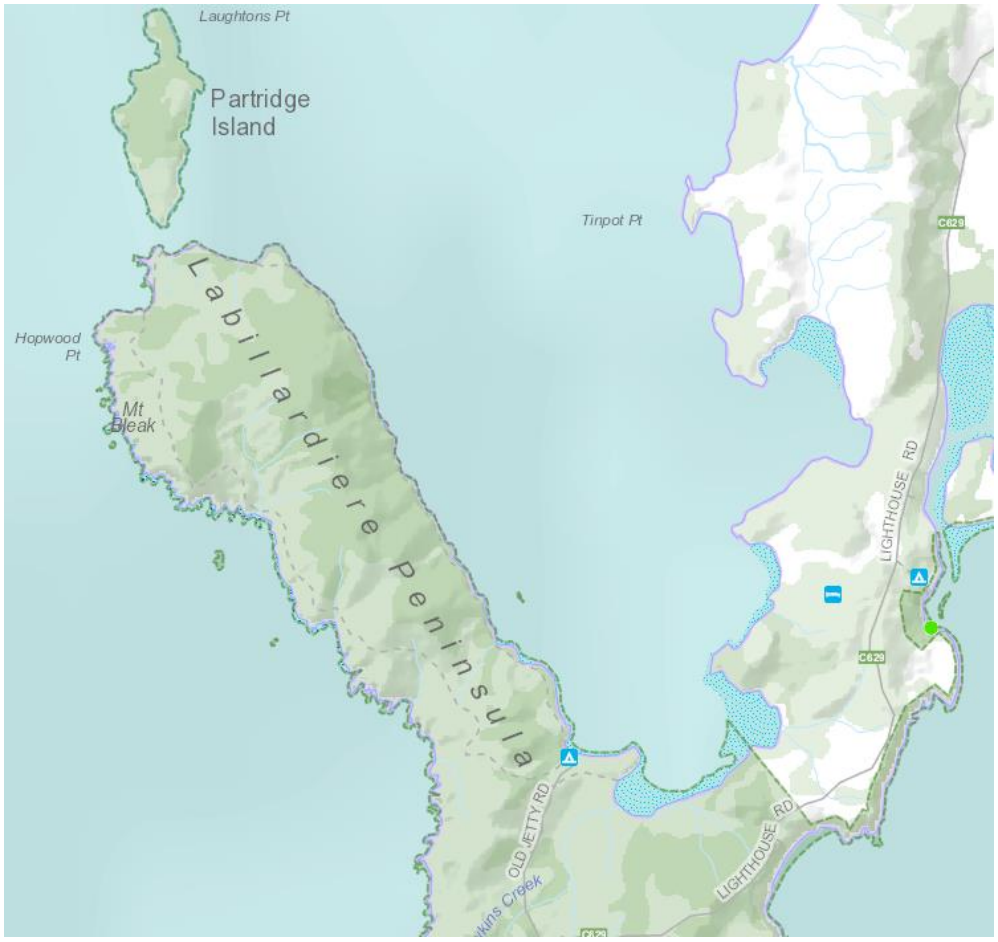

Figure 5.14. Map indicating public recreational facilities and walking tracks, South Bruny National Park (LISTMap)

5.3.5 Other Conservation Areas

The coastal shoreline from the midpoint of Lady Bay southward is a relatively narrow strip of Crown coastal reserve that extends to the south to include Rossell Point; it is designated the Burnett Point Conservation Area under the *Nature Conservation Act 2002*.

5.4 Land Planning Aspects

5.4.1 Land Tenure

All relevant land on the western shore adjacent to the proposed Zone 25 is Crown Land and Public Reserve (shown in green and orange in Figure 5.15). The remaining adjacent land is predominately private freehold (shown in cream in Figure 5.15).

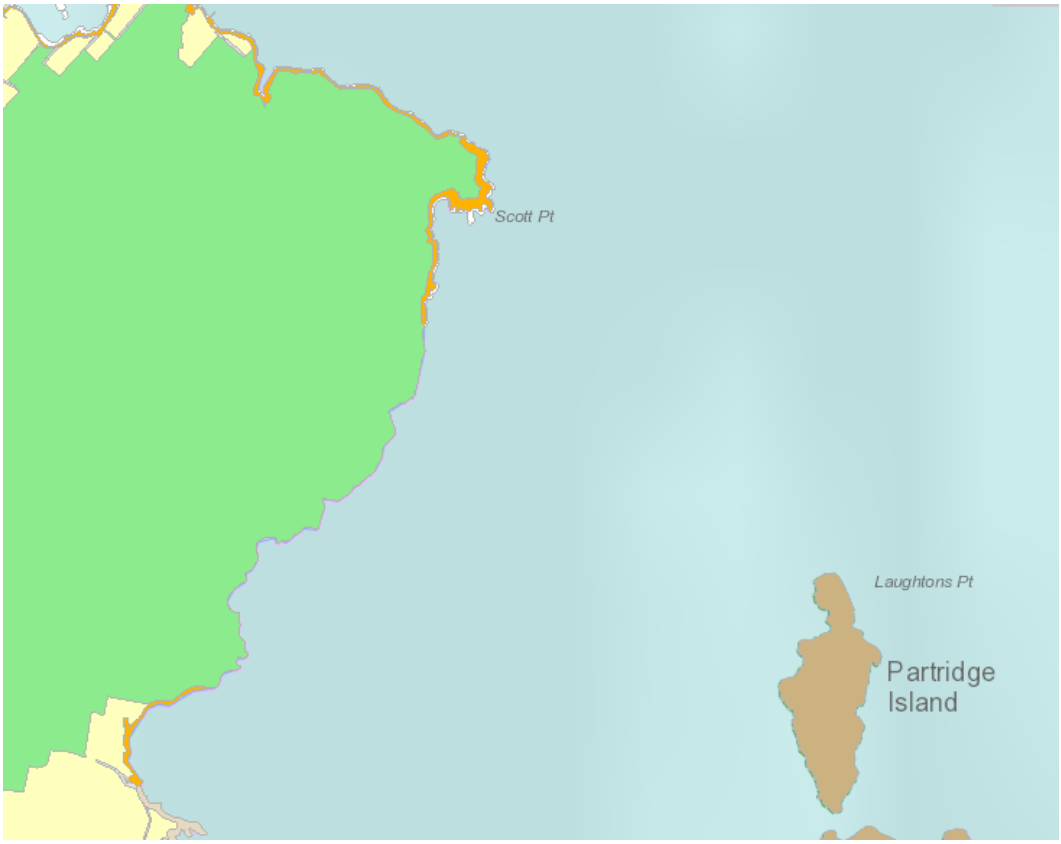

Figure 5.15. Crown and private freehold land adjacent to the proposed zone (LISTMap)

The South Bruny National Park to the east of the proposed amendment area, encompassing the Labillardiere Peninsula including Partridge Island as shown on Figure 5.14, is Crown land.

5.4.2 Land Zoning

All relevant land on the western shore adjacent to the proposed Zone 25 is classified Permanent Timber Production Zone under the *Forest Management Act 2013*.

Also shown in Figure 5.16 is a relatively narrow strip of Crown coastal reserve extending around Lady Bay southward, forming part of the Burnett Point Conservation Area. This, along with the coast north of Lippies Point, is zoned Open Space and may allow public access.

The Labillardiere Peninsula is zoned 'Environmental Management' under the *Kingborough Planning Scheme 2000*.

Figure 5.16. Current zoning east of the proposed lease – Rural (light green) and Open Space (purple) under the *Esperance Planning Scheme 1989* (LISTMap)

5.4.3 Land Use

South Bruny National Park

The South Bruny National Park (the Park) is a popular tourist destination with an abundance of bird life and a scenic landscape containing a varied coastline of beach, cliffs, headlands and coastal heathland. It has prominence in Tasmanian Aboriginal and European history, and provides key habitat for threatened species.

The western coastal fringes of the Park on the Labillardiere Peninsula and Partridge Island are possible viewpoints for the proposed lease. A bushwalking track in the Park and tracks on Partridge Island with western vantage points may offer a distant view of the proposed lease (see section 6.2.1). The tracks are within a designated 'Recreational Zone' in the *South Bruny National Park, Waterfall Creek State Reserve, and Green Island Nature Reserve - Management Plan 2000* (DPIWE 2000), under which the park is managed.

Partridge Island is used by the recreational boating community and accessed by a jetty on the eastern side of the island.

5.5 Maritime Aspects

5.5.1 Commercial Shipping

Presently, the area of the proposed amendment is not used for any regular commercial shipping activities. Between 1999 and 2012, only 17 vessels over 35 m in length were

recorded in the D'Entrecasteaux Channel (C. Black, Tasmanian Ports Corporation, pers. comm.). A summary of these vessels is provided in Table 19 below.

Table 19. Ships over 35m length recorded in the D'Entrecasteaux Channel between 1999 and 2012 (from Parsons 2012).

Type of Vessel	Number	Home/Last Port
Antarctic	3	San Lorenzo, Vladivostok, Russia
Warship	2	Australia
Fishing	3	Hobart
Passenger Liner	8	Hamilton (Bermuda), Nassau, Yokohama, Majuro, Macau, Port of Spain, Australia
Research	1	Hobart

Commercial shipping vessels that occur in the area on a frequent basis are few and mostly relatively small in size; they include a small number of tourism vessels (see section 5.7.2.1), fishing vessels (see section 5.5.3) and marine farming service vessels. Privately owned luxury cruise boats are known to visit the area infrequently (C. Black, Tasmanian Ports Corporation, pers. comm.).

Pennicott Wilderness Journeys launched a new tour in November 2013, the "Tasmanian Seafood Seduction" that operates within the D'Entrecasteaux Channel. Up to one tour per day operates, and may or may not pass through the Lippies area, depending on weather conditions. Pennicott Wilderness Journeys also operates charter boat trips in the D'Entrecasteaux Channel.

Peppermint Bay Cruises does not currently operate any regular tours in the vicinity of the proposed amendment. Historically, they have conducted tours to Recherche Bay requiring a transit through the area of the proposed amendment. At the time of writing, they were also considering the addition of a Bruny Island circumnavigation as a new tourism product which would involve transiting through the area occupied by the Lippies lease.

Tasmanian Air Adventures operates seaplane tours around Tasmania. Reliable landing locations in the southern D'Entrecasteaux area, including Tin Pot Bay, Port Esperance and Southport are utilised occasionally by Tasmanian Air Adventures, but they are not currently part of any regular tour.

Marine farming companies including Tassal and Huon Aquaculture operate a variety of planing hull and displacement service vessels in the southern D'Entrecasteaux Channel area. These vessels facilitate day-to-day operations of farms including personnel and equipment transportation.

Jurisdiction over navigation and boating activities within the D'Entrecasteaux Channel resides with Marine and Safety Tasmania (MAST). MAST has delegated the responsibility for ensuring the safe operation of commercial shipping within the area to the Tasmanian Ports Corporation Pty. Ltd. (TasPorts). The area falls within Designated Pilotage Zone C of the *Marine and Safety (Pilotage and Navigation) Regulations 2007 (Reg 6)*, requiring that any vessel over 35 m must carry a licensed marine pilot or be under the command of a master who holds a pilotage exemption certificate for the area. The southern boundary of this zone is

defined by a straight line bearing 223° from the southern end of Partridge Island to Southport Island.

5.5.2 Recreational Boating

Coastal scenery and the presence of anchorages in adjacent waterways make the waters around Lippies popular with recreational boaters transiting the area. Recreational vessels utilising the area range from small run-abouts to sailing vessels, and occasionally luxury yachts. The frequency of people using recreational boats are increasing in number in the area corresponding with local population expansion and an increase in boating accessibility through improved marine facilities. The peak period for recreational vessel movement throughout the D'Entrecasteaux Channel is summer and autumn, corresponding with the most favourable boating weather conditions and the peak period for tourism.

Organised boating events that occur in the area, or attract vessels to transit through the area, include:

- Bruny Island Race (February)
- Mewstone Race
- Southport Regatta (February)
- Van Diemen Circumnavigation.

Each of these is run annually, with the exception of the Van Diemen Circumnavigation which is run biannually. Figure 5.17 shows the approximate routes taken on these boating events, and the locations of boating hubs in the D'Entrecasteaux Channel and further afield. Boating transit lines interconnect these hubs.

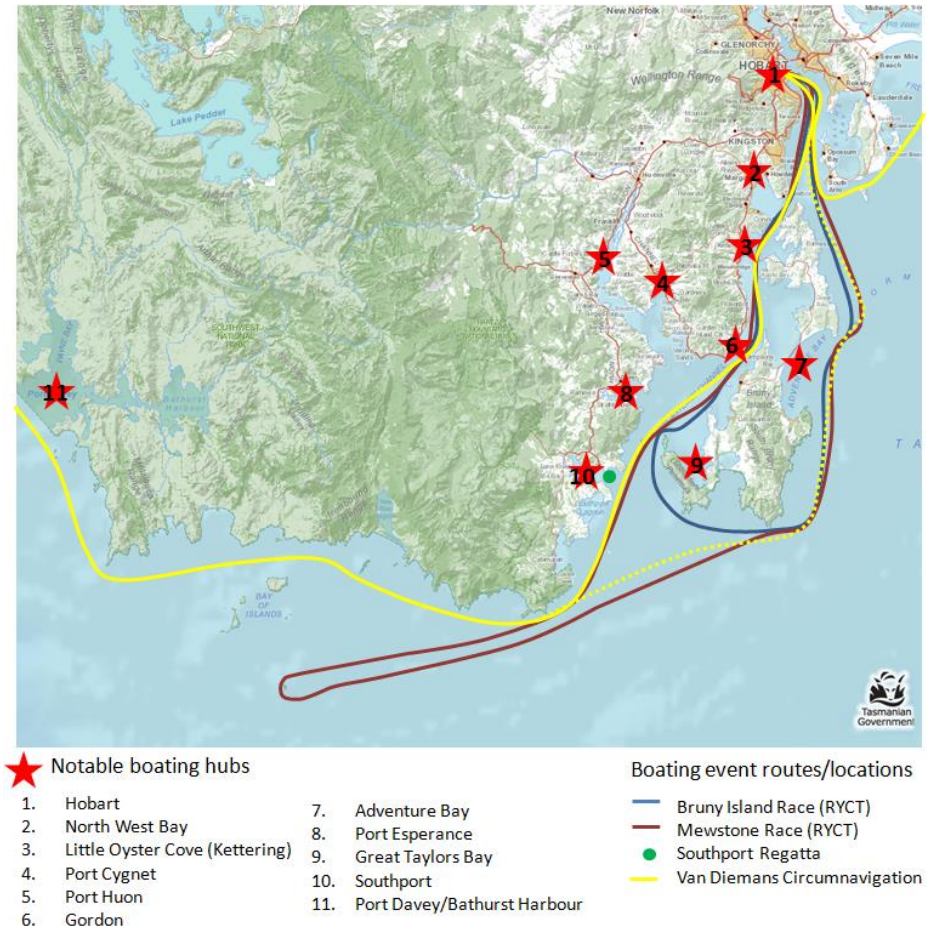

Figure 5.17. Approximate locations/routes of organised boating events in the vicinity of Lippies

There are no popular anchorages within the immediate vicinity of the proposed amendment; the west side of the Labillardiere Peninsula and Partridge Island is relatively exposed, as is the section of coastline between Scott Point and Rossell Point. Shallow embayments such as Lady Bay and Sisters Bay provide some shelter in westerly conditions and are utilised by recreational boaters as day anchorages. Superior anchorages are found within Great Taylors Bay to the east, Port Esperance to the north, and Southport to the south. Boats pass through the area in transit to these anchorages and to fishing/cruising grounds in the D'Entrecasteaux Channel and on the south coast, during both the day and night.

The nearest boat ramps are located at Southport and Dover; there is no coastal marine infrastructure between Scott Point and Rossell Point, or on the west side of the Labillardiere Peninsula. There is a public jetty located on the eastern side of Partridge Island (Figure 5.18).

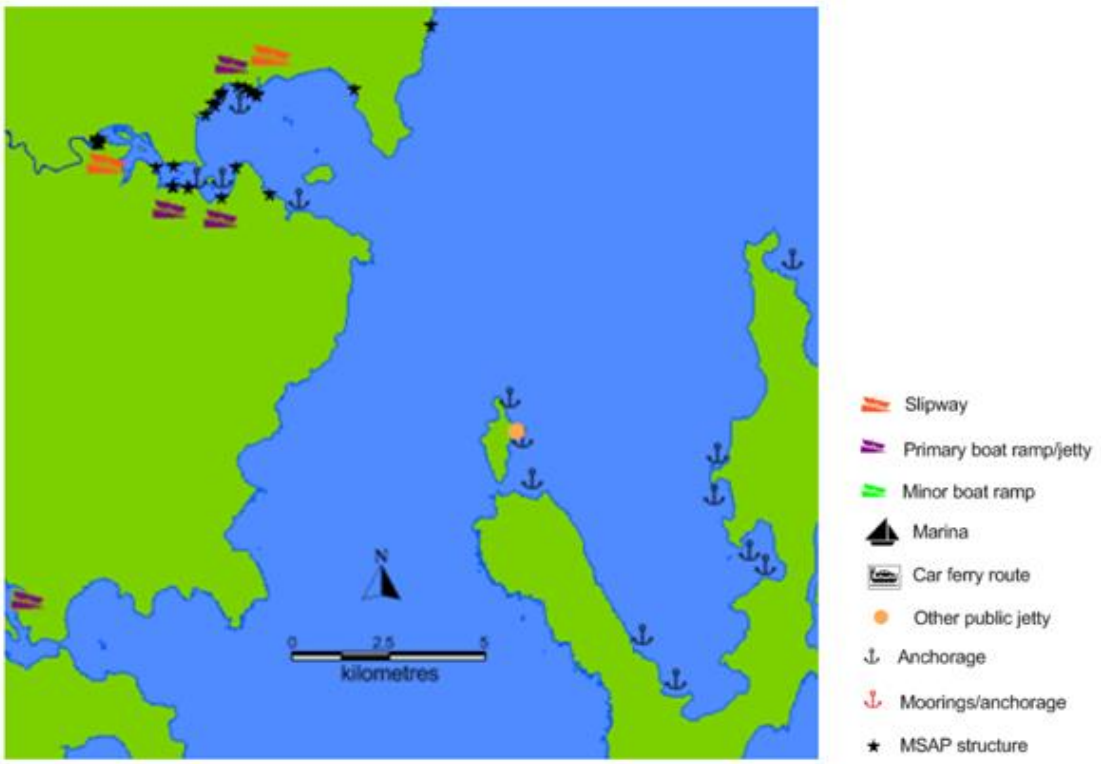

Figure 5.18. Marine facilities in the vicinity of the proposed amendment (modified from Parsons 2012)

5.5.3 Commercial Fishing

The main target species of commercial fishing in area of the proposed amendment is blacklip abalone. Commercial fishing for scalefish and rock lobster does occur, but only relatively small amounts are taken.

5.5.3.1 Abalone Fishery

The only species of abalone commercially harvested from the region is blacklip abalone, *Haliotis rubra*. The total annual catch of blacklip abalone for sub-blocks in the immediate vicinity of the Lippies area (sub-blocks 14A, 14B, 14C and 14D; see Figure 5.19 below right) in the last 5 years has ranged from 17 t (2011) to 59 t (2010) (Figure 5.19). This represents <1% of the Tasmanian Eastern Zone Total Allowable Catch (TAC) (Tarbath and Gardner 2012). Abalone harvest grounds in the region include waters around Partridge Island and down the south-west side of the Labillardiere Peninsula. Traditionally, reefs along the coastline between Port Esperance and Southport have been targeted, but catches have been relatively low in recent years. The greatest proportion of the TAC for the Eastern Zone abalone fishery is caught at and around the Actaeon Islands (in management sub-block 13E), located approximately 13 km south of the proposed amendment, where more than 50% of the Eastern Zone TAC and 15% of the Tasmanian's total TAC is harvested (Tarbath and Gardner 2012). The Actaeon Island fishing grounds represent a significant component of the total State fishery's production.

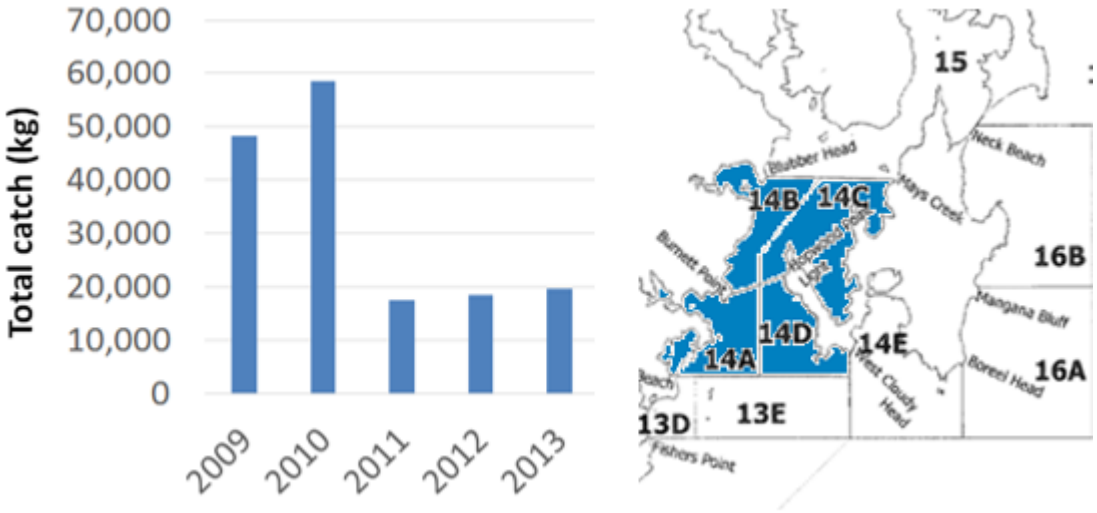

Figure 5.19. Total catch of black-lip abalone by year between 2009 and 2013 from sub-blocks 14A, 14B, 14C and 14D combined (data source: DPIPWE 2014[9]). Locations of sub-blocks are shown on map on the right (from Tarbath and Gardner 2012)

The eastern Tasmanian abalone fishery closes from January to March each year as a voluntary measure to protect spawning stocks (Mark Webster, pers. comm. 2013). Periodic toxin-producing algal blooms (*Gymnodinium catenatum* and *Alexandrium tamarense*) have resulted in periodic closures of affected sub-blocks in recent years as a risk-based management action (DAFF 2014[10]). There is support from industry to identify the cause of these blooms.

5.5.3.2 Scalefish Fishery

The Tasmanian scalefish fishery comprise a variety of species and fishing methods (Hartmann and Lyle 2011). Table 20 summarises the likely fishing methods used within the southern D'Entrecasteaux Channel for the following target species.

Table 20. Summary of fishing methods and targeted species in Tasmania (Hartman and Lyle 2011)

Fishing Method	Target Species
Beach seine netting	Australian Salmon Garfish
Graball/small mesh netting	Blue Warehou Banded Morwong Flounder Other (opportunistically – by-catch)

[9]DPIPWE (2014) Commercial fisheries database (accessed by data request)
[10]DAFF (2014) Industry Advice Notices for Fish and Fish Productshttp://www.daff.gov.au/biosecurity/export/fish/industry-advice-notices - date accessed 25-Feb-2014

Handline	Striped Trumpeter Wrasse
Dipnet	Garfish Squid
Dropline/longline	Striped Trumpeter
Spear	Flounder
Fish trap	Wrasse
Squid jig	Squid

Under the *Fisheries (Scalefish) Rules 1998*, all commercial scale-fishing is prohibited within the D'Entrecasteaux Channel (Reg. 22). A small amount of scale-fishing occurs immediately south of the channel; the total catches of scalefish in these waters is summarised in Figure 5.20 below. In 2013, the recorded commercial scalefish catch for the Lippies area (fishing blocks 7F41 and 7G13; see Figure 5.20 below) was approximately 100 t, more than double the annual catch of any other year over the past 5 years (DPIPWE catch statistics.).

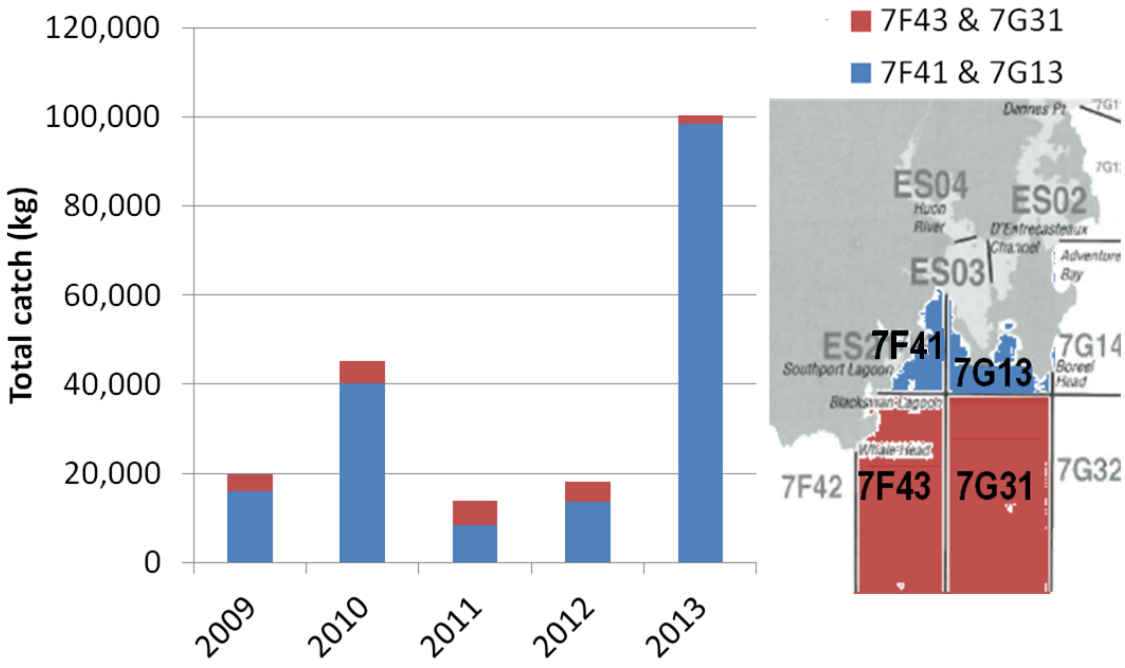

Figure 5.20. Total annual recorded scalefish catch in kilograms for blocks 7F43 and 7G31 (combined), and blocks 7F41 and 7G13 (combined) (data source: DPIPWE 2014[11]).

[11]DPIPWE (2014) Commercial fisheries database (accessed by data request)

5.5.3.3 Rock Lobster Fishery

The commercial rock lobster fishery within the region is very small. No commercial fishing is allowed north of the line between Scott Point and Partridge Island in the D'Entrecasteaux Channel. The recorded commercial catch of rock lobster within a10 km radius of the Lippies lease, from 2009 to 2013, totals less than 600kg (DPIPWE catch statistics).

5.5.4 Recreational Fishing

Recreational fishing provides significant social and economic benefit to communities throughout south east Tasmania (DPIPWE 2010). A survey of over 130 residents of the D'Entrecasteaux Channel/Huon Estuary region identified recreational fishing as a key social and recreational value, with a high number of respondents specifically identifying the regions of Great Taylors Bay and Port Esperance as valued fishing grounds (Ogier and Macleod 2013). Popular fishing methods include line fishing, potting, dive harvesting and gill-netting (DPIPWE 2010; Lyle et al. 2009). Engagement in recreational fishing as a boat-based activity is nearly 5 times higher than as a shore-based activity in south-east Tasmania (Figure 5.21).

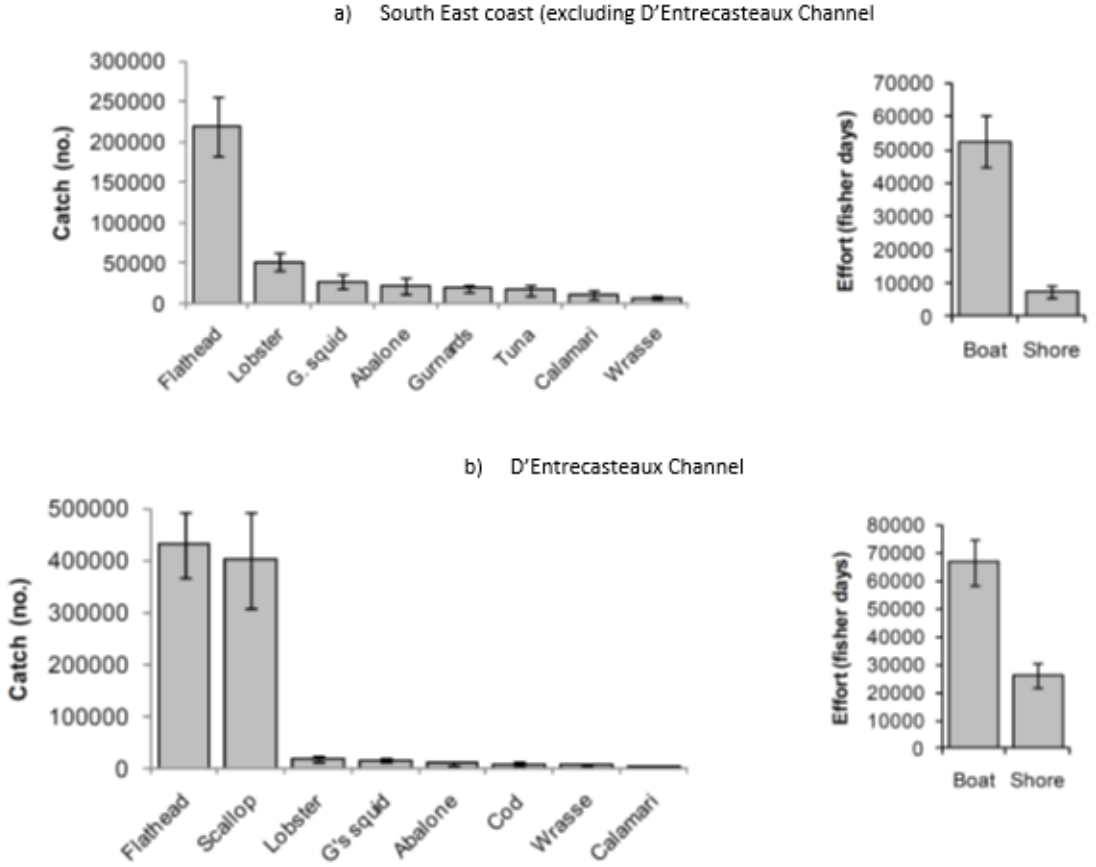

Figure 5.21. Characteristics of recreational fisheries in (a) south east coast (top) and (b) D'Entrecasteaux Channel (bottom) based on 2007-08 activity (from Lyle et al 2009)

By number of specimens caught, (DPIPWE 2010) identified flathead, scallops and rock lobster as the key species targeted by recreational fishers in south east Tasmania (inclusive of the D'Entrecasteaux Channel) (Figure 5.21). Species of secondary importance included arrow squid, abalone, gurnards, tuna, black bream, cod, wrasse and southern calamari (Lyle et al. 2009). Flounder are a popular target in the sheltered waters of the D'Entrecasteaux

Channel to the north of the proposed amendment. Note that scallops have historically been caught recreationally in high numbers in the upper D'Entrecasteaux Channel, but they are not an important target species in the more exposed and deeper Lippies area. The D'Entrecasteaux Channel has been closed for recreational scallop fishing since 2012 to allow stocks to recover following previous fishing seasons (Parsons 2012).

The southern sand flathead (*Platycephalus bassensis*) is the dominant species of flathead caught in Tasmanian waters, accounting for an estimated 95% of the total Tasmanian catch for the 2007/08 fishing season (Lyle et al. 2009), with over 85% of the catch coming from the central east and south east coasts.

Over half of Tasmania's total recreational rock lobster (*Jasus edwardsii*) catch is from the south-east (Lyle et al. 2009), with a high proportion (around half) of those caught being released. Recreational lobster potting is prohibited north of the line between Scotts Point and Partridge Island in the D'Entrecasteaux Channel. Therefore, for fishers based in Southport or Port Esperance, the Lippies region represents an important, easily accessible fishing ground for lobster potting.

The only species of abalone taken recreationally in the south east region of Tasmania is the blacklip abalone, *Haliotis rubra*. In the 2008/09 season, between 4,000 kg and 5,000 kg of abalone was recreationally harvested from the waters around Bruny Island (Lyle and Tracey 2010).

Over 50% of the total Tasmanian recreational catch of arrow squid is taken from the south-east (mainly Storm Bay and D'Entrecasteaux Channel). Similarly, the south-east of Tasmania is popular for southern calamari fishing, but the spread of catch of this species is more even across the state than for arrow squid (Lyle et al. 2009).

5.5.5 Recreational Activities

Recreational activities that are known to take place in the area of the proposed amendment can be broadly divided into three main categories:

- On-water activities
    - Boating/sailing
    - Fishing
    - Kayaking
- In-water activities
    - Diving/Snorkelling
    - Swimming
- On-land activities
    - Fishing
    - Camping
    - Walking/hiking
    - Wildlife-watching
    - General sight-seeing

A survey of over 130 interested community members, management agencies and marine industries identified marine-associated recreational activities that are valued in the D'Entrecasteaux/South Bruny region ("*Your Marine Values*" survey; Ogier and Macleod 2013). Table 21 shows the specific areas and values that were named by survey respondents.

Table 21. Areas identified by YMV survey respondents as valued for marine-associated recreation. Numbers indicate the number of survey respondents that identified an association between given values and places. The total number of survey respondents was 137 (Ogier and Macleod 2013)

	Recreational use (access/opportunity)						
	Un-specified	Boating	Recreational fishing	Swimming	Beach/ coastal walking	Kayaking	Diving/ snorkelling
Esperance Narrows		1	3			1	
Great Taylor's Bay	2	3	9	3	4	3	1
Kent Beach (Dover)			1	1	1		
Little Taylors Bay			3	2	3	2	
Lune River			1				
Mickeys Bay	1	1					
Partridge Island			2		1	1	
Port Esperance	4	3	6	1	3		2
Recherche Bay			2		1		1
Southport		1	2	1	2	1	

5.5.5.1 On-Water Activities

A range of users engage in on-water recreational activities in the vicinity of the proposed lease amendment. The waterways of the D'Entrecasteaux Channel are regarded as some of the best cruising waterways in the world due to a diversity of sheltered bays, anchorages, deep waters, coastal scenery and seascapes offered throughout the area. Southport and Port Esperance are both utilised as ports and anchorages by recreational boaters, fishers and sometimes kayakers. There is a trend of increasing on-water recreational use of the waters around Bruny Island, as reflected by the increase in ownership of recreational boats in the last decade in the region (MAST 2010[12]).

Recreational boating and fishing are described in greater detail in sections 5.5.2 and 5.5.3, respectively.

5.5.5.2 In-Water Activities

There are a number of sandy beaches that are valued swimming locations in the vicinity of the proposed lease amendment. Jetty Beach at the base of the Labillardiere Peninsula is a

[12]MAST (2010) Recreational boating survey results 2010 http://www.mast.tas.gov.au/domino/mast/mastweb.nsf/e8b363ac427c4ab9ca2573920015fccc/e0cdd48cda9078eaca2577eb007dd6ee/$FILE/101731%20MAST%20Survey%20Results%20(3).pdf – date accessed 24-Feb-2014

safe, sheltered swimming beach, mainly used by camp site users. Other swimming beaches include Kingfisher Beach, Mickeys Beach and Tin Pot Beach in Great Taylors Bay, and Kent Beach in Dover. Nearby areas of Southport, Partridge Island and Lady Bay are popular with divers and snorkelers.

5.5.5.3 On-Land Activities

The coastline between Scott Point and Rossell Point is relatively underused for recreation. There are no notable walking tracks or campgrounds in this section of coastline. Nearby Port Esperance and Southport offer some hiking, beach-walking and camping opportunities. There are caravan parks in both Port Esperance and Southport (Huon Trail 2013[13]).

The Labillardiere Peninsula and Partridge Island are a part of the South Bruny National Park, which was declared a National Park in 1997 on account of its valued coastal scenery (Parks and Wildlife Service 2014[14]). There are camping grounds at Jetty Beach at the base of the peninsula and a scenic lookout at Cape Bruny. Maintained walking tracks in the national park include

- The Labillardiere Peninsula Walk: an estimated 5-hour moderate difficulty circuit track that skirts the entire peninsula (Parks and Wildlife Service 2014[14]).
- The Luggaboine Circuit: an easier 1.5-hour circuit through coastal heath, eucalypt forest and southern coastline, commencing at Jetty Beach camping area.

Opportunities for observing native wildlife occur on both the south east coast and Bruny Island. Over 120 bird species have been recorded on Bruny Island (Parks and Wildlife Service 2014[14]). Notable species include tawny-crowned honey eaters, Australasian gannets, Ground Parrots, Shy Albatross, Forty-spotted Pardalotes, Wedge-tailed Eagles and White-bellied Sea Eagles. One of the largest surviving colonies of Forty-spotted Pardalotes is found on Partridge Island (Parks and Wildlife Service 2014[14]). Seals and dolphins are commonly observed throughout the region. Whales are also frequently observed in Tasmanian coastal waters during the winter months. Migratory species such as the Humpback Whale and Southern Right Whale have been observed in the waters of the D'Entrecasteaux Channel during their migration. There are opportunities to encounter terrestrial mammal species including short-beaked echidnas, brushtail possums, Tasmanian pademelons and Bennetts wallabies.

[13]Huon Trail (2013) Huon Trail Discover the South Touring Guide and Map http://www.huontrail.org.au/files/97/1357248820HT%20brochure%20LOW%20RES%20FINAL%202013.pdf date accessed 18-Feb-2014

[14]Parks and Wildlife Service (2014) South Bruny National Park http://www.parks.tas.gov.au/index.aspx?base=3773 - date accessed 18-Feb-2014

5.6 Heritage

5.6.1 Aboriginal Heritage

Aboriginal heritage is protected under the *Aboriginal Relics Act 1975*, which states that if at any time during works, suspected Aboriginal heritage is uncovered or revealed, works must be ceased and Aboriginal Heritage Tasmania notified. An Unanticipated Discovery Plan is available in the event that any Aboriginal heritage is uncovered during ground disturbing works to ensure that the requirements of the Act are met.

Aboriginal Heritage Tasmania conducted a desktop search of the Tasmanian Aboriginal Site Index (TASI) regarding proposed amendment of Zone 25 and has advised that there are no Aboriginal heritage sites recorded in the vicinity. Due to the proposal having no land based construction, the area is considered to have a very low likelihood of Aboriginal heritage being present within or around the proposed zone.

Therefore, there is no requirement for an Aboriginal heritage investigation and Aboriginal Heritage Tasmania has no objection to the proposed amendment.

5.6.2 European and Other Heritage

5.6.2.1 Places listed on the Tasmanian Heritage Register (maintained by the Tasmanian Heritage Council), including consideration of cultural landscapes

Tassal conducted a search of the Tasmanian Heritage Register (Heritage Tasmania 2013[15]). The Tasmanian Heritage Register is a register of places that are recognised as being of historic cultural heritage significance to the whole of Tasmania. These places are important to Tasmania and Tasmanians because of their contribution to the State's culture and society. The Register is maintained by the Heritage Council under the *Historic Cultural Heritage Act 1995*.

There are no registered places located within or in close proximity to the proposed lease area.

It is noted that there are registered places several kilometres away in Southport, the *Convict Farm and Graveyard* at Blue Gum Avenue and Lady Bay Road Southport, the *Probation Station* at Kingfish Beach Road Southport, and there are listed sites in the South Bruny National Park area that are noted in the following section.

5.6.2.2 Places on the Tasmanian Historic Places Inventory (maintained by the Tasmanian Heritage Office)

Tassal has conducted a search of the Tasmanian Heritage Places Inventory, under the Australian Heritage Places Inventory. There are no historic places within or in close proximity to the proposed amendment.

[15]Heritage Tasmania (2013) Tasmanian Heritage Register http://www.heritage.tas.gov.au/thr.html date accessed 20-Feb-2014

However, it is noted that there is a registered historic place at the *Convict Farm and Graveyard* at Blue Gum Avenue and Lady Bay Road Southport, and listed sites in the South Bruny National Park area as noted below.

The Light Station and associated buildings on Lighthouse Road Cape Bruny as identified on Figure 5.14 (section 5.3.4) above are listed on:

- Register of the National Estate – Federal heritage significance
- Tasmanian Heritage Council listing – State heritage significance, and
- Register of National Trust – Classified – State heritage significance.

Part of the South Bruny National Park is listed on the Register of the National Estate as being of Commonwealth heritage significance.

5.6.2.3 Local government planning scheme heritage schedules

Tassal has conducted a search of the local government planning scheme heritage schedules. There are no scheduled historic places within or in close proximity to the proposed amendment.

There are no scheduled historic places under the Esperance Planning Scheme 1989 governing the Dover – Southport area. However, Schedule 2 of the Kingborough Planning Scheme 2000 lists:

- The Light Station and associated buildings Lighthouse Road Cape Bruny as
  - Registered National Estate – Federal heritage significance
  - Tasmanian Heritage Council listing – State heritage significance, and
  - Register of National Trust – Classified – State heritage significance
- South Bruny National Park as Registered National Estate – Federal heritage significance
- Cape Bruny Lighthouse Jetty Lunawanna as Kingborough Council listing of National significance.

None of the above is in or near the vicinity of the proposed amendment.

5.6.2.4 Other places of heritage significance

There are no other places of heritage significance within the proposed lease area or surrounds.

5.7 Social and Economic Description

5.7.1 Population

The land area in the vicinity of the proposed amendment zone area is largely unpopulated. South Bruny National Park lays further to the east of the area, with the closest populated area to the proposed lease being Southport, a small gazetted locality to the south of the

proposed lease area. The township of Dover (gazetted locality) lies further north of the proposed amendment zone area.

Southport has a hotel-based general store, caravan park, shop and post office, and a post box. The Australian Bureau of Statistics (ABS) does not release data for gazetted localities; however population data from the ABS has been accessed to describe the State Suburb (SSC) of Southport (Figure 5.22).

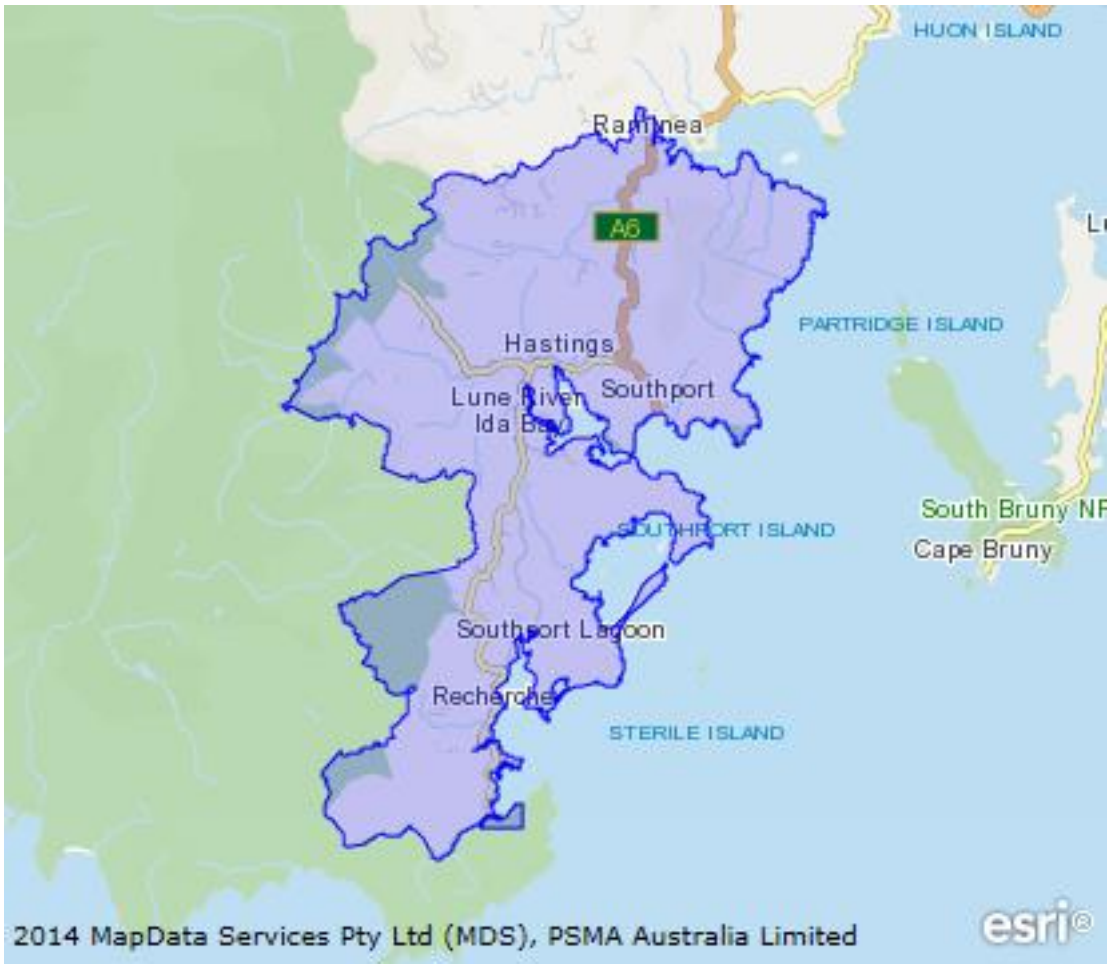

Figure 5.22. State Suburb (SSC) of Southport

Southport (SSC), Tasmania

Total Population 2011	372
Male	208
Female	164
Median Age	49
Unemployment Rate	10%
Full Employment Rate	47.3%
Part Time Employment Rate	36.7%

Of the population of Southport over 15 years of age in employment, 21.5% are employed in the Aquaculture industry.

The land base for the Huon Farming Region that will be used to service the lease is located in Dover. Population data from the ABS has been accessed to describe the State Suburb (SSC) of Dover (see Figure 5.23).

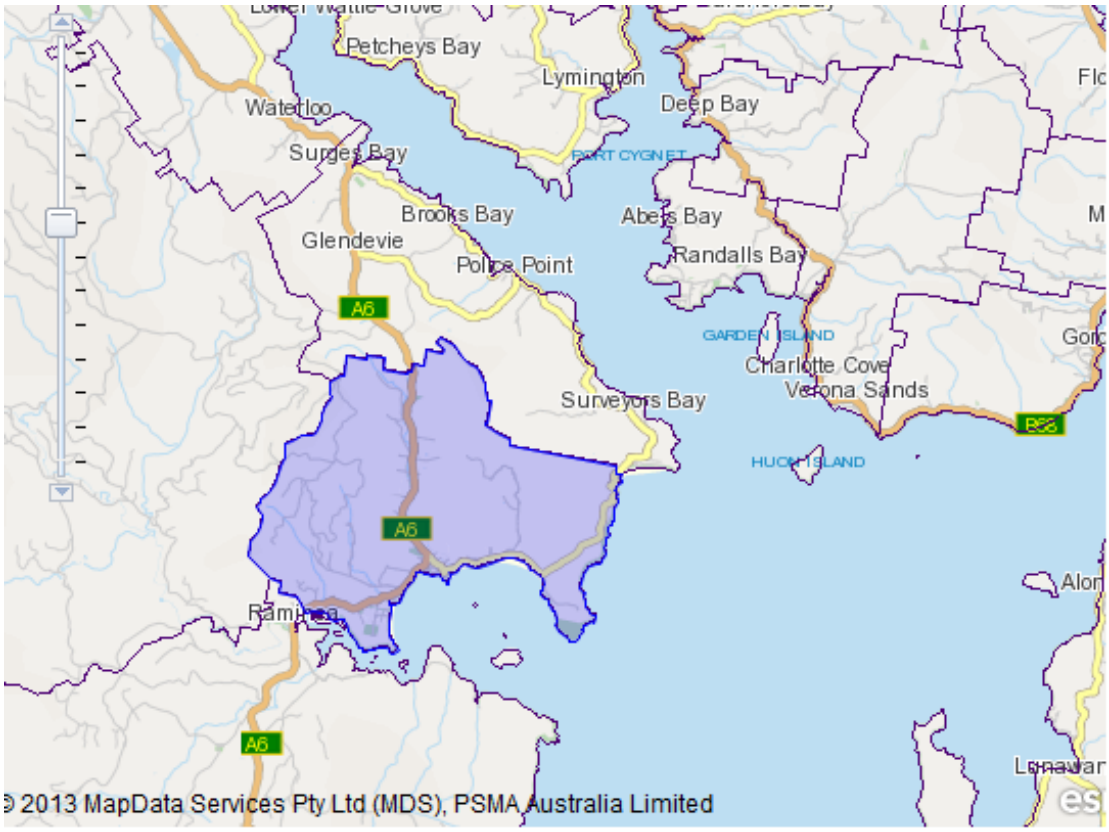

Figure 5.23. State Suburb (SSC) of Dover

Dover (SSC), Tasmania

Total Population	763
Male	387
Female	376
Median Age	51
Unemployment Rate	10%
Full Employment Rate	47.3%
Part Time Employment Rate	36.7%

Of the employed people aged 15 years and over, 24% of the population in Dover work in the aquaculture industry.

5.7.2 Economic Description

5.7.2.1 Tourism

The current and proposed lease and zone area falls within the 'Huon Trail' tourism area. The Huon Trail incorporates touring routes south of Hobart and is made up of four regions – the Huon Valley, Far South, D'Entrecasteaux Channel and Bruny Island and covers 56 registered attractions (Huon Trail 2013[16]).

The *State of the D'Entrecasteaux Channel and the lower Huon Estuary 2012 Report* (Parsons 2012) summarised that the number of tourists visiting the area has declined in the past five years with a decrease of 21% recorded between 2008/09 and 2011/12, and a decrease of 9.5% recorded between 2010/11 and 2011/12, but noted that visitors are choosing to spend more time in the area, with an increase in overnight stays (Tourism Tasmania 2012[17]).

5.7.2.1.1 Land-based tourism

Accommodation

There are numerous accommodation options throughout the region, becoming sparser further southward. An extensive desktop search using several mainstream websites (www.google.com.au, www.stayz.com.au, and www.huontrail.org.au) has identified 23 accommodation options in the Dover/Southport regions; these are shown in Figure 5.24. Aside from a campsite at Jetty Beach, there is no accommodation on the nearby Labillardiere Peninsula, nor is there any accommodation in the section of coastline between Port Esperance and Southport. Note that the list of accommodation presented here may not be exhaustive for the region.

Restaurants, cafes, bars and other food outlets

Six eateries have been identified for Dover/Southport region, five of which are located in Dover; these are shown in Figure 5.24. There are no eateries on the Labillardiere Peninsula. Note that the list of restaurants, cafes, bars and other food outlets presented here may not be exhaustive for the region.

[16]Huon Trail (2013) Huon Trail Discover the South Touring Guide and Map http://www.huontrail.org.au/files/97/1357248820HT%20brochure%20LOW%20RES%20FINAL%202013.pdf date accessed 18-Feb-2014

[17]Tourism Tasmania (2012).Tasmanian Visitor Survey data.Tourism Tasmania. Available via the WebReporter website at: http://webreporter.asteroid.com.au/webreporter/ttreports/

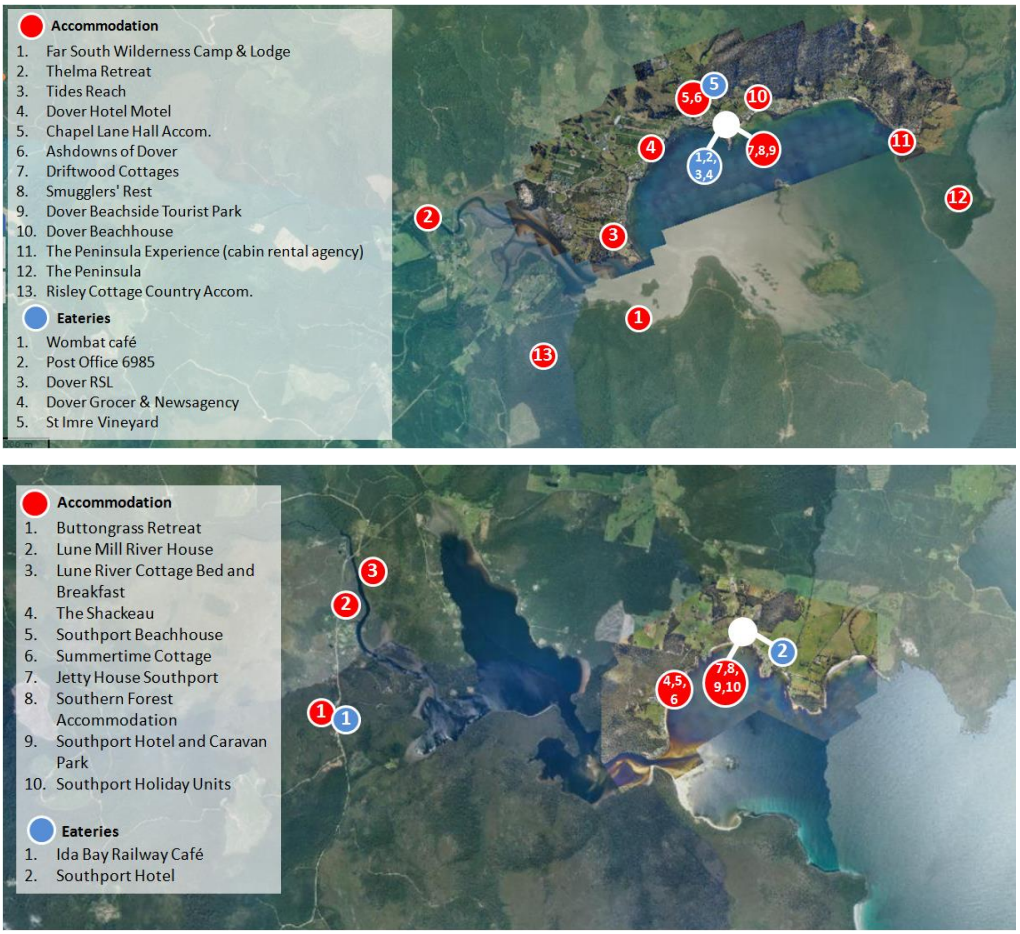

Figure 5.24. Accommodation and eatery map of the Dover (top) and Southport (bottom) regions

Cultural heritage

Ida Bay Railway operates scenic tours on a heritage-listed bush railway. Tours operate daily from October to April, and four times a week from May to September. The railway line is over 7 km long from the Lune River (marked as eatery #1 in the Southport region in Figure 5.24 above) to Deep Hole Bay (Ida Bay Railway 2014[18]). There are two marked walks that are accessible from the Deep Hole Bay terminus of the Ida Bay Railway (see *Walks and Treks* below).

Lookouts

No renowned lookouts have aspects that will be affected by the proposed amendment. The nearest well-known lookout is at Cape Bruny, from which the Lippies lease is not visible.

[18]Ida Bay Railway (2014) http://www.idabayrailway.com.au - accessed 28-Feb-2014

Walks and treks

Within the Southport area, there are two walking tracks: the Southport Bluff Beach walk and the Southport Lagoon walk (Huon Trail 2013[19]). These begin at the eastern terminus of the Ida Bay Railway.

Maintained walking tracks in the South Bruny National Park include the Labillardiere Peninsula walk, an estimated 5-hour moderate difficulty circuit track that skirts the entire peninsula, and the Luggaboine Circuit, an easier 1.5-hour circuit through coastal heath, eucalypt forest and southern coastline, commencing at Jetty Beach camping area (Parks and Wildlife Service 2014[20]).

The Huon Trail touring guide (Huon Trail 2013[19]) does not list any walking tracks within the Dover area, however the Dover foreshore allows for activities such as walking and bike riding. The Dover public nine hole golf course is Australia's most southerly golf course.

5.7.2.1.2 Marine-based tourism

Marine-based tourism is limited in the immediate vicinity of the Lippies lease. Some marine-based tourism operators utilise the area intermittently. More generally, the D'Entrecasteaux Channel and lower Huon Estuary region is the state's most popular area for boating, fishing and yachting as well as SCUBA diving, surfing, kayaking and swimming (Parsons 2012).

Pennicott Wilderness Journeys' "Tasmanian Seafood Seduction" tour operates within the D'Entrecasteaux Channel. The Seafood Seduction tour was launched in November 2013. One boat seating a maximum of 12 passengers departs Hobart per day, depending on demand. Seafood including abalone and rock lobster is harvested during the tour. The exact route and fishing locations are not fixed but rather are determined by weather conditions, and as such periodically overlap with southern D'Entrecasteaux Channel region (Pennicott Wilderness Journeys, pers. comm.). Pennicott Wilderness Journeys also operates charter boat trips in the D'Entrecasteaux Channel as requested.

Peppermint Bay Cruises does not currently operate any regular tours in the vicinity of the Lippies lease. Historically, they have conducted tours to Recherche Bay requiring a transit through the area. At the time of writing, they were considering the addition of a Bruny Island circumnavigation as a new tourism product (Peppermint Bay Cruises, pers. comm.). This would involve transiting the area occupied by the Lippies lease.

Tasmanian Air Adventures operates seaplane tours around Tasmania. Reliable landing locations in the southern D'Entrecasteaux Channel area including Tin Pot Bay, Port Esperance and Southport are utilised occasionally by Tasmanian Air Adventures, but they are not currently part of any regular tour (Tasmanian Air Adventures, pers. comm.). Tour guides often identify Tasmanian salmon farming pens from the air to guests.

Roaring 40°s Kayaking operates guided kayaking tours in southern Tasmania. They do not regularly use the Lippies lease area (Roaring 40°s Kayaking, pers. comm.).

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[19]Huon Trail (2013) Huon Trail Discover the South Touring Guide and Map http://www.huontrail.org.au/files/97/1357248820HT%20brochure%20LOW%20RES%20FINAL%202013.pdf date accessed 18-Feb-2014

[20]Parks and Wildlife Service (2014) South Bruny National Park http://www.parks.tas.gov.au/index.aspx?base=3773 - date accessed 18-Feb-2014

5.7.2.2 Industry

In addition to aquaculture (finfish and shellfish farming), the region supports a number of industries including commercial fishing, boat building, gourmet food production and tourism, providing valuable employment for the region (Parsons 2012).

6 Potential Effects and their Management

6.1 Impacts on the Natural Environment

6.1.1 Water Quality

6.1.1.1 Recognised effects of farming emissions on water quality

A key component of marine finfish aquaculture, both in terms of fish performance and developing an ecologically responsible industry, involves understanding the environmental effects of farming on water quality.

Aquaculture has the potential to impact negatively on water quality, the severity of which depends on the type and intensity of the farming activity and the capacity of the receiving environment to assimilate any impact (Black 2001). There have been a range of significant improvements over the last 20 years in the management of marine finfish aquaculture operations, resulting in improved water quality. This has been observed through improvements in feeding practices, feed formulation, understanding fish behaviour (Price and Morris 2013) and better siting of farming leases.

Farm site characteristics, such as bathymetry, current and tidal flows are significant drivers in nutrient dispersion in and around farms. Establishing farm sites in waters of suitable depth, with sufficient flushing rates are known to lessen impacts on water quality. In addition, the combination of physical (hydrodynamic) and ecological (trophic relationships) processes are also known to influence the assimilative capacity of the receiving environment through:

- nutrient uptake by phytoplankton, and the associated trophic transfers through higher trophic levels, and
- dilution of nutrients and planktonic organisms, primarily driven by the prevailing hydrodynamic forces and movement of water masses – these occurrences may reflect patterns of large scale oceanic circulation or individual wind mixing events, or a combination of both (Buschmann et al. 2007).

Reviews of the existing literature on the impacts of aquaculture (see Munday et al. 1992, Gowen and Rosenthal 1993, Wu 1995, Black 2001) essentially report similar conclusions.

Nutrient emissions associated with finfish farming are known to affect water quality at both near-field and broadscale levels. The release of nutrients into the environment from finfish farming is largely associated with the exogenous feed input (De Pauw and Joyce 1991, Handy and Poxton 1993, Pillay 1995). The extent to which water quality is affected by farming emissions can be attributed to the assimilative capacity of the environment, fish stocking densities and levels of feed input (Ackefors and Enell 1990, Black 2001).

Soluble wastes associated with finfish culture include ammonia, phosphates and dissolved organic carbon emissions. The CSIRO Huon Estuary Study (HES) (2000) assessed the sources, distribution and cycling of nutrients (including those derived from finfish farming) in the Huon Estuary (Butler et al. 2000). These studies and further analysis of the broadscale impacts to the ecosystem were subsequently updated through the Aquafin CRC biogeochemical modelling of the D'Entrecasteaux Channel and Huon Estuary (Volkman et al. 2009).

The results of the HES demonstrated the importance of flow and flushing rates of a system in relation to nutrient cycling and confirmed that problems associated with nutrient emissions are minimised where flushing rates are sufficient enough to dilute nutrient loads.

One of the environmental concerns relating to fish farming in Tasmania is eutrophication of the water column, since the combination of high stocking densities and feed inputs could potentially lead to imbalanced levels of nitrogen and phosphorous in the water column. In marine systems, nitrogen is typically the limiting nutrient, so its availability will dictate the amount of primary production.

Approximately 5% of the total feed input from salmon farming is released into the receiving environment as a form of nitrogen (Wild-Allen 2005), of which 85% is released as dissolved nitrogen (predominantly ammonium) and 15% in particulate form. The phosphorus component released into the environment is considered to be divided between particulate labile detritus (at a fixed Redfield ratio of 16N:1P) and dissolved inorganic phosphorus. However, because nitrogen is the limiting nutrient in this marine system, the environmental impacts of salmon farming in the D'Entrecasteaux Channel and Huon Estuary are managed by regulating the total permissible dissolved nitrogen output (TPDNO) that enters the receiving environment as emissions from feed input.

Previous studies in Scotland have found that at most farm sites, enrichment levels are low and that primary production attributable to fish farm nutrients is small relative to that generated by other marine and terrestrial nutrient inputs. Research also failed to conclusively establish a link between perceived increases in Harmful Algal Blooms (HABs) and expansion of the fish farming industry (The Scottish Association for Marine Science and Napier University 2002).

Assessment of water quality is typically based on measuring physico-chemical parameters including temperature, pH, light, dissolved oxygen, salinity and nutrients. All of these vary on a temporal basis and are subject to the movement of water masses and the site specific characteristics of the surrounding environment (e.g. currents, depth, tidal flow and weather conditions). The Broadscale Environmental Monitoring Program (BEMP) in the D'Entrecasteaux Channel and Huon Estuary (2009-ongoing) provides a whole of ecosystem approach to understanding how water quality and biological assemblages respond to nutrient loads from both natural and anthropogenic sources.

A report by GESAMP (1996) stated that the acceptable level of change in any water quality parameter is generally unknown and the definition of impact level threshold is usually only achieved after data have been collected over a considerable period of time. This report suggested measuring chlorophyll concentrations to assess nutrient enrichment because:

- nutrient enrichment is not a problem in itself; and
- nutrient enrichment will only stimulate phytoplankton growth when that particular nutrient is the limiting factor.

In most studies there is usually insufficient data to link nutrient availability to algal growth. The succession of algal species may be of significance, since species have different responses to different nutrient levels. The particular species present may be the most important factor in determining the nutritional value of the food, or impact of the algal bloom. Microscopic analysis of the species composition of the communities may be needed, or specific phytoplankton pigments may be measured as an indirect assessment of the community present. Phytoplankton assessment forms a key component of the BEMP and on-site daily water quality monitoring, as stated in section 3.4.3.

In addition, Thompson et al. (2008) suggested that low dissolved oxygen is a high risk contributor to changes in trophic structure and should be regarded as a high priority for broadscale ecological monitoring programs in the D'Entrecasteaux Channel and Huon Estuary. Dissolved oxygen monitoring is a key monitoring parameter of the BEMP. Tassal also undertakes routine daily monitoring of dissolved oxygen levels in farmed cages, as it is a key parameter for fish health and it is in the company's best interest to ensure that dissolved oxygen is maintained at appropriately high levels.

6.1.1.2 Current levels of farming emissions

6.1.1.2.1 Soluble nutrient emissions from stock/feed/faeces

As stated in section 3.1.3, although Tassal is entitled to utilise the existing lease and zone, it is not currently farmed because its size does not allow for the configuration of moorage assemblies required for cost effective modern farming operations. For the purpose of this document, the site will be treated as a new development i.e. current farming emissions are best represented by zero.

6.1.1.2.2 Soluble effluent stream from in-situ net cleaning

In line with section 6.1.1.2.1 above, there are currently no emissions associated with in-situ net cleaning activities.

6.1.1.3 Expected levels of farming emissions

The proposed production strategy at Lippies involves staggering the input of smolt year classes within the lease area.

Smolt will be introduced at approximately 140 g average weight and grown out to harvest over a 19 month period. The first input of smolt for the Lippies lease is proposed for mid-2016. Subsequent year classes will be introduced to alternate ends of the lease, and will only be stocked with two year classes for seven months of the year. The staggering of stock input across the lease will provide for adequate periods of benthic remediation in line with best practice aquaculture. The monthly feed input to accommodate this production strategy (for four consecutive year classes) is shown in Figure 6.1.

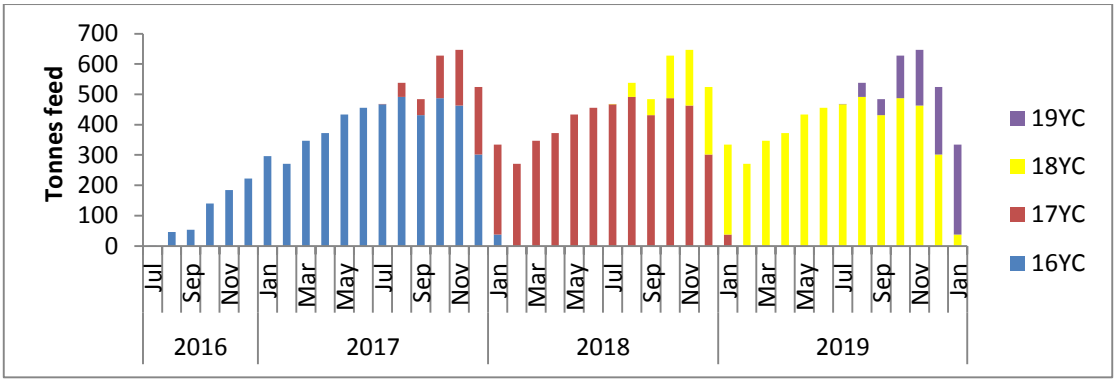

Figure 6.1. Feed inputs (tonnes) at Lippies over the extended production cycle (19 months). Note staggered stocking/feeding regimes

6.1.1.3.1 Soluble nutrient emissions from stock/feed/faeces

The combined total feed input to the proposed lease at Lippies is expected to be 5 500 t/yr. (Table 22). This figure represents 234 t of dissolved nitrogen released into the receiving environment as soluble emissions annually, predominantly as ammonium.

Table 22. Expected annual nitrogen emissions from feed input (total, soluble and particulate N) for the proposed Lippies lease area

Feed Management (Annual)	Total Feed Input (t)	Total N released to environment (t)	Soluble N released to environment (t)	Particulate N released to environment (t)
Proposed - feed input (combined year class stocking)	**5 500**	**275**	**234**	**41**

The proposed amendment to Zone 25 will not compromise the TPDNO (from feed input) for the D'Entrecasteaux Channel MFDP Area. For more information on the total permissible dissolved nitrogen output limit, see section 6.1.1.4.1 below.

6.1.1.3.2 Soluble effluent stream from in-situ net cleaning

Each year class consignment of 14 cages at Lippies would require in-situ cleaning under the proposed amendment. Current projections regarding net cleaning suggest that each cage requires in-situ net cleaning approximately 10 times per year. This means that the expected soluble/suspended emissions from net cleaning activities for Lippies would be approximately 3.8 t/yr when the lease is fully stocked with two separate year classes (i.e. 28 cages). These calculations are based on the maximum weight of material removed during net cleaning activities for net cleaning effluent from monofilament nets in the D'Entrecasteaux Channel as determined by DHI 2012. As Kikko mesh nets are intended for deployment at the proposed lease, this figure overestimates both biofouling volumes and netwash frequency. The actual emissions from netwashing activities are predicted to be 2/3 less than the figures provided. This decrease has been observed at other sites where traditional monofilament nets have been replaced with Kikko mesh nets.

Further, as stocking of cages will be staggered over the production cycle to maintain appropriate stocking densities (e.g. biomass split from 10 into 14 cages at 200 days), the projections described above have been determined for 28 cages for the duration of the production cycle and are likely to overestimate the soluble emissions resulting from net cleaning activities.

6.1.1.3.3 The effects of the expected emission levels on a local and regional scale

The proposed amendment involves the establishment of a 28 pen bay mooring system at the Lippies lease. This site will be utilised as a full marine lifecycle production site, where smolt inputs are grown to harvest size. This means that for seven months of the year, there will be an overlap of two year classes (see section 6.1.1.3) and the potential for a maximum of 28 pen bay positions to be occupied on the lease during this overlap period.

It is possible that the effects of an increase in soluble nitrogen emissions (234 t/yr) could lead to short term changes to ammonia/nitrate concentrations in close proximity to the proposed lease and that possible impacts could manifest in increased primary production within a localised area. Table 23 lists a range of studies that describe the extent of environmental impacts of nutrient emissions from marine cage aquaculture. Based on the results of these studies, it is suggested that the detectible effects of elevated nutrients from soluble emissions can occur within 500 m of the emission source.

Table 23. Pelagic and broadscale effects of soluble emissions from marine cage aquaculture

Author	Title	Farmed species	Region	Measured Effect	Environmental Effect
Crawford et al. 2006(unpublished)	Development of broad scale environmental monitoring and baseline surveys in relation to sustainable salmon aquaculture in the D'Entrecasteaux Channel region.	Atlantic salmon (*Salmo salar*)	South east Tasmania (D'Entrecasteaux Channel)	Intertidal algae	Results from intertidal communities (in particular the dominant species *Ulva* and *Hormosira*) showed natural variation and no clear trends in abundance with distance from salmon farms
Dalsgaard and Krause-Jensen 2006	Monitoring nutrient release from fish farms with macroalgal and phytoplankton bioassays	Sea bream (*Sparus aurata*) and Sea bass (*Dicentrarchus labrax*)	Mediterranean Sea (Greece, Cyprus, Italy and Spain)	Macroalgal and phytoplankton bioassay analysis	This study showed that fish farms clearly stimulated the pelagic primary production of the receiving environment. The effects of nutrient emissions release was observed up to a distance of about 150 m downstream in the dominant current direction
Oh 2009	Macroalgal assemblages as indicators of the broad-scale impacts of fish farms on temperate reef habitats	Atlantic salmon (*Salmo salar*)	South east Tasmania (D'Entrecasteaux Channel and Port Esperance)	Subtidal macroalgae	This study suggested that fish farms were associated with increased cover of opportunistic algae within 100-400 m of the farms
Sanderson et al. 2008	Distribution of nutrients for seaweed cultivation around salmon cages at farm sites in north–west Scotland	Atlantic salmon (*Salmo salar*)	Badcall, north-west Scotland	Ammonium concentration	Salmon farm derived enhancements of 1 µM were detected at distances >200 m
Volkmann et al. 2009	Numerical Hydrodynamic Modelling of the D'Entrecasteaux Channel and Huon Estuary	Atlantic salmon (*Salmo salar*)	D'Entrecasteaux Channel and Huon Estuary	Nutrient concentrations modelled using particle traces	The particle trace modelling showed that it is possible for a plume having concentration of 10% (i.e. 10:1dilution) of the source concentration to exist up to 500 m from the net cage on occasion

The range and complexity of possible responses to nutrient loading are extremely difficult to predict and measure, particularly at the broadscale level, and where water bodies (such as the D'Entrecasteaux Channel) exhibit contrasting biological, physico-chemical and hydrological processes. Studies undertaken on the emissions from a single cage at the entrance to Port Esperance by Volkman et al. (2009) using particle traces suggest that it is possible for an emissions plume having a concentration of 10% (i.e. 10:1 dilution) of the source concentration to exist up to 0.5 km from the cage at times. The proposed lease is located in deep, well mixed waters, with high flow rates and significant oceanic exposure. Therefore it would be expected that the dilution effect at this site would be greater than waters in and around more sheltered waters (i.e. Port Esperance).

Other studies suggest that nutrient plumes can be detected at similar distances from the source (i.e. sea cages) (Dalsgaard and Krause-Jensen 2006, Sanderson et al. 2008, Oh 2009).

Overall, it is considered that the proposed amendment would not result in any significant environmental impact to the broader ecosystem of the southern D'Entrecasteaux Channel.

6.1.1.4 Mitigation measures

6.1.1.4.1 Monitoring and management response

The proposed amendment at Lippies will be regulated through Tassal's existing TPDNO for the D'Entrecasteaux Channel MFDP area.

Tassal adopts a conservative approach to feed input volumes, with current feed volumes in the D'Entrecasteaux Channel being maintained below the TPDNO for this MFDP area. The establishment of the lease at Lippies will result in increased nitrogen emissions within a localised, more exposed region that has not been subject to previous salmon farming activities.

As described in section 3.5.3 and section 5.1.4, the BEMP includes a monitoring site (W9) located in close proximity to Lippies (refer Figure 3.4 in section 3.5.3) (W9 is approximately 1.8 km from Lippies). To date, 85 sampling events have occurred (between March 2009 and August 2014), representing a significant baseline with which to measure any broadscale effects on water quality or sediments. A recent IMAS review of the BEMP undertaken in 2013 showed that this monitoring program was sensitive enough to detect changes in nutrient levels at some sites (particularly in the Huon Estuary), they did not translate into significant or adverse effects to water quality or sediments at most of the sampling sites (Ross and Macleod, 2013).

The following Management Controls are prescribed in the D'Entrecasteaux Channel MFDP and will apply to this proposed amendment for Lippies:

- **Management Control 3.1.1 (MFDP)** There must be no unacceptable environmental impact, to the satisfaction of the Secretary, 35 metres outside the boundary of the marine farming lease area. Relevant environmental parameters must be monitored in the lease area, 35 metres from the boundary of the marine farming lease area and at any control site(s) in accordance with the requirements specified in the relevant marine farming licence.

- **Management Control 3.2.1 (MFDP)** The Secretary may, from time to time, determine the total permissible dissolved nitrogen output, within specified periods, attributable to marine farming operations within a specified area covered by this Plan.

- **Management Control 3.2.2 (MFDP)** For the purposes of assessing quantities of dissolved nitrogen output attributable to marine farming operations the Secretary may use:
    - **Management Control 3.2.2.1 (MFDP)** the proportion of expected dissolved nitrogen output from a unit of feed as used in Butler et al. (2000) at section 10.2.5; or
    - **Management Control 3.2.2.2 (MFDP)** any other method that the Secretary is satisfied delivers a measure of total dissolved nitrogen output from marine farming operations equal to or better than that used by Butler et al.(2000).
- **Management Control 3.2.3 (MFDP)** If the Secretary makes a determination under clause 3.2.1, the Secretary is to apportion the total permissible dissolved nitrogen output between those leaseholders within the specified area.
- **Management Control 3.2.4 (MFDP)** The Secretary is to give notice in writing to leaseholders within the area specified in 3.2.1 of any determination the Secretary makes under 3.2.1 and 3.2.3.
- **Management Control 3.2.5 (MFDP)** Lessees must comply with any written notice given by the Secretary under 3.2.4.
- **Management Control 3.3.1 (MFDP)** The maximum permissible stocking density of salmonid fish is 25 kg/m^3 of caged volume unless otherwise specified in the marine farming licence.
- **Management Control 3.3.2 (MFDP)** Maximum permissible stocking densities for other finfish species may be specified in licence conditions.
- **Management Control 3.3.3 (MFDP)** Lessees must ensure that farmed areas are fallowed as soon as practicable after bubbles of hydrogen sulphide and/or methane gasses form in the sediment and rise to the surface without physical disturbance of the seabed.
- **Management Control 3.3.4 (MFDP)** Finfish cage nets must be at least 1 metre clear of the seabed at low tide under normal growing conditions unless otherwise specified in the relevant marine farming licence.
- **Management Control 3.4.2 (MFDP)** Lessees must comply with the environmental monitoring requirements for collection, analysis and reporting as specified in the relevant marine farming licence;
- **Management Control 3.4.3 (MFDP)** Lessees must provide to the Director, Marine Resources of the Department of Primary Industries, Water and Environment in each calendar year the following information for the immediately preceding
    - **Management Control 3.4.3.1 (MFDP)** The quantity and type of fish feed placed into each lease area each month for which they hold a marine farming licence.
    - **Management Control 3.4.3.2 (MFDP)** A list specifying the names and quantities of therapeutic treatments, pesticides, anaesthetics, antibiotics, hormones, pigments, antifoulants, disinfectants, cleansers, sedatives and any

other potentially harmful materials which have been used in each lease area for which they hold a marine farming licence.

    - **Management Control 3.4.3.3 (MFDP)** Location, size and stocking rates of cages on each lease area for which they hold a marine farming licence and the areas being fallowed as specified in the relevant marine farming licence.

- **Management Control 3.4.4 (MFDP)** Environmental data is to be collected at each finfish lease area and analysed, by persons approved by the Secretary for that purpose, to specific standards and in accordance with the requirements for collection, reporting and analysis as specified in the relevant marine farming licence.

- **Management Control 3.4.5 (MFDP)** Lessees are to ensure that underwater surveys are conducted as specified in the relevant marine farming licence to assess the extent of marine farming-derived organic sedimentation and the degree of impact on the benthic community.

Further, marine farming licence conditions also detail the specific requirements for monitoring and reporting (see Marine Farming Licence MF78, Appendix 10).

6.1.1.4.2 In-situ net cleaning protocols

Measures are in place to mitigate the amount of soluble net wash released into the water column from net cleaning activities; these measures are included in the *'Environmental Best Management Practice for in-situ Net Cleaning'* (see Appendix 4). The most effective means for managing and minimising the effects of net wash effluent is through good house-keeping, where nets are cleaned more frequently to prevent the accumulation of excessive biofouling on nets.

The installation of Kikko nets at the proposed Lippies lease is also expected to result in greater efficiencies in in-situ net cleaning than previously observed with monofilament nets, purely because the consistently smooth surface of Kikko net mesh offers reduced opportunities for fouling organisms and propagules to attach to than monofilament net mesh. In addition, the proposed lease at Lippies is subject to significantly more exposed conditions than experienced at other marine farming leases in the D'Entrecasteaux Channel, hence as discussed in section 6.1.1.3.3, it is expected that soluble/suspended emissions from in-situ net cleaning activities will be dispersed more effectively than would be the case in more sheltered conditions.

6.1.1.5 Overall effect following implementation of mitigation measures

The establishment of a marine farming lease at Lippies will result in emissions from the feed input of approximately 5 500 t/yr. This equates to an increase of approximately 275 t/yr of nitrogen as farm emissions of which approximately 234 t/yr is in the dissolved form.

The effect of feed input at this location is expected to result in localised environmental impacts to water quality, restricted to areas within and around the lease boundary. The studies listed in Table 23 describe the extent of environmental impacts anticipated from soluble emissions. While these impacts are shown to be restricted to a scale of hundreds of metres, they are not anticipated to result in significant or broadscale effects to the water quality characteristics or ecosystem structure and function within the southern D'Entrecasteaux Channel. Feed inputs into the proposed lease areas will remain within Tassal's regulatory TPDNO for the D'Entrecasteaux Channel MFDP Area.

6.1.2 Substrates and Fauna

6.1.2.1 Recognised effects of farming emissions on substrates and benthic fauna

Benthic impacts from aquaculture are primarily associated with the settlement of solid waste products originating from marine farming operations where cultured stock is fed. Many studies have been conducted on the impact of marine farming to the benthic environment around fish farms with known effects reasonably well established and understood (Black et al. 1997, Hargrave et al. 1997, Crawford et al. 2002, Macleod et al. 2002).

While the majority of exogenous feed input is ingested and metabolised by the target culture species (i.e. Atlantic salmon), a small percentage of this feed is uneaten and is deposited in particulate form on sediments under stocked pens (NPI 2001).

Visible impacts of solid waste deposition tend to be confined to directly under stocked pens, evident as distinct "footprint" zones (Crawford et al. 2001). Benthic monitoring and research conducted at various sites throughout Tasmania has shown that physico-chemical and biological impacts extend beyond this footprint zone, but are generally not discernible more than 35 m from the edge of the pen (Woodward et al. 1992, Macleod et al. 2002). Physical disturbances of substrates from mooring systems also occur within farm lease and zone areas, however, these impacts are localised and restricted to sediments directly beneath fixed mooring block positions.

Essentially the impacts from solid waste follow the patterns of impact described for other organic pollutant sources (Pearson and Rosenberg 1978), but on a more reduced spatial scale. Recorded effects include marked changes in benthic faunal and meiofaunal assemblages in terms of species number, diversity, abundance and biomass, hypoxia in the water overlying the sediment, increased sulphate reduction and the build-up and release of methane and hydrogen sulphide gas (Duplisea and Hargrave 1996, Crawford et al. 2002, Macleod et al. 2002).

Fish farms release particulate organic matter from two main sources, uneaten feed and faecal material. Salmon farming is known to cause localised benthic impacts. Faecal matter is the largest contributor of solid waste (15% dry matter basis) (Buschmann 2007). Effects on the substrate and benthic community assemblages have been well studied and the results confirm the successional community patterns associated with organic enrichment gradients (Black et al. 2008).

In a Tasmanian context, impacts from organic enrichment of sediments manifest in a variety of forms (biological and chemical), and the level of impact can be categorised using a range of assessment techniques, including:

- key faunal indicators (species, abundance and biodiversity)
- visual assessment using underwater video
- sediment chemistry – determinations of sulphide concentration and redox potential.

The methods for determining the level of impact are comprehensively described in Macleod and Forbes (2004) and are widely used both by industry and regulatory authorities to manage impacts from salmon farming and to assess sediment recovery characteristics for individual lease areas in Tasmania.

Studies by Edgar et al. (2009) described effects of salmonid aquaculture in Tasmanian waters on benthic infaunal communities and sediment properties near actively farmed leases. The study utilised two forms of sediment monitoring data collected by the Tasmanian salmonid

industry, namely physico-chemical and benthic infauna between 1997 and 2003. Effects detected by the study on sediments near farm leases included a decline in redox potential of sediments, an increased faunal dominance pattern and an increased proportional abundance of capitellid worms, indicative of organic enrichment within sediments.

The degree of impact to sediments is influenced largely by the rate of water exchange at particular sites, water depth, sediment characteristics, feed management systems, the physical characteristics of feed (e.g. settlement rate), pen size and pen separation distance (Holmer 1992, ICES 1995).

Benthic impacts are reversible and an impacted site can recover to background conditions. However, the time taken for this recovery is dependent on a range of factors (Macleod et al. 2013) including previous stocking practices, husbandry techniques and environmental conditions in the region (Black 2001), and abiotic and biotic factors (Lumb 1989, Chang and Thonney 1992, Lam et al. 1994). It is widely accepted that the variation in observed benthic recovery is dependent on the physical, chemical and biological characteristics of the system together with the duration and intensity of past production at a site and the level of impact at the time that site is fallowed (Gowen and Rosenthal 1993, Wu 1995, British Columbia Environmental Assessment Office 1997, Black 2001).

If sites are not managed properly, the cumulative effect of prolonged marine farming operations over the same area within a lease can lead to what is commonly referred to as "site souring". Partially fallowed, impacted sediments also deteriorate at a faster rate. In addition, sites tend to take longer to recover to transitional and background conditions if they are restocked with fish prematurely.

For these reasons a robust site fallowing and monitoring strategy is an important environmental and farm management tool. The establishment of the marine farming lease at Lippies and development of effective and systematic fallowing regimes is a key driver of this proposed amendment

6.1.2.2 Current levels of farming emissions

6.1.2.2.1 Fish faeces and feed

In line with section 6.1.1.2.1, there are currently no emissions associated with the lease.

6.1.2.2.2 Solid effluent stream from in-situ net cleaning

Similar to 6.1.1.2.1, there are no effluent streams associated with in-situ net cleaning activities at the proposed Lippies lease.

6.1.2.3 Expected levels of farming emissions

6.1.2.3.1 Fish faeces and feed

The feed input to Lippies is expected to be 5 500 t/yr. This represents 275 t of nitrogen emissions released into the receiving environment annually, of which 41t is released as solid particulate emissions from fish faeces and uneaten feed, of which faecal matter is the largest contributor.

Table 24 shows the solid waste components associated with uneaten feed pellets (including fines) and faecal material estimated for the proposed feed management regime. Tassal's

uneaten feed has been determined at <1.5% of total feed input (see A in Table 24). Of this amount, approximately 15% by weight is released as soluble inorganic nitrogen to the surrounding environment (see B in Table 24) (Arzul et al. 2002).

The largest contributor to solid waste generation from salmonid fish culture is faecal material, and the amount and composition of this waste component is determined by the indigestible components of the feed diet. For typical Atlantic salmon feed used during the grow out stage of production, approximately 15% (DMB) of the consumed amount becomes faecal matter (see C in Table 24), and of this amount, only a small fraction (0.6%) is included as a form of nitrogen (see D in Table 24 (Buschmann et al. 2007).

Table 24. Solid feed waste components (faeces and uneaten feed)

Feed Management (Annual)	Total Feed Input (t)	Total Uneaten Feed (t)	Total Uneaten Feed (N) (t)	Total Faecal Component (t)	Total Faecal Component (N) (t)
Proposed - feed input (combined year class stocking)	**5 500**	**82.5[A]**	**12.4[B]**	**812.6[C]**	**5.0[D]**

As stated in section 3.3.2, the mooring arrangement will have a capacity of 28 pen bays. Maximum stocking of pen bays will only occur for seven months of the year; while one year class is in its juvenile stage, the other will approach harvest size.

6.1.2.3.2 Solid effluent stream from in-situ net cleaning

The deployment of stocked cages at Lippies would require in-situ cleaning under the proposed amendment. Current projections regarding net cleaning suggest that each cage requires in-situ net cleaning approximately 10 times per year. This means that the expected solid emissions from net cleaning activities for Lippies would be approximately 39.8 t/yr (1.3 t/yr N). These calculations are based on the maximum weight of material removed during net cleaning activities for net cleaning effluent in the D'Entrecasteaux Channel/Huon Estuary as determined by DHI (2012).

Based on the biomass splits that occur as previously described, the lease will not be fully stocked at 28 cages all year round. The figure listed above is a worst case scenario, and the actual volume is likely to be considerably less.

6.1.2.3.3 The effects of the expected emission levels on a local and regional scale

As stated in section 6.1.1.2.1, the proposed development is for a new developed farming site and involves the establishment of a 28 pen bay marine farming lease. This site will be maintained as a production site, where smolt input will be grown to harvest size.

It is possible that the effects of an introduction of particulate nitrogen emissions (41t /yr from uneaten feed and faeces and 1.3 t/yr from solid netwash effluent) could lead to short term changes to sediment condition in close proximity to the proposed lease and that possible impacts could manifest as changed infaunal assemblages within a localised area in and around the lease area. However, it is considered that this additional loading would result

in minor impacts to the receiving environment within the lease area and not extending beyond 35 metres from the lease boundary.

The proposed lease is situated in an offshore location in exposed, deeper waters than typically farmed elsewhere in the D'Entrecasteaux Channel. While a considerable amount of the biodeposition will settle in the immediate vicinity of the lease area and be assimilated within this footprint, particulates are also expected to be resuspended and advected beyond this immediate vicinity by currents.

Overall, it is considered that the proposed amendment would not result in any significant environmental impact to the broader ecosystem of the southern D'Entrecasteaux Channel.

According to Cromey et al. (2002), observable macrofaunal community responses occurred at carbon deposition rates of approximately 3.3 $gC/m^2/day$. Sowles et al. (1994) considered a rate of 2.5 $gC/m^2/day$ as an acceptable level of benthic enrichment. Other studies such as, Hargreave (1994) and Gillibrand et al. (2002) concluded that long term benthic loading of <2 $gC/m^2/day$ may have little impact on benthic conditions. For the purpose of this EIS, a conservative value of 2 $gC/m^2/day$ was applied as a threshold level to assess the area potentially impacted by faeces and uneaten feed deposition.

The software package DEPOMOD was used in this instance to model the benthic footprint from faeces deposition and feed wastage. The modelling was undertaken on the basis of maximum feed input, however it is expected that actual volumes of feed will be more conservative. The following assumptions were also used as input into the model, these are;

- <1.5% feed waste
- 79% digestibility rate
- 20% carbon content of faeces.

The average daily output $gC/m^2/day$ over a 542 day production cycle for Lippies is shown in Figure 6.2. This figure shows the overlap of two separate year classes (smolt in 10 pen bays and growout stock in 14 pen bays).

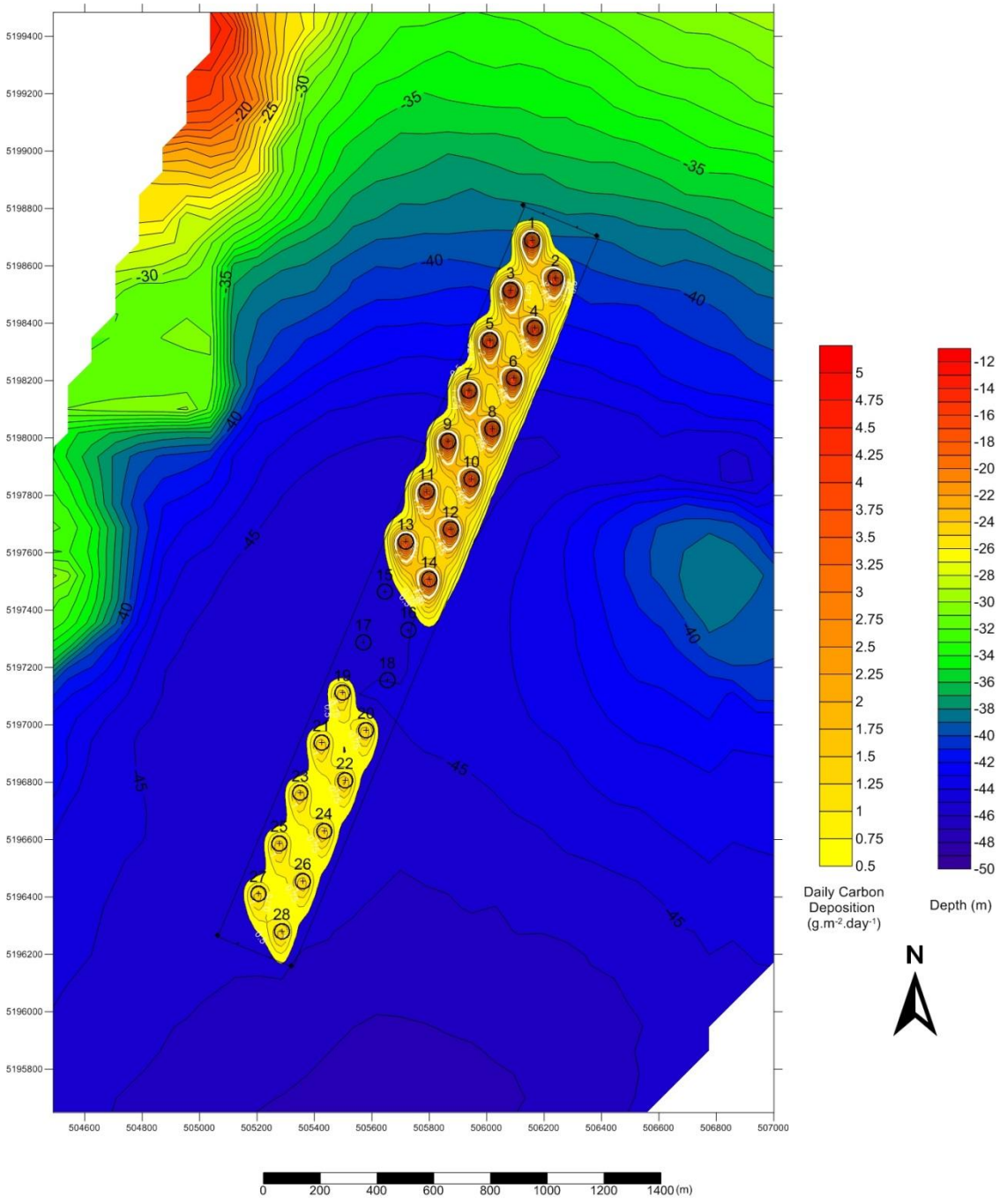

Figure 6.2. Average daily carbon depositional footprint for the proposed Lippies lease

Figure 6.2 and Figure 6.3 show the depositional patterns at the northern and southern ends of the proposed lease, respectively, at a higher resolution. Slight differences between the two plots are a result of variations in bathymetry. For instance the northern aspect displays a more concentrated depositional footprint due to a slightly shallower depth of water, resulting in less dispersal throughout the water column. Despite these variations, average deposition of carbon exceeding 2 gC/m²/day (as shown by the white contour line in Figure 6.2, Figure 6.3, & Figure 6.4) does not extend beyond the lease boundary.

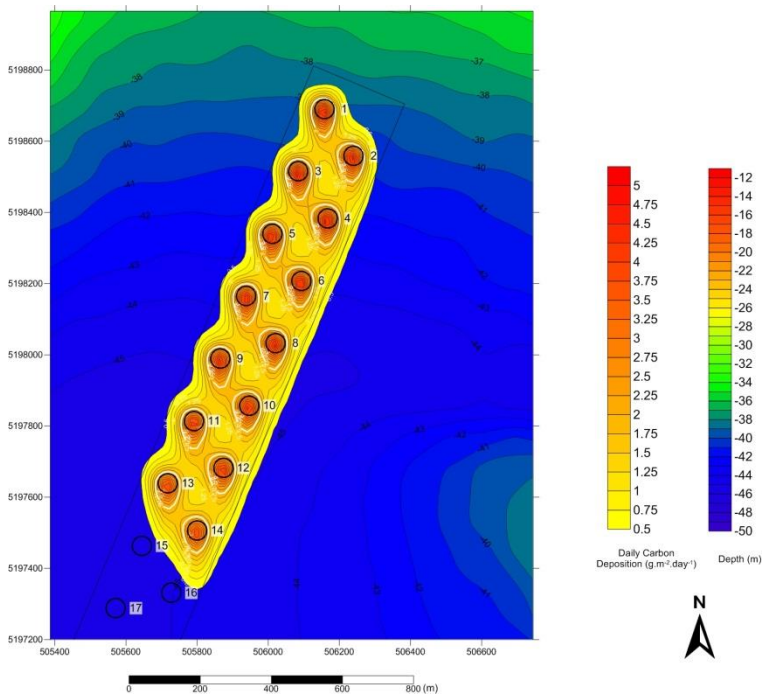

Figure 6.3. Average daily carbon depositional footprint (full production cycle) for the proposed Lippies lease – northern aspect

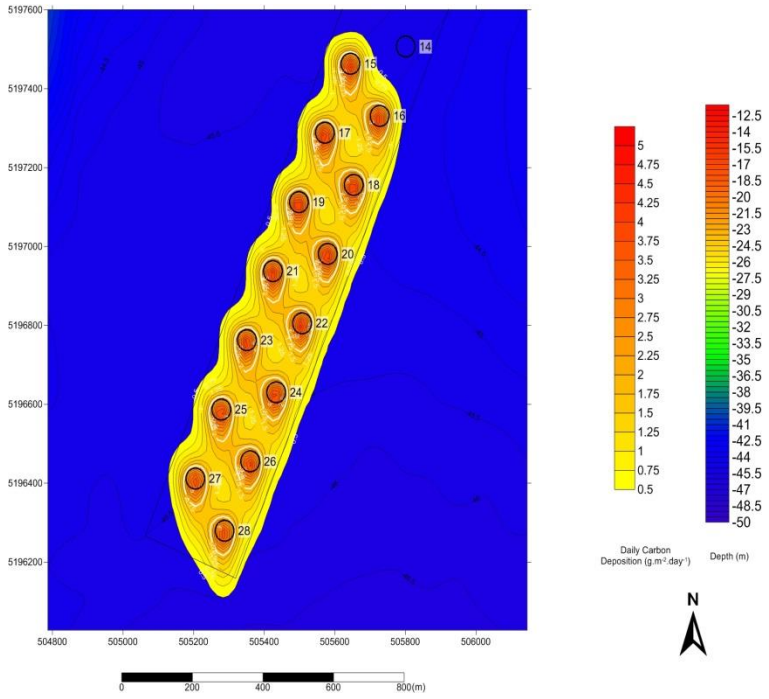

Figure 6.4. Average daily carbon depositional footprint (full production cycle) for the proposed Lippies lease – southern aspect

6.1.2.4 Other effects of farming operations

6.1.2.4.1 Physical/structural disturbance of substrates and fauna

There is currently no mooring infrastructure housed at Lippies.

The proposed 28 pen bay herringbone mooring systems at Lippies will require 256 five tonne blocks.

6.1.2.5 Mitigation Measures

The range of mitigation measures to ensure that impacts to the substrate are maintained at acceptable levels includes:

- compliance with schedule 3V of the Licence Conditions (Salmonid finfish annual video surveys – see Appendix 10)
- in-situ net cleaning is carried out in line with Net Cleaning Best Practice Guidelines (Appendix 4)
- internal feed management practices to minimise feed wastage
- fallowing principles (see below in section 6.1.2.5.3)
- specific regulatory management controls (see below in section 6.1.2.5.4).

6.1.2.5.1 Fish feeding regimes/feed wastage minimisation

Feed control is constantly being improved by Tassal and remains a focus for the company. The use of strict feeding regimes and feed conversion targets are critical for production and environmental targets, and the minimisation of feed wastage. Surface and underwater cameras are used to monitor feeding rates at all marine farming leases. This form of visual monitoring assists with minimising feed wastage and unnecessary organic loads to the substrates. Pellet catching devices are also periodically used to assess effectiveness of camera depth and angle. Routine ROV surveys can also detect the presence of feed wastage. In addition, divers report the presence of any uneaten feed within and underneath cages. Tassal's feed management performance and its effect on the environment are also subject to third party audit through BAP and ASC certification.

Routine ROV inspections beneath cages within leases and around lease boundaries are an important monitoring tool for determining environmental impacts and depositional patterns on the substrate. This visual data along with feed, stocking and net wash data are used in combination to manage the fallowing and stocking rotations in the D'Entrecasteaux Channel. This reporting requirement is outlined in Schedule 3V and is included with Appendix 10.

6.1.2.5.2 In-situ net cleaning protocols

Refer to section 6.1.1.4.

6.1.2.5.3 Fallowing principles

The proposed lease area at Lippies will be used as a production site where smolt will be introduced to the lease and grown out to harvest size.

Fallowing of pen bay positions is undertaken regularly to allow sediments to recover and for the level of organic enrichment caused by farming (i.e. faeces, net washing) to be metabolised by natural benthic processes. Tassal conducts internal ROV surveys to determine optimal fallowing regimes and to adjust stocking schedules based on the environmental characteristics and recovery capacity of individual farm sites.

Excess build-up of farm detritus beneath leases has the potential to affect not only benthic and environmental health, but also fish health and farm performance. This is a major factor driving Tassal to manage benthic impacts responsibly and sustainably for the long term. Tassal manages farm sites on an individual basis to maintain the best conditions possible within its lease areas, understanding that previous stocking levels and site characteristics (such as depth and current flow) also affects the ability of sediments to recover from the impacts of farming.

6.1.2.5.4 Monitoring and management response

Management Controls contained within the D'Entrecasteaux Channel MFDP include requirements for monitoring and reporting of environmental aspects. Management Controls include:

- **Management Control 3.1.1 (MFDP)** There must be no unacceptable environmental impact, to the satisfaction of the Secretary, 35 metres outside the boundary of the marine farming lease area. Relevant environmental parameters must be monitored in the lease area, 35 metres from the boundary of the marine farming lease area and at any control site(s) in accordance with the requirements specified in the relevant marine farming licence.
    - **Specific environmental compliance standards of the licence include;**
        - The licence holder must comply with the following environmental standards in carrying out operations on the marine farming lease area to which this license relates (the Lease Area):
        - **Visual impacts:**
            - The presence of fish feed pellets,
            - The presence of bacterial mats (e.g. *Beggiatoa spp.*)
            - The presence of gas bubbling arising from the sediment, either with or without disturbance of the sediment, presence of numerous opportunistic polychaetes (e.g. *Capitella spp., Dorvelleid spp.*) on the sediment surface

- In the event that a significant visual impact is detected at any point 35 m or more from the lease boundary, the license holder may be required to undertake a triggered environmental survey or other remedial activity determined by the Director.

- **Physico-chemical:**

  - A corrected redox value which differs significantly from the reference site(s) or is less than 0 mV at a depth of 3 cm within a core sample

  - A corrected sulphide level which defers significantly from the reference site(s) or is greater than 250 mM at a depth of 3 cm with a core sample

- **Biological:**

  - A 20 times increase in the total abundance of any individual taxonomic family relative to reference sites

  - An increase at any compliance site of greater than 50 times the total Annelid abundance at reference sites

  - A reduction in the number of families by 50% or more relative to reference sites

  - Complete absence of fauna

- As natural environmental variation renders some locations more susceptible to significant change in parameter values, the above thresholds will be considered in addition to baseline environmental information for determining the presence/absence of a significant impact.

- **Management Control 3.2.1 (MFDP)** The Secretary may, from time to time, determine the total permissible dissolved nitrogen output, within specified periods, attributable to marine farming operations within a specified area covered by this Plan.

- **Management Control 3.2.2 (MFDP)** For the purposes of assessing quantities of dissolved nitrogen output attributable to marine farming operations the Secretary may use:

  - **Management Control 3.2.2.1 (MFDP)** the proportion of expected dissolved nitrogen output from a unit of feed as used in Butler et al. (2000) at section 10.2.5; or

  - **Management Control 3.2.2.2 (MFDP)** any other method that the Secretary is satisfied delivers a measure of total dissolved nitrogen output from marine farming operations equal to or better than that used by Butler et al.(2000).

- **Management Control 3.2.3 (MFDP)** If the Secretary makes a determination under clause 3.2.1, the Secretary is to apportion the total permissible dissolved nitrogen output between those leaseholders within the specified area.

- **Management Control 3.2.4 (MFDP)** The Secretary is to give notice in writing to leaseholders within the area specified in 3.2.1 of any determination the Secretary makes under 3.2.1 and 3.2.3.

- **Management Control 3.2.5 (MFDP)** Lessees must comply with any written notice given by the Secretary under 3.2.4.

- **Management Control 3.3.1 (MFDP)** The maximum permissible stocking density of salmonid fish is 25 kg/m3 of caged volume unless otherwise specified in the marine farming licence.

- **Management Control 3.3.2 (MFDP)** Maximum permissible stocking densities for other finfish species may be specified in licence conditions.

- **Management Control 3.3.3 (MFDP)** Lessees must ensure that farmed areas are fallowed as soon as practicable after bubbles of hydrogen sulphide and/or methane gasses form in the sediment and rise to the surface without physical disturbance of the seabed.

- **Management Control 3.3.4 (MFDP)** Finfish cage nets must be at least 1 metre clear of the seabed at low tide under normal growing conditions unless otherwise specified in the relevant marine farming licence.

- **Management Control 3.4.2 (MFDP)** Lessees must comply with the environmental monitoring requirements for collection, analysis and reporting as specified in the relevant marine farming licence;

- **Management Control 3.4.3 (MFDP)** Lessees must provide to the Director, Marine Resources of the Department of Primary Industries, Water and Environment in each calendar year the following information for the immediately preceding

    - **Management Control 3.4.3.1 (MFDP)** The quantity and type of fish feed placed into each lease area each month for which they hold a marine farming licence.

    - **Management Control 3.4.3.2 (MFDP)** A list specifying the names and quantities of therapeutic treatments, pesticides, anaesthetics, antibiotics, hormones, pigments, antifoulants, disinfectants, cleansers, sedatives and any other potentially harmful materials which have been used in each lease area for which they hold a marine farming licence.

    - **Management Control 3.4.3.3 (MFDP)** Location, size and stocking rates of cages on each lease area for which they hold a marine farming licence and the areas being fallowed as specified in the relevant marine farming licence.

- **Management Control 3.4.4 (MFDP)** Environmental data is to be collected at each finfish lease area and analysed, by persons approved by the Secretary for that purpose, to specific standards and in accordance with the requirements for collection, reporting and analysis as specified in the relevant marine farming licence.

- **Management Control 3.4.5 (MFDP)** Lessees are to ensure that underwater surveys are conducted as specified in the relevant marine farming licence to assess the extent of marine farming-derived organic sedimentation and the degree of impact on the benthic community. Further, marine farming licence conditions specify the specific requirements for monitoring and reporting (see Schedule 3V, Appendix 10).

6.1.2.5.5 Other mitigation

A custom designed mooring system will be used that will be sufficiently weighted and anchored to prevent dragging of mooring blocks in the proposed zone (see Appendix 3).

6.1.2.6 Overall effect following implementation of mitigation measures

The establishment of a marine farming lease at Lippies will result in emissions from the feed input of approximately 5 500 t/yr. This equates to an increase of approximately 275 t/yr. of nitrogen as farm emissions, of which approximately 41 t/yr. is deposited as fish faeces and feed wastage.

The impact of this feed input at Lippies will result in localised, reversible impacts to sediment condition beneath the cages and within the lease area. These impacts are not anticipated to result in unacceptable or adverse effects to the broader ecosystem and will continue to be managed through the management controls listed above in section 6.1.2.5.4 and through Tassal's program of regular fallowing.

Tassal undertakes annual video surveys of the benthic environment within and outside of marine farming leases. As part of Tassal's licence conditions, there must be no significant visual, physico-chemical or biological impacts at or extending beyond 35 m from the boundary of the lease area. Internal visual assessments are routinely undertaken to assess sediment condition and to determine optimal fallowing strategies for the farming region.

6.1.3 Marine Vegetation

6.1.3.1 Recognised effects of farming emissions on marine vegetation

Marine farming operations have the potential to impact on marine vegetation if those operations are sited over or directly adjacent to marine flora.

Physical damage may be caused by the placement of marine farming structures directly on top of vegetation; such structures include moorings.

Shading from marine farming structures may reduce light to an extent where the growth or survival of marine vegetation is impacted. Deposition of fish feed and excretory products are also known to effect macroalgal growth.

In marine coastal waters, the two most important elements promoting algal growth are nitrogen and phosphorous in their dissolved forms, both of which are released into the receiving environment from feed inputs associated with finfish aquaculture, however it is assumed that nitrogen is more likely to be limiting for growth in marine conditions than phosphorous (Sanderson et al. 2008, Mente et al. 2006).

Overall, approximately 5% of the total feed input is released into the environment as a form of nitrogen, of which 85% is released as dissolved nitrogen, and 15% in its particulate form (Ross and Macleod 2013). Most of the dissolved nitrogen is excreted by fish as ammonium, which is a preferred source of nitrogen for phytoplankton and other marine plant species.

Nutrient loading can also increase the abundance of algal epiphytes which has the potential to smother marine vegetation. A UTAS honours project used macroalgae as a bioindicator of nutrient level changes in southern Tasmanian waters to determine whether aquaculture leases are impacting on nutrient levels in adjacent waters (Oh 2009). This study found that aquaculture farms could potentially have some impact on macroalgal assemblages up to several hundred metres away, however the findings from this study were not conclusive. The study found that several other factors could possibly contribute to the changes measured including natural variations in nutrient levels, changing ocean conditions and seasonal variation. Additional research in this area is currently being undertaken by IMAS to determine the specific environmental conditions that might adversely impact macroalgal reefs systems, including potential broadscale effects from soluble nutrient emissions on the structure and function of natural marine macroalgal assemblages.

There are two industry funded PhD studies currently underway to clarify the relationship between salmon farm nutrient loads and changes in macroalgal community structure and distribution. The first project is investigating the effects of increased nutrient availability on macroalgal communities in the D'Entrecasteaux Channel and Lower Huon areas by introducing a nutrient source to 3 reef systems. The second project has modelled the feasibility of growing algae in and around salmon farms in the D'Entrecasteaux Channel and Huon Estuary for integrated multi-trophic aquaculture (IMTA).

The impact from soluble nutrient emissions on macroalgal assemblages from marine farming is not restricted to negative impacts alone; there are known instances where increased macroalgal growth can occur as a result of increased nutrient supply from point source nutrient additions. For instance, Giant Kelp Marine Forests of South East Australia (Giant Kelp) has been shown to respond favourably to the supply of nutrients from sewage outfalls and other nutrient sources (Edyvane 2003, Parsons 2012).

Whilst there are conflicting reports in the global scientific literature as to whether nutrients from salmon farming adversely affect macroalgal communities, studies undertaken locally suggest that the complex nature of the structure and function of macroalgal assemblages makes it difficult to discern any direct influence of aquaculture. In a study of subtidal macrolagal assemblages at the Ninepin Point and Tinderbox Marine Reserves in the D'Entrecasteaux Channel between 1992 - 2002, Crawford et al. (2006 unpublished) found that no consistent pattern of change in community composition was apparent. No impact of increased nutrients as a result of expansion of salmon farming in the area could be detected.

There is increasing interest in developing a monitoring program in Tasmania to assess macroalgal biodiversity and examine how patterns of distribution and community structure are affected at the broadscale level by external nutrient influences, both natural and anthropogenic. Industry based research studies to assess potential nutrient response criteria for sub-tidal and intertidal macroalgal assemblages in south east Tasmania will be undertaken to monitor changes to these communities and determine potential sources of impacts.

6.1.3.2 Current levels of farming emissions

6.1.3.2.1 Soluble nutrient emissions from stock/feed/faeces

See Section 6.1.1.2.1.

6.1.3.2.2 Soluble effluent stream from in-situ net cleaning

See Section 6.1.1.2.2.

6.1.3.3 Expected levels of farming emissions

6.1.3.3.1 Soluble nutrient emissions from stock/feed/faeces

An increase of approximately 5 500t /yr. in feed input is anticipated at Lippies. This equates to an increase of approximately 275 t/yr. of nitrogen as farm emissions of which approximately 234 t/yr. is in the dissolved form.

6.1.3.3.2 Soluble effluent stream from in-situ net cleaning

See Section 6.1.1.3.2.

6.1.3.3.3 The effects of the expected emission levels on a local and regional scale

See Section 6.1.1.3.3.

6.1.3.4 Mitigation Measures

6.1.3.4.1 Monitoring and management response

An initial survey of the proposed zone was undertaken by IMAS in March 2014 (IMAS 2014, see Appendix 6a). The survey did not detect any reef substrate within the proposed zone. Unvegetated, sandy substrate occurs throughout the entire proposed zone. Due to modifications to the initial location of the zone area (following stakeholder engagement), a follow-up survey was undertaken by IMAS in August 2014 to ensure that the revised area was located over similar habitat (see section 5.1.2).

Management Controls listed in section 6.1.1.4, particularly in respect of limits placed on soluble nitrogen emissions in the D'Entrecasteaux Channel, stocking densities and requirements for benthic monitoring, are considered to be relevant mitigation measures for potential impacts on marine vegetation. In addition, Tassal has commissioned independent monitoring of macroalgal assemblages (including monitoring of Southern Giant Kelp) at fixed monitoring positions to the west of the proposed amendment, between Port Esperance and Southport Bay, and to the east, off the western side of Partridge Island. An initial survey was undertaken in March 2014 to map the extent of Giant Kelp forests in the southern D'Entrecasteaux Channel region (see Figure 5.11), and while this survey was undertaken at a time when Giant Kelp stands have been subject to seasonal die-back, the survey nevertheless provides an important baseline with which to assess changes in distribution over time. A second survey will be completed late in 2014 to assess the macroalgal communities in these same locations and further extend this baseline information.

The BEMP provides a comprehensive assessment of ecosystem health in the D'Entrecasteaux Channel and Huon Estuary. The data collected through the BEMP is used by industry, regulators, and research organisations to determine the broadscale ecosystem effects from salmon farming and support adaptive management strategies and the future development of decision support systems. Whilst it does not involve direct sampling of macroalgal assemblages, the BEMP does involve monitoring water quality and sediment health at locations in close proximity to the proposed lease. The IMAS review of the BEMP in 2012 demonstrated that the monitoring design is sensitive enough to detect broadscale

change (Ross & Macleod, 2013). Any change at the monitoring sites adjacent to the proposed lease may also trigger further examination and additional sampling.

6.1.3.4.2 In-situ net cleaning protocols

See section 6.1.1.4.1.

6.1.3.5 Overall effect following implementation of mitigation measures

As the proposed amendment at Lippies represents a new marine farming development, marine farming emissions will impact upon the marine environment in the immediate vicinity of the lease area. However, as the nearest macroalgal assemblages adjacent to Lippies are located approximately 1.5 km from the lease boundaries, the potential for adverse environmental effects from the proposed amendment is considered to be low.

The additional soluble emissions (i.e. an additional 234 t/yr. of soluble nitrogen) are unlikely to have an effect on macroalgal assemblages at the fine spatial level because the near field substrate is unvegetated. Broadscale effects are likely to be minor with nutrient concentrations above ambient levels restricted to areas 500 m from the proposed lease boundary (see Table 23). In addition, Lippies is located in waters that are exposed and well mixed, more so than other marine farming sites in the D'Entrecasteaux Channel. Hence, the potential effects of soluble nutrient emissions on macroalgal assemblages will be diminished by the flushing and dilution effect from prevailing environmental conditions.

Overall, it is considered that there is a low risk that the proposed amendment will result in any significant environmental effects on marine vegetation communities within the southern D'Entrecasteaux Channel region, particularly macroalgal communities along the fringing reefs to the east and west of the proposed amendment at Lippies.

6.1.4 Birds

6.1.4.1 History of bird entanglements/predation issues at proposed sites

As the proposed lease at Lippies has not yet been developed, there are no recorded interactions between birds and marine farming activities at the lease. However, because the proposed amendment occurs along a more exposed coastline, it is possible that a range of different species (i.e. marine seabirds such as gulls, shearwaters, penguins, gannets, albatrosses and cormorants) may occur, or their habitat may occur, within these waters.

6.1.4.2 Migratory bird species listed under international agreements (e.g. JAMBA/CAMBA/ROKAMBA)

There are a number of migratory birds that occur within Tasmania during the year that are listed under international bilateral agreements (e.g. Japan-Australia Migratory Bird Agreement - JAMBA, China-Australia Migratory Bird Agreement -CAMBA, and Republic of Korea-Australia Migratory Bird Agreement - ROKAMBA). Being the most southerly point of the East Asian-Australasian Flyway, Tasmania is an important destination for many migratory species from the Northern Hemisphere that spend the summer months in the Southern Hemisphere (see Table 25).

Table 25. Birds protected under bilateral agreements (JAMBA, CAMBA and ROKAMBA) through the EPBC Act

Scientific Name	Common Name	CAMBA	JAMBA	ROKAMBA
Diomedea exulans	Wandering Albatross		X	
Oceanites oceanicus	Wilson's Storm Petrel		X	
Puffinus carneipes	Fleshy-footed Shearwater		X	X
Puffinus griseus	Sooty Shearwater	X	X	
Puffinus tenuirostris	Short-tailed Shearwater		X	X
Stercorarius parasiticus	Arctic Jaeger		X	X
Sterna albifrons sinensis	Little Tern	X	X	X
Sterna caspia	Caspian Tern	X	X	
Actitis hypoleucos	Common Sandpiper	X	X	X
Arenaria interpres	Ruddy Turnstone	X	X	X
Calidris acuminata	Sharp-tailed Sandpiper	X	X	X
Calidris alba	Sanderling	X	X	X
Calidris canutus	Red Knot	X	X	X
Calidris ferruginea	Curlew Sandpiper	X	X	X
Calidris melanotos	Pectoral Sandpiper		X	X
Calidris minuta	Little Stint			X
Calidris ruficollis	Red-necked Stint	X	X	X
Calidris tenuirostris	Great Knot	X	X	X
Charadrius leschenaultii	Greater Sand Plover	X	X	X
Charadrius mongolus	Lesser Sand Plover, or Mongolian Plover	X	X	X
Charadrius veredus	Oriental Plover, or Oriental Dotterel		X	X
Gallinago hardwickii	Latham's Snipe	X	X	X
Gallinago megala	Swinhoe's Snipe	X	X	X
Gallinago stenura	Pin-tailed Snipe	X	X	X
Heteroscelus brevipes	Grey-tailed Tattler	X	X	X
Limnodromus semipalmatus	Asian Dowitcher	X	X	X
Limosa lapponica	Bar-tailed Godwit	X	X	X
Limosa limosa	Black-tailed Godwit	X	X	X
Numenius madagascariensis	Eastern Curlew	X	X	X
Numenius minutus	Little Curlew, or Little Whimbrel	X	X	X

Scientific Name	Common Name	CAMBA	JAMBA	ROKAMBA
Numenius phaeopus	Whimbrel	X	X	X
Pluvialis dominica	Lesser Golden Plover	X	X	
Pluvialis fulva	Pacific Golden Plover	X	X	X
Pluvialis squatarola	Grey Plover	X	X	X
Tringa nebularia	Common Greenshank	X	X	X
Tringa stagnatilis	Marsh Sandpiper, or Little Greenshank	X	X	X
Xenus cinereus	Terek Sandpiper	X	X	X
Ardea ibis	Cattle Egret	X	X	
Haliaeetus leucogaster	White-bellied Sea-Eagle	X		
Hirundapus caudacutus	White-throated Needletail	X	X	X
Ardea alba	Great Egret	X	X	

6.1.4.3 Roosting, nesting and feeding sites

Tasmania's coastal fauna support significant populations of birds that are dependent on the beach and foreshore areas for breeding and the littoral zones, mudflats and estuaries for feeding and roosting. The proposed amendment at Lippies is surrounded by a range of important habitat types for birds, including open *Eucalyptus viminalis* (White Gum) woodlands on Partridge Island (to the east of the proposed amendment) which is critical habitat for the endangered Forty-spotted Pardalote. In addition, the coastline to the west of the proposed amendment includes favoured sites for both nesting and foraging for the vulnerable White-bellied Sea Eagle. As mentioned in section 5.2.4, 60% of all bird species recorded in the 2012 State of the D'Entrecasteaux Channel and the lower Huon Estuary Report (Parsons 2012) have been identified by observational data recorded by BirdLife Tasmania within 5 km of the proposed amendment. Therefore, maintaining and protecting known roosting, nesting and feeding sites is considered to be a key initiative, and where Tassal will continue to work with Birdlife Tasmania and develop appropriate mitigation strategies to prevent unnecessary habitat degradation and reduce potential interactions between birds and the proposed development.

6.1.4.4 Potential Impacts

6.1.4.4.1 Impacts on marine farms

Predation by birds can be a significant problem for finfish culture, particularly when smolt are first introduced into the marine environment. Similar problems may also exist with the consumption of feed pellets by birds. If neither of these situations is managed effectively, the potential for an increased incidence of interactions with birds can impact upon farm operational practices and efficiencies.

6.1.4.4.2 Impacts on birds

Potential general impacts on birds from salmon farming activities comprise of:

- Habitat loss - marine farming activities and related debris may restrict access to inter-tidal feeding and shoreline habitat or feeding, roosting and nesting sites through a process of habitat alienation.

- Behavioural change - home ranges may alter with an increased reliance on marine farms for foraging activity.

- Entanglement and bird strike - birds may be killed or injured by entanglement in bird netting or through collisions with farm infrastructure.

Consultation with BirdLife Tasmania identified a number of specific potential impacts on birds within the D'Entrecasteaux Channel from the proposed amendment including the following:

- Birds such as cormorants, gulls, terns, penguins and eagles may view the proposed amendment as a potential food source, including opportunistic scavenging. It is expected that some bird species (gulls) would congregate at the farming area.

- The proposed zone may be seen as a convenient staging point for bush birds that fly across this part of the D'Entrecasteaux Channel (e.g. Swift Parrot and Forty-spotted Pardalote) and they may become entangled in the equipment, nets, etc. Collisions with marine farm infrastructure are also identified as a potential threat.

- Nocturnal illumination may disorient birds, and particularly during twilight or low-light or low-visibility periods (i.e. fog and mists) resulting in birds striking equipment and infrastructure.

- Any increase in marine debris from fish farms on foreshores may potentially reduce available habitat and/or habitat quality to birds in these foreshore areas, reducing opportunities for nesting and/or feeding.

- Marine debris poses additional risks to birds from entanglement and ingestion, resulting in increased mortalities. BirdLife Tasmania has been working collaboratively with Tassal to advise and assist in the coordination of regular clean-up activities by, and supporting/facilitating community groups who wish to remove debris from foreshore areas as a means of mitigating or removing the threat to birds posed by the presence of marine debris (see Figure 6.5. Tassal shoreline clean-up schedule).

6.1.4.5 Mitigation Measures

Tassal imposes upon all staff a range of stringent bird protocols to mitigate potential interactions with birds around its marine farms. These protocols provide guidance to Tassal's marine operations staff to assist with the passive exclusions of birds from sea cages, removal of trapped birds and reporting of any entanglements of birds in exclusion nets to the DPIPWE.

Management Controls contained within the D'Entrecasteaux Channel MFDP include requirements for monitoring and reporting of environmental aspects. Management Controls include:

- **Management Control 3.12.6 (MFDP)** Lessees must ensure any predator control of protected species is conducted with the approval of the Parks and Wildlife Service of the Department of Primary Industries, Water & Environment.

6.1.4.5.1 Bird netting and other exclusion mechanisms

The attraction of birds to marine farms can be decreased by removing opportunities for birds to scavenge around marine farms. To prevent bird predation on smaller farmed fish and the opportunity to scavenge feed pellets, Tassal currently deploys bird nets over all pens containing fish. Birds could potentially gain access to stocked fish and feed through holes in netting and in places where the netting has not been securely fastened to the cage handrail. Birds can become entangled in the netting whilst attempting to enter or exit the cage. Tassal has developed a detailed Wildlife Interaction Plan that includes bird management and exclusion mechanisms.

At the proposed lease area at Lippies, Tassal will use black netting with a mesh size less than 115 mm covering each pen, fastened to the handrail and supported by buoyant 'mouse wheel' bird stand in the centre of the pen.

This netting configuration has proven to be very effective at excluding birds and other wildlife from stocked pens. Bird netting will continue to be routinely inspected by Tassal staff and repairs undertaken immediately upon identification of damage. This practice minimises the number of birds that are able to enter a cage and become entangled if trapped within the cage environment. Tassal is trialling company designed bird escape hatches installed at every farm site around the state. This equipment allows the safe passage (via a landing platform) of birds from within a salmon pen. These are particularly useful at high exposure sites where weather damaged bird nets may allow access through holes in nets.

6.1.4.5.2 Protocols for managing bird entanglements

Tassal has invested considerable cost and effort to reduce interactions with birds, and has developed a Code of Best Practice (COBP) for Bird Interactions (Tassal Bird Protocols). This document was developed in conjunction with the Royal Society for Protection of Cruelty to Animals (RSPCA), BirdLife Tasmania and World Wildlife Fund for Nature (WWF). It covers exclusion measures, entanglements, birds trapped in pens, removal procedures, record keeping and bird identification. Section 6.1.4.5.3 below also describes internal auditing procedures undertaken by Tassal's Wildlife Management Officer to continue to improve on operational procedures that have the potential to reduce the incidence of bird entanglements.

6.1.4.5.3 Maintenance regime for inspection and repair of bird nets and other exclusion devices

Tassal bird nets are maintained in as good condition as practically possible; small holes are repaired by Tassal operational staff in-situ. If this is not possible, nets are removed, replaced and repaired on land.

Tassal's Wildlife Management Officer conducts quarterly audits at farm sites for:

- bird netting – particularly holes (points of ingress for birds)
- number of birds in pen
- number of birds released
- bird species
- number of entanglements/bird deaths.

These monitoring data are included within Tassal's annual sustainability reporting framework.

6.1.4.5.4 Marine debris clean-ups

As previously stated in section 6.1.4.4.2, Tassal conducts regular marine debris clean-ups of the shorelines surrounding its operations as a part of the Shoreline Clean-up Program in conjunction with community groups. This is done with the cooperation and advice of BirdLife Tasmania to ensure that nesting shorebirds are protected from disturbance during their breeding season (see Figure 6.5. Tassal shoreline clean-up schedule).

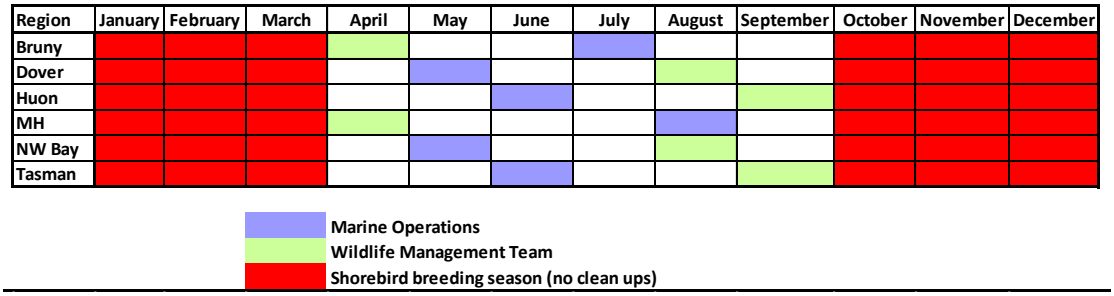

Figure 6.5. Tassal shoreline clean-up schedule

6.1.4.6 Overall effect following implementation of mitigation measures

The proposed amendment would provide 28 cages (at peak stocking) within the proposed zone and it is anticipated that some interactions with birds will occur. The current wildlife control measures employed by Tassal have observed a continued decrease in the numbers and types of bird entanglements and mortalities through improved maintenance procedures, the use of better equipment and netting material, the development of formal wildlife handling and management protocols, and the implementation of a more effective feeding system. However, additional consultation with BirdLife Tasmania may be required if high numbers of gulls and cormorants are attracted to the proposed sites regularly, or if sightings of raptors (i.e. White-bellied Sea Eagles and/or Wedge-tailed Eagles) occur within close proximity to farming operations.

The proposed amendment will not involve the use of marine vessels outside of daylight hours, apart from possible intermittent small vessel activities involved with security procedures. Therefore the potential for birds to become disoriented at night by the use of floodlights on vessels, or collide with marine farming infrastructure as a result of this disorientation is considered to be low.

In addition, the proposed amendment will not include the development of a land base to service the Lippies lease, and will not impact on natural coastal foreshore features or important roosting or breeding sites for local bird populations.

Tassal proposes to adopt and improve upon the mitigation measures and protocols that have been implemented successfully elsewhere within the D'Entrecasteaux Channel and Huon Estuary to minimise potential negative interactions with birds.

Following implementation of these mitigation measures, it is considered that the proposed amendment will not have a significant or adverse impact on birds in the southern D'Entrecasteaux Channel.

6.1.5 Marine Mammals

6.1.5.1 History of marine mammal interactions at existing site

There have been no recorded interactions with marine mammals at Lippies, since this lease has not been developed.

6.1.5.2 Potential Impacts

6.1.5.2.1 Impacts on marine mammals

Potential impacts on marine mammals may include:

- behavioural management, trapping and relocation of seals from marine farming areas may cause animals to experience stress
- modification of behaviour in seals that habituate to marine farms, which may alter, for example, foraging behaviours
- potential for dolphins, whales and seals to become entangled in netting, ropes or farm infrastructure resulting in injury or death. Entanglement causing death to seals and a dolphin has occurred in the past - these figures are reported annually in Tassal's Sustainability Report (see Appendix 1 – page 33 Wildlife Management).

6.1.5.2.2 Impacts on marine farms

Seal interactions are a significant issue for the finfish aquaculture industry causing a range of negative effects including:

- predation of farmed stock - seals damage and kill fish by biting fish through netting
- causing stress in fish - ongoing attacks on fish within pens causes stress to fish and a subsequent reduction in feeding rates
- increases in the cost of production - seal defence systems such as predator netting and seal trapping/removal and damage to nets caused by seals – this currently equates to millions of dollars per year for the company
- workplace health and safety issues - aggressive seals may cause injury to personnel employed on marine farms.

6.1.5.3 Mitigation Measures

6.1.5.3.1 Details of any marine mammal interaction plan

As part of Tassal's commitment to operating in an environmentally sustainable manner, there has recently been the development of a Wildlife Interaction Plan (WIP). This document covers the bird and marine mammal management strategy for all Tassal operations which is a requirement under the Best Aquaculture Practices Salmon Farm standard. The WIP will be implemented by the recently developed Wildlife Working Group (WWG). Tassal is in the process of creating a Code of Best Practice for Whale interactions alongside an updated system for recording and reporting whale interactions on site. Tassal has taken a proactive approach to managing key environmental issues as they arise.

6.1.5.3.2 Seal netting – tensioning and stiffening

Removing the potential for scavenging by seals reduces their attraction to aquaculture farms. The primary means of controlling seal predation is through exclusion. Seal jump fences extending above the cage handrail and aerial seal netting may also be used to exclude seals from entering fish cages. The routine collection of mortalities from fish cages also removes the attraction for seals.

Tassal currently uses heavily weighted and tensioned cage netting at its farming regions to restrict access by seals to stocked fish below the waterline. The continued introduction of the Kikko net systems throughout the D'Entrecasteaux and Huon farming regions will also provide more effective exclusion controls for seals; Kikko mesh nets will be used at the proposed Lippies lease on all cages.

Tassal is committed to the use of passive seal deterrents and exclusion infrastructure, and employs a dedicated Wildlife Management Officer who regularly consults with researchers, experts and government authorities to manage seal exclusion responsibly and effectively. All Tassal marine cages are rigged in accordance with DPIPWE seal management protocols and will be continually improved as new methods are developed.

Tassal has worked closely with Plastic Fabrications Pty Ltd to develop a new aerial seal resistant net that it believes will easily cope with loadings placed on the net by seals trying to gain access to pens. These are currently used at other leases within the D'Entrecasteaux Channel and will be deployed at Lippies. On a weekly basis, divers inspect nets for holes and to ensure that they are correctly positioned and tensioned by the weighting system. Tassal does not propose to use predator nets on its cages at Lippies.

6.1.5.3.3 DPIPWE seal management protocols

The Wildlife Management Branch of DPIPWE, in consultation with sections of the marine industry and other interest groups, developed a set of specific protocols to manage the risk posed to both seal and human interests. These protocols address circumstances and procedures under which it would be appropriate to apply negative conditioning (methods to deter seals from sites) to persistent seals, to trap and relocate individual seals, or to destroy seals that have been determined as posing a significant threat to human safety.

Selected staff and all divers employed at the proposed lease area will be trained in the seal management protocols. Seals that persist to repeatedly enter a secure pen pose WH&S risks to staff will be trapped and relocated to Devonport in accordance with DPIPWE protocols. The main WH&S risks are cause by biting and include disease transfer, infection of wounds and crush injuries.

Regulatory Controls

The following regulatory controls are contained in the D'Entrecasteaux Channel MFDP.

- **Management Control 3.12.6 (MFDP)** Lessees must ensure any predator control of protected species is conducted with the approval of the Parks and Wildlife Service of the Department of Primary Industries, Parks, Water & Environment.

- **Management Control 3.12.9 (MFDP)** Lessees must notify the Nature Conservation Branch of the Department of Primary Industries, Parks, Water & Environment in the event that any marine mammals are found entangled in marine farming equipment.

6.1.5.4 Overall effect following implementation of mitigation measures

The proposed amendment at Lippies is expected to attract seals. In addition, the proposed lease is positioned in waters that are likely to be an important transit point for other marine mammals (such as dolphins and whales) entering sheltered embayments within the D'Entrecasteaux Channel as part of their seasonal migration patterns, or to forage and feed.

The likelihood of interactions occurring with dolphins or whales is considered low. Both of these cetaceans are sound navigators and are rarely troubled by marine farming infrastructure. Nevertheless, there is some evidence that the frequency of Southern Right Whale sightings has increased in south east Tasmanian waters in recent years, and Tassal is conscious of the need to monitor for the presence of large marine mammals in Tasmanian waterways, particularly during winter months when Southern Right Whales may be calving or migrating through Tasmanian waters. As previously stated, Tassal is in the process of developing a Code of Best Practice for Whale interactions to ensure that information and observations on whale movements can be collected and analysed for ongoing management of potential interactions.

While seal management at most farms continues to be a challenging occurrence on a regular basis, the most effective way in dealing with these mammals is through the implementation of active exclusion controls. In practical terms, this is being achieved through the deployment of Kikko nets throughout the farming area, deployment of more effective (i.e. seal proof) aerial netting, systematic inspections and maintenance of sea cages and nets by divers, and continued attempts to better understand seal (and other marine mammal) behaviour.

6.1.6 Threatened Species

6.1.6.1 History of threatened species interactions at existing sites

There is no history of threatened species interactions at Lippies as this site has not been developed.

A number of listed threatened and migratory species and one threatened ecological community under the EPBCA and TSPA have been identified in this EIS as either occurring, or their habitat occurs, within areas surrounding the proposed amendment (i.e. within 5 km of the proposed lease) and are shown in Table 18 (see section 5.2.6). Some of these species have been recorded within and around the proposed amendment area (e.g. BirdLife Tasmania unpublished data), whilst others may be present based on suitable habitat being found within the area for breeding, foraging or feeding. For some species, the areas surrounding the proposed amendment may represent part of a migratory route.

6.1.6.2 Potential impacts on threatened species, communities and habitats listed under the EPBCA and the TSPA

General potential impacts on threatened species within the southern D'Entrecasteaux Channel region may include the following.

- Entanglement - marine farming equipment such as bird netting and mooring lines have the potential to entangle birds and marine mammals resulting in injury or death.

- Habitat loss - the deployment of marine farming equipment within a lease area may degrade suitable habitat for some marine species. Some examples of direct impact on habitat may include the deployment of mooring blocks (benthic species), rows of

pens restricting access (pelagic species), or smothering from solid waste (benthic species).

- Behavioural change - the presence of marine farms may cause some threatened species to alter their behaviour, particularly foraging behaviour in species such as seals and birds.
- Predation – potential predation of threatened species and/or threatened species prey by escaped salmonids.
- Alteration of breeding behaviour – the presence and intensity of marine farming activities may interrupt breeding and reduce breeding success.
- Reduction of the integrity of an ecological community – assisting invasive species that are harmful to listed ecological communities to become established or causing the mobilisation of pollution into an ecological community that kills or inhibits the growth of species within the community.
- Other effects - noise, lighting, waste and vessel movements all have the potential to impact on threatened species through potential behavioural changes, direct interactions or by the physical presence of artificial structures and associated infrastructure.

There are nine threatened species and one listed threatened ecological community that may potentially be subject to specific impacts from the proposed amendment. Listed threatened terrestrial plant, reptile, mammal, frog and insect species have not been assessed for potential impacts because the proposed amendment does not involve any land-based development activities or the erection of artificial structures on land. The species listed below have been selected on the basis that they are known to occur within the proposed amendment and surrounding areas (within 5 km radius) and/or have been recorded in the Tasmanian Natural Values Atlas within the extent of this area. These are:

- White-bellied Sea Eagle
- Wedge-tailed Eagle
- Swift Parrot
- Forty-spotted Pardalote
- Shy Albatross
- White-throated Needletail
- Southern Right Whale
- Humpback Whale
- New Zealand Fur Seal
- Giant Kelp Marine Forests of South East Australia

White-bellied Sea-Eagle (*Haliaeetus leucogaster*)

The White-bellied Sea-Eagle occurs in Tasmania as a single population containing fewer than 1000 individuals and has a restricted distribution, usually occurring and nesting within 5 km

of the coast, estuaries or large inland lakes (Threatened Species Section 2006). They occur on most of the islands of Bass Strait and are believed to possess the ability to island-hop between Tasmania and the mainland. Large estuaries and convoluted coastlines are the favoured sites for both nesting and foraging as these provide a greater interface between land and water. Population density is lower on the west and south coasts, possibly due to the lack of suitable forest habitat sheltered from high winds. This species is commonly observed within marine coastal waters of south east Tasmania, and nesting sites have been recorded (on multiple locations) within 5 km of the proposed amendment (Tasmanian Natural Values Report). There have been no recorded negative interactions between White-bellied Sea Eagles and current marine farming operations in the D'Entrecasteaux Channel. White-bellied Sea Eagles are listed as Marine and Migratory (CAMBA) under the EPBCA and Vulnerable under the TSPA.

Key potential threats to the species from activities associated with the proposed amendment may include:

- nest disturbance
- marine debris
- modification of foraging behaviour
- reduction in habitat quality and quantity.

Nest Disturbance

Disturbance to nests can impact on White-bellied Sea Eagles. A management practice recommended in the Recovery Plan requires buffers of 500 m and 1000 m line of sight to protect nests from disturbance arising from human activities during the breeding season. Nesting sites have been recorded in forests fringing the coastline between Port Esperance and Southport.

Marine Debris

White-bellied Sea-Eagles may potentially be affected by marine farming-derived debris located within the water column or on shorelines within the southern D'Entrecasteaux Channel region. White-bellied Sea-Eagles may become entangled in marine debris resulting in injury or death. It is likely that the proposed development at Lippies will result in an increase of marine debris in surrounding waters and along the foreshore in the areas downstream and downwind. The scale of increase at Lippies will require careful management to ensure that these more exposed operations do not result in any increase in marine debris in the marine environment. Additional shore monitoring by Tassal operational staff will be undertaken during the winter months to collect marine debris within and around the proposed lease area.

Foraging

White-bellied Sea-Eagles are attracted to fish farms and will extend their foraging range to include fish farms, although they rarely exploit fish directly due to the large size of the fish and the aerial netting deployed on all sea cages (Wiersma and Richardson 2009). Whilst the proposed amendment represents a new activity in this area, any reduction in foraging habitat is not expected to significantly impact on the foraging behaviour or capacity of White-bellied Sea-Eagles to source an adequate supply of marine prey.

Depletion of habitat

Residential, tourist and industrial developments and recreational pursuits pose a potentially significant threat to White-bellied Sea-Eagles through the reduction (alienation or fragmentation) of available habitat (Threatened Species Section 2006) and significant reduction in habitat quality. The coastline to the west of the proposed amendment is relatively undeveloped and it is unlikely that the proposed marine farming development will result in a significant loss of habitat for any White-bellied Sea-Eagle populations located near the lease area.

Wedge-tailed Eagle (*Aquila audax fleayi*)

The Tasmanian Wedge-tailed Eagle (*Aquila audax fleayi*) is an endemic subspecies and is listed as Endangered under the TSPA and the EPBCA. The Wedge-tailed Eagle occurs as a single population of fewer than 1000 individuals (Threatened Species Section 2006). Wedge-tailed Eagles are landscape hunters with a wide distribution throughout Tasmania but prefer to nest in tall open forests. A number of nesting sites for this species has been recorded in the Tasmanian Natural Values Report within 5 km of the proposed amendment between Port Esperance and Southport (to the west of the proposed amendment). The Tasmanian Wedge-tailed Eagle has been subject to Recovery Plans since 1992. Recovery actions have included increasing public awareness of the Wedge-tailed Eagle's conservation value, educating the public about the eagle's importance and consulting with farmers to protect nesting sites and reducing disturbances near nesting sites during breeding.

Key potential threats to the species from activities associated with the proposed amendment may include:

- nest disturbance
- marine debris
- modification of foraging behaviour
- depletion of habitat.

Nest Disturbance

Nesting habitat includes a range of old-growth native forests (Threatened Species Section 2006). This habitat occurs on Bruny Island and along the D'Entrecasteaux Channel coast between Port Esperance and Southport. Medium and high levels of disturbance during nesting, such as forest harvesting and road building have been known to adversely affect the success of breeding birds (Bell and Mooney 1999). The proposed amendment does not include shore based operations or disturbance within forests and is unlikely to adversely affect the breeding success of Wedge-tailed Eagles within the southern D'Entrecasteaux Channel and surrounding areas.

Marine Debris

Wedge-tailed Eagles may potentially be affected by marine farming-derived debris located on the shorelines around the southern D'Entrecasteaux Channel. Wedge-tailed Eagles may become entangled in marine debris resulting in injury or death. The proposed amendment is a significant development that has the potential to increase marine debris in surrounding waters and along the foreshore in the areas downstream and downwind. This issue requires careful management, and Tassal has undertaken to engage BirdLife Tasmania to assist in the development of practical measures to prevent the possibility of marine debris impacting

upon raptors that forage and feed within the southern D'Entrecasteaux Channel. Additional shore monitoring by Tassal operational staff will be undertaken during the winter months to collect marine debris within and around the proposed lease area.

Foraging

Wedge-tailed Eagles may be attracted to fish farms, however they are generally known to favour hunting in open areas and have been recorded hunting over most terrestrial Tasmanian habitat types (Bell and Mooney 1999). Whilst the proposed amendment represents a new activity in this area, any reduction in available marine habitat is unlikely to impact on the foraging behaviour or capacity of Wedge-tailed Eagles to forage and obtain adequate levels of prey.

Depletion of habitat

Residential, tourist and industrial developments and recreational pursuits pose a potentially significant threat to Wedge-tailed Eagles through depletion, alienation or fragmentation of available habitat (Threatened Species Section 2006) and significant reduction in habitat quality. It is unlikely that the proposed increase in area at Lippies will result in a significant loss of foraging and nesting habitats for Wedge-tailed Eagles located in the southern D'Entrecasteaux Channel and surrounding areas.

Swift Parrot (*Lathamus discolor*)

The swift parrot is a small fast-flying, nectivorous parrot which inhabits eucalypt forests in south eastern Australia and is listed as endangered on the EPBCA and TSPA. Within the parrot's breeding range the area of occupancy is less than 500 km^2 and the population has a severely fragmented distribution. A continuing decrease in the number of mature individuals and in habitat extent and quality is projected unless action is taken to address the threats to the species. The Swift Parrot breeds only in Tasmania and migrates to mainland Australia in autumn. In Tasmania, the breeding range of the swift parrot is largely restricted to the east coast within the range of the Tasmanian blue gum (*Eucalyptus globulus*). The breeding season of the Swift Parrot coincides with the flowering of blue gum and the nectar of this eucalypt is the main source of food for the parrots during breeding (Swift Parrot Recovery Team 2001). The breeding distribution varies substantially interannually, reflecting food availability and the distribution, abundance and quality of flowering gums and other species.

Whilst habitat loss through land clearance for agriculture and urban and coastal developments are known to impact on the population status of this species, the swift parrot also suffers from high mortality rates during the breeding season through collisions with anthropogenic structures such as windows, wire-mesh fences and vehicles. Numerous swift parrot sightings have been recorded in the Tasmanian Natural Values Atlas within 5 km of the proposed zone amendment. There have been no recorded negative interactions between Swift Parrots and current marine farming operations in the D'Entrecasteaux Channel.

Key potential threats to the species from activities associated with the proposed amendment may include:

Collisions with anthropogenic structures

There are a number of anthropogenic structures associated with marine farming operations, such as sea cages, feed barges and large vessels. As Swift Parrot sightings have previously been recorded within the D'Entrecasteaux Channel and surrounding areas, there is the possibility of interactions with these structures. To date, no interactions have been recorded

causing direct mortality or injury during the Swift Parrot's breeding season in the vicinity of the proposed amendment. It is considered unlikely that these mortality events would occur within the waters of the proposed amendment. Ongoing consultation with BirdLife Tasmania will continue to be an important part of Tassal's management of potential risks to this species, or their habitat.

Forty-Spotted Pardalote (*Pardalotus quadragintus*)

The Forty-spotted Pardalote (*Pardalotus quadragintus*) is an endemic species and is listed as endangered under the TSPA and the EPBCA. The Forty-spotted Pardalote occurs as a number of discrete breeding populations of fewer than 1200 individuals (TSS 2006). Forty-spotted Pardalotes have a restricted breeding distribution in Tasmania. The Forty-spotted Pardalote has been subject to Recovery Plans since 1991. Actions have included increasing public awareness of the Forty-spotted Pardalote's conservation value, establishing nesting boxes in known breeding sites and restoring woodland areas for nesting and foraging habitat. There have been no recorded negative interactions between Forty-spotted Pardalotes and current marine farming operations in the D'Entrecasteaux Channel

Key potential threats to the species from activities associated with the proposed amendment may arise from collisions with anthropogenic structures.

Collisions with man-made structures

There are a number of anthropogenic structures associated with marine farming operations, such as sea cages, feed barges and large vessels. As Forty-spotted Pardalotes sightings have previously been recorded within the D'Entrecasteaux Channel and surrounding areas, there is the possibility of interactions with these structures. To date, no interactions have been recorded causing direct mortality or injury during the Forty-spotted Pardalote's breeding season in the vicinity of the proposed amendment. It is presently considered unlikely that these mortality events would occur within the waters of the proposed amendment, however ongoing consultation with BirdLife Tasmania will continue to be an important part of Tassal's management of potential risks to this species, or their habitat.

Shy Albatross (*Thalassarche cauta steadi*)

The Shy Albatross is the only albatross species endemic to Australia and Tasmania, with colonies limited to three islands: Albatross Island off Tasmania's north west, and Mewstone and Pedra Branca off the Tasmanian south coast (Brothers et al. 2001, Aquenal 2011). These breeding sites have been declared as Nationally Critical for threatened albatrosses and are recognised as critical to the survival and genetic viability of these species nationally and globally. The Shy Albatross is listed as vulnerable under both the EPBCA (and as a Marine and a Migratory Species) and the TSPA.

The total breeding population is currently around 14 000 (Alderman et al. 2011). Adults remain close to their breeding colonies year-round, whereas juvenile birds – predominantly from the Mewstone colony – have been recorded foraging at sites as distant as southern Africa (ACAP 2009, Alderman et al. 2010).

Although numbers of Shy Albatross have been increasing through the 20th century, the species is still vulnerable to incidental mortality associated with commercial fishing (Gales 1998). Around 10% of the feeding and foraging grounds off Tasmania and the entire foraging zone around Pedra Branca and Mewstone are fished commercially by longline fishing vessels (Brothers et al. 1998) and the species is among the most frequently killed by longlines in the

AFZ (Brothers 1991; Gales 1993). Such mortality rates are unlikely to be sustainable (http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=82345).

While the *National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016* identifies incidental catch during fishing operations as a key threat to the future viability of the species, the Plan also identifies ingestion and entanglement of fishing equipment as potential threats to this species.

Key potential threats to the species from activities associated with the proposed amendment may include:

- Collisions with anthropogenic structures
- Entanglement and ingestion of marine farming equipment (including marine debris)

Collisions with man-made structures

There are a number of anthropogenic structures associated with marine farming operations, such as sea cages, feed barges and large vessels. The foraging range of the Shy Albatross is wide, and it is likely that the waters surrounding the proposed amendment at Lippies would, at times, be included within this foraging range. The Shy Albatross feeds in waters over the continental shelf, including harbours and bays (Garnett & Crowley 2000) and follows fishing vessels in flocks (Brothers et al. 1998, Gales 1998, Marchant & Higgins 1990).

It is possible that marine farming activities may attract Shy Albatrosses at Lippies during foraging and feeding activities in the southern D'Entrecasteaux Channel; the most likely scenario is albatrosses attracted to the area to scavenge food. To date, no interactions have been recorded where marine farming activities have caused direct mortality or injury to albatrosses; however the proposed amendment represents the first offshore marine farming development where there is potential overlap with the foraging range of these seabirds. It is considered unlikely that incidental mortality events would occur within the waters of the proposed amendment, but the likelihood would increase if large vessels (with artificial deck lighting) were attending Lippies during night-time, hours of low light or during foggy/misty conditions when illumination can result in disorientation of the birds. Ongoing consultation with BirdLife Tasmania will continue to be an important part of Tassal's management of potential risks to this species, or their habitat.

Entanglement in, and ingestion of, fishing equipment

Shy albatrosses may potentially be affected by marine farming-derived debris located on the shorelines around the southern D'Entrecasteaux Channel, and may become entangled resulting in injury or death. An additional cause of incidental mortality occurs through the ingestion of fishing equipment and marine debris. The incidental mortality of Shy Albatrosses from entanglement and ingestion of fishing equipment has been identified as a key threat to the species, and despite no known interactions between marine farming operations and albatrosses in Australia, the proposed amendment is a significant development that has the potential to increase marine debris in surrounding waters and along the foreshore in the areas downstream and downwind. This issue requires careful management because the potential overlap with the foraging range of Shy Albatrosses and the proposed farming activities at Lippies (including the potential spread of marine debris into offshore waters) means that entanglement and ingestion of marine farming equipment could potentially be considered as an additional threat to this species. Tassal has undertaken to engage BirdLife Tasmania to assist in the development of practical measures to remove the potential for marine debris to cause incidental mortality to Shy Albatrosses in the southern D'Entrecasteaux Channel.

White-throated Needletail (*Hirundapus caudacutus)*

The White-throated Needletail is a large swift that is widespread in eastern and south-eastern Australia, usually between late spring and early autumn, but mostly in summer. It is widespread in Tasmania, although the numbers of annual reports are relatively low (http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=682).

The White-throated Needletail is a trans-equatorial migrant, breeding in the Northern Hemisphere and flying south for the boreal winter. Most White-throated Needletails spend the non-breeding season in Australasia, mainly in Australia. Outside of Australia, White-throated Needletails also occur as non-breeding visitors to New Guinea and New Zealand (http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=682).

While its total population is unknown, the White-throated Needletail has been described as abundant in Australia during the non-breeding season. The major threat affecting the White-throated Needletail in Australia includes the constant threat of collisions with overhead wires, anthropogenic infrastructure, windows, lighthouses and wind farms. The main biological threat to the survival of this species relates to its annual migration over thousands of kilometres over some of the most densely populated areas of the world where natural resources are becoming increasingly depleted along its flight path.

Key potential threats to the species from activities associated with the proposed amendment may arise from collisions with anthropogenic structures.

Collisions with anthropogenic structures

There are a number of anthropogenic structures associated with marine farming operations, such as sea cages, feed barges and large vessels. White-throated Needletails have been recorded in the D'Entrecasteaux Channel and surrounding areas, and there is the possibility of interactions with these structures causing incidental mortality. To date, no interactions have been recorded causing direct mortality or injury to the White-throated Needletails in the vicinity of the proposed amendment. It is possible that marine farming activities may attract White-throated Needletails to the proposed lease at Lippies during foraging and feeding activities in the southern D'Entrecasteaux Channel; the most likely scenario is the birds attracted to the area to feed on insects above the lease. It is considered unlikely that incidental mortality events would occur within the waters of the proposed amendment, but the likelihood might increase if large vessels (with artificial deck lighting) were attending the lease during dusk or twilight, hours of low light or during foggy/misty conditions when illumination can result in disorientation of the birds. Ongoing consultation with BirdLife Tasmania will continue to be an important part of Tassal's management of potential risks to this species, or their habitat.

Southern Right Whale (*Eubalaena australis*)

The Southern Right Whale is currently listed as endangered under both the EPBCA and TSPA because they have undergone a severe reduction in numbers as a result of commercial whaling activities in the 19th and 20th centuries. There has been recent evidence of some population increase in southern Australian waters, however the current abundance is well below the estimated historic abundance. Southern Right Whales only occur in the Southern Hemisphere – they have a circumpolar distribution between 16°S and 65°S. Southern Right Whales from Australian populations probably forage between about 40°S and 65°S, generally south of Australia. In the region of the Sub-tropical Front (41°–44°S) they mainly consume copepods, while at higher latitudes (south of 50°S) krill is the main prey item. The migratory paths between calving and feeding areas are not well understood.

Calving usually takes place in sheltered coastal waters of southern Australia in the winter months. Nursery grounds are occupied from May to October in shallow coastal waters, and there is an increasing incidence of female whales giving birth and nursing calves in southern Tasmanian waters in recent years. Female Southern Right Whales exhibit strong calving site fidelity, generally returning to the same location to give birth and nurse offspring (Department of Sustainability et al. 2012). While Southern Right Whales have been sighted in south eastern Tasmanian coastal waters and estuaries, there have been no recorded negative interactions between Southern Right Whales and current marine farming operations in the D'Entrecasteaux Channel.

Key potential threats to the species from activities associated with the proposed amendment may include:

- entanglement
- vessel disturbance, including noise pollution
- habitat modification.

Entanglement (ropes and marine debris)

Entanglement can harm or kill individual whales, and can reduce the fitness of an individual whale by restricting mobility and impairing breathing, swimming or feeding ability. Entanglement causes physical damage (e.g. nets and lines cutting through the skin and blubber thus exposing the animal to infection and amputation or death). Entanglements in Australian waters primarily come from commercial fishery equipment and marine debris. In the Protected Matters Report, Southern Right Whales are the only cetacean where breeding is likely to occur within 5 km of the proposed amendment. Despite the increased presence of this species in recent years in southern Tasmanian coastal waters, it is considered unlikely that this species will be affected by the proposed amendment. Interactions between Southern Right Whales and marine farming activities have not been recorded in the D'Entrecasteaux Channel, despite their known occasional presence in these waters. It is considered unlikely that the proposed development will result in the entanglement of Southern Right Whales. Nevertheless, Tassal will monitor for their presence and report the incidence of Southern Right Whales to the DPIPWE as they are observed during the course of marine farming operations.

Vessel disturbance, including noise pollution

Vessel disturbance can occur in the form of collisions or by disrupting the behaviour of animals. Southern Right Whales appear to be the primary whale species involved in vessel collisions in the southern hemisphere. Vessel collision can lead to mortality or significant injury. Southern Right Whales are naturally conspicuous by virtue of their size. Rosenbaum (2014) highlights the need for further research into the potential anthropogenic effects of industrial activities (i.e. hydrocarbon production and exploration, shipping traffic and fisheries) on whales and other cetaceans and suggests the development of nationally and regionally relevant policies and targeted mitigation measures to prevent the potential for impacts at the individual and population level. Tassal proposes to monitor for the presence of this species and will reduce or halt vessel or marine farming activities if whales are sighted within 500 m of the proposed lease.

Marine farming operations involve significant movement of vessels ranging in size from outboard dinghies to large feed delivery and harvest vessels. The nature of the waters around the proposed development are considered to be somewhat exposed, yet sheltered enough to allow Southern Right Whales to be observed in nearby waters should they be present. There are no recorded interactions between Southern Right Whales and marine

farming activities in the D'Entrecasteaux Channel, hence it is considered highly unlikely that the proposed development will result in any collisions with or disturbance of Southern Right Whales that may inhabit or transit through the waters surrounding the proposed development at Lippies. Tassal will adhere to the DPIPWE whale and dolphin viewing guidelines when in transit should a whale be present in the area.

Habitat modification

Habitat modification through the development of infrastructure such as ports, marinas, aquaculture facilities, and ocean/marine energy production facilities could lead to the physical displacement of Southern Right Whales from their preferred (breeding) habitats or disruption to normal behaviour. Animals may also encounter chemical pollution in the form of sewage and industrial discharges, run off from onshore activities, and accidental spills. In their feeding grounds they are most at risk from bioaccumulation of human-made chemicals such as organochlorines. The proposed development includes an expanded area to the existing lease at Lippies of 38.51 ha. It is unlikely that this increase in area within the waters of the southern D'Entrecasteaux Channel will impact upon the status of Southern Right Whale populations.

Humpback Whale (*Megaptera novaeangliae)*

The Humpback Whale is listed as vulnerable under the EPBCA and endangered under the TSPA. It is a virtually worldwide, but with apparent geographical segregation. Each year Australian humpback whales migrate from the Southern Ocean summer feeding grounds to sub-tropical winter calving grounds. The northern and southern hemisphere populations appear to be distinct given temporal migration separation (Department of the Environment and Heritage 2005).

Humpback Whales migrating through Australian waters currently occupy tropical calving grounds along the mid and northern parts of the east and west coasts of Australia, and feeding grounds in the Southern Ocean. The majority of Humpback Whales in Australian waters migrate north to tropical calving grounds from June to August, and south to the Southern Ocean feeding areas from September to November. The exact timing of the migration period can change from year to year and may be influenced by water temperature, the extent of sea-ice, predation risk, prey abundance and location of feeding ground (Department of the Environment and Heritage 2005).

Feeding is likely to be related to krill density and primarily occurs in Southern Ocean waters south of 55°S. However, several opportunistic feeding areas have also been found off the coast of Australia. The available information suggests that a portion of the east coast population disperses into the South Pacific including New Caledonia, Tonga and probably other western South Pacific Islands.

It is not currently possible to define habitat critical to the survival of Humpback Whales. The flexibility and adaptability of the species' habitat requirements are not known, and it is not clear if all the currently used areas are critical to survival or whether the loss of one of these areas could be sustained. Habitat important (and potentially critical) to the survival of humpback whales is defined as those areas known to seasonally support significant aggregations of whales, and those ecosystem processes on which humpback whales rely - in particular known calving, resting and feeding areas, and certain sections of the migratory pathways (Department of the Environment et al. 2009).

Whilst Humpback Whale sightings have occurred within 5 km of the proposed amendment, there have been no recorded negative interactions between Humpback Whales and current marine farming operations in the D'Entrecasteaux Channel.

Key potential threats to the species from activities associated with the proposed amendment may include:

- entanglement
- vessel disturbance, including noise pollution
- habitat modification.

Entanglement (ropes and marine debris)

Observations for Southern Right and Humpback Whales have been recorded in the Tasmanian Natural Values Atlas Report within 5 km of the proposed amendment area, therefore the proposed amendment area is considered to provide suitable habitat for these species. As described above for Southern Right Whales, entanglement in mooring lines or as a direct result of marine debris can harm or kill individual whales, and can reduce the fitness of an individual whale by restricting mobility and impairing breathing, swimming or feeding ability. Entanglement causes physical damage (e.g. nets and lines cutting through the skin and blubber thus exposing the animal to infection and amputation or death). It is considered unlikely that this species will be affected in any way by the proposal. Interactions between Humpback Whales and marine farming activities have not been recorded in the D'Entrecasteaux Channel, despite their known presence in surrounding waters. It is considered unlikely that the proposed development will result in the entanglement of Humpback Whales.

Vessel disturbance

Humpback Whales are likely to be affected in a manner similar to the vessel disturbance impacts identified for the Southern Right Whales above. However, high levels of boating traffic have been found to cause lactating female humpback whales and calves to leave traditional inshore resting areas in favour of offshore waters (DEH 2005). Whilst there are no recorded interactions between Humpback Whales and marine farming activities in the D'Entrecasteaux Channel, it is considered unlikely that the proposed amendment will result in any disturbance to or collisions with Humpback Whales that may transit through, or temporarily reside in waters surrounding the proposed amendment.

Similar to Southern Right Whales above, Tassal proposes to monitor for the presence of this species during marine farming operations and will reduce or halt vessel or marine farming activities if whales are sighted within 500 m of the proposed leases. Tassal will adhere to the DPIPWE whale and dolphin viewing guidelines when in transit should a whale be present in the area.

Habitat modification

Habitat modification through the development of infrastructure such as ports, marinas, aquaculture facilities, and ocean/marine energy production facilities could lead to the physical displacement of Humpback Whales from their preferred habitats or disruption to normal behaviour. The annual migration of Humpback Whales covers a distance up to 10 000 km from their summer feeding grounds to their sub-tropical winter breeding grounds. It is unlikely that the addition of 38.51 h to the existing lease at Lippies will significantly impact on the habitat requirements for Humpback Whale populations, or affect their patterns of migration.

New Zealand Fur-seal (*Arctocephalus forsteri*)

The New Zealand Fur-seal is listed as rare under the TSPA and is found in West Australia, South Australia, New Zealand and Tasmanian waters, where it mainly occurs on the west and south coasts. Only a small number of New Zealand fur seals breed on remote islands off the south coast. The total population in Tasmania may be as low as only several thousand and they have not re-populated traditional areas such as Bass Strait. About 100 pups are born annually. Australia-wide, the population is estimated to be 58 000 individuals.

It is very difficult differentiate between the Australian Fur-seal and the New Zealand Fur-seal. The New Zealand Fur-seal is slightly smaller than the Australian fur seal and are best distinguished from this species by their much darker colouration. For more positive identification, a suite of other morphological and behavioural characteristics are used as diagnostic features.

The New Zealand Fur-seal's main prey includes Redbait and Jack Mackerel and myctophid species. Unlike the Australian Fur-seal, it also consumes seabirds such as Little Penguins (*Eudyptula minor*) and Shearwaters (*Puffinus spp*.).

Seal interactions (Australian and New Zealand Fur-seals) are a significant issue for the Tasmanian finfish farming industry, and will continue to be so while seals are attracted to marine farms which are seen as a source of food. Tassal manages this issue by excluding seals from entering the cages through the use of specifically designed nets and weighting systems. The company's ongoing transition to Kikko net mesh technology will further reduce the potential for seals to enter salmon cages, and this may assist in mitigating against habituate behaviour and the attraction of seals to marine farms.

Potential threats to the species from activities associated with the proposed amendment may include:

- entanglement and entrapment
- marine debris
- modified foraging behaviour.

Entanglement and entrapment

By the very nature of finfish aquaculture techniques, equipment and infrastructure deployed in marine waters, netting and ropes can potentially cause entanglement and entrapment of seals, resulting in injury or death. Ropes and nets that are poorly maintained provide points of potential entanglement and entrapment. Seal mortalities (including mortalities to New Zealand Fur-seals) have historically occurred as a result of entanglement and entrapment during the development of the Tasmanian Salmon farming industry. Between 2010 and 2012, there were 1-5 seal deaths annually from accidental entanglement throughout Tassal's farming operations in south east Tasmania.

Marine debris

Commercial fishing and aquaculture activities are known to cause injury and death to seals from marine debris, predominantly through net material that may become entangled around seals. New Zealand Fur-seals may potentially be affected by marine farming-derived debris located within the water column or on shorelines around the southern D'Entrecasteaux Channel.

Modified foraging behaviour

New Zealand Fur-seals are attracted to fish farms and will extend their foraging range to include fish farms. This issue continues to be managed using predator exclusion devices and the use of approved seal deterrents.

Giant Kelp Marine Forests of South East Australia

Giant kelp (*Macrocystis pyrifera*) forests in Australia are found in temperate south eastern waters on rocky reefs where conditions are cool and relatively nutrient rich. The Giant Kelp Forests of South East Australia ecological community is defined as giant kelp growing typically at depths greater than eight metres below sea level and forming a closed or semi-closed surface or sub-surface canopy (Threatened Species Scientific Committee 2012). The Giant Kelp Marine Forests of South East Australia ecological community is listed as endangered under the EPBCA, a determination made because the ecological community has undergone substantial decrease in geographic distribution to the extent that regeneration is unlikely within the near future, even with human assisted intervention (Threatened Species Scientific Committee 2012).

The Giant Kelp Marine Forests of South East Australia is a unique ecological community that extends from the ocean floor to the ocean surface and exhibits a 'forest-like' structure with a diverse range of organisms occupying its benthic, pelagic and upper-canopy layers. The ecological community is characterised by a closed to semi-closed surface or subsurface canopy of *Macrocystis pyrifera*.

M. pyrifera is the only species of kelp able to provide this three dimensional structure from the sea floor to the sea surface, so if giant kelp plants are lost or removed, the ecological community no longer exists.

The key threats to this ecological community include increasing sea surface temperatures, changes in nutrient availability in warmer waters, changes in weather patterns and large scale oceanographic conditions, and associated range expansion of invasive species that can have a catastrophic impact on the ecological community. These are all driven by climate change. Other threats include impacts on water quality from land-based activities and aquaculture and potential loss from catastrophic storm events (Threatened Species Scientific Committee 2012).

Giant kelp populations are relatively abundant in south eastern Tasmania, and giant kelp stands occurs in close proximity (>1 500 m) to the west and east of the proposed amendment at Lippies. The distribution of *M. pyrifera* in the southern D'Entrecasteaux Channel was surveyed in March 2014 and its current extent is shown in Figure 26 in section 5.2.1.

Potential threats to the species from activities associated with the proposed amendment may include:

Impacts on water quality

Marine farming emissions contribute to nutrient loads and effects on other water quality parameters (such as decreased dissolved oxygen and increased ammonium concentrations) in pelagic ecosystems where these effects can extend hundreds of metres from farm sites (CSIRO Huon Estuary Study Team 2000) (HES), and may impact on macroalgal community composition in reef habitats. Such effects would be considered relatively broadscale in comparison to other benthic impacts of fish farms.

Based on the range of studies undertaken to examine the impacts of soluble emissions from marine farming activities (see Table 23), this EIS considers that nutrient concentrations above ambient levels can occur up to 500 m from the proposed lease boundary. In addition,

Lippies is located in waters that are exposed and well mixed, more so than other marine farming sites in the D'Entrecasteaux Channel. Hence, the potential effects of soluble nutrient emissions on *Macrocystis pyrifera* communities will be diminished by the flushing and dilution effect from prevailing environmental conditions.

6.1.6.3 Mitigation Measures

White-bellied Sea-Eagle

Marine Debris

Tassal currently participates in a program involving the collection of marine debris from shorelines around the D'Entrecasteaux Channel. To reduce the potential for disturbance, marine debris collections will only be undertaken during the non-breeding season to avoid disturbance to nesting birds. As the proposed amendment represents a new marine farming development, BirdLife Tasmania will be engaged to provide additional expert advice on minimising the potential impacts to raptors (and other birds) that forage within the D'Entrecasteaux Channel

Foraging

No additional mitigation measures are deemed necessary for the proposed amendment.

Nest disturbance

No additional mitigation measures are deemed necessary for the proposed amendment.

Reduction in habitat quality and quantity

No additional mitigation measures are deemed necessary for the proposed amendment.

Wedge-tailed Eagle

Marine Debris

The mitigation response addressing the potential impacts to Wedge-tailed Eagles from marine debris as a result of the proposed amendment is identical to the mitigation response described above for White-bellied Sea-Eagles.

Nest disturbance

No additional mitigation measures are deemed necessary for the proposed amendment.

Modification of foraging behaviour

No additional mitigation measures are deemed necessary for the proposed amendment.

Reduction in habitat quality and quantity

No additional mitigation measures are deemed necessary for the proposed amendment.

Shy Albatross

Collisions with man-made structures

Should any collision events be recorded through farming operations within the southern D'Entrecasteaux Channel, Tassal will continue to liaise with BirdLife Tasmania to ameliorate any residual risks or negative impacts and develop solutions to prevent further collisions and interactions.

Entanglement and ingestion of marine farming equipment (marine debris)

The main threat to the Shy Albatross arising from the proposed amendment would be through entanglement and/or ingestion of marine-farm derived debris in the marine environment. As the proposed amendment represents a new marine farming development in an area that overlaps with the foraging range of various albatross species, BirdLife Tasmania will be engaged to provide additional expert advice on minimising the potential for interactions with albatrosses within the southern D'Entrecasteaux Channel.

Swift Parrot, Forty-spotted Pardalote and White-throated Needletail

Collisions with man-made structures

Should any collision events be recorded through farming operations within the southern D'Entrecasteaux Channel for any of these species, Tassal will advise the DPIPWE and continue to liaise with BirdLife Tasmania to ameliorate any residual risks or negative impacts and investigate solutions to prevent further collisions and interactions.

New Zealand Fur-seal

Refer to section 6.1.5.3 for general mitigation measures. No specific additional mitigation measures are proposed for this species.

Southern Right Whale

Refer to section 6.1.5.3 for general mitigation measures. No specific mitigation measures are proposed for this species however, vessel and farming activities will be reduced or halted if whales are sighted within 0.5 km of farming operations.

Humpback Whale

Refer to section 6.1.5.3 for general mitigation measures. No specific mitigation measures are proposed for this species however, vessel and farming activities will be reduced or halted if whales are sighted within 0.5 km of farming operations.

Giant Kelp Marine Forests of South East Australia

Impacts on water quality

Refer to section 6.1.1.4 for general mitigation measures and management controls relating to the total permissible dissolved nitrogen output for the D'Entrecasteaux Channel. No additional specific mitigation measures are proposed for this threatened ecological community.

The main water quality issue associated with potential impacts on the Giant Kelp Marine Forests of South East Australia arise from soluble emissions and the associated elevated levels of nutrient concentrations (particularly ammonium) that could potentially affect the underlying ecological structure and function within these communities if the structural integrity of Giant kelp plants is compromised as a result of the proposed amendment.

Section 6.1.1.3.3 lists a range of studies that have investigated broadscale environmental effects from salmon farming, and some of these have targeted intertidal and subtidal macroalgal assemblages. The main point to note from these studies is that elevated nutrient levels and detectable environmental effects can extend at scales of hundreds of metres from the farms. Whilst Crawford et al. (2006) showed no clear trend in the abundance of dominant intertidal macroalgae with distance from salmon farms, Oh (2009) found that detectable effects of salmon farming on subtitdal macroalgal assemblages could extend from 100 m - 400 m from the lease areas.

The proposed amendment is located approximately 1.4 km from the nearest stand of *Macrocystis pyrifera*. At this distance from the source of soluble emissions, it is very unlikely that the species or the Giant Kelp community (threatened under the EPBCA) would be negatively affected by water quality impacts, or small elevations in background ammonium levels.

No specific mitigation measures are proposed for this threatened ecological community.

6.1.6.4 Overall effect following implementation of mitigation measures

White-bellied Sea-Eagle

Following mitigation the risk to this species from the proposed development is considered low. The proposed amendment is unlikely to contribute to the decrease in the White-bellied Sea-Eagle population in the D'Entrecasteaux Channel region.

Wedge-tailed Eagle

Following mitigation the risk to this species from the proposed development is considered low. The proposed amendment is unlikely to contribute to the decrease in the Wedge-tailed Eagle population in the D'Entrecasteaux Channel region.

Swift Parrot, Forty-spotted Pardalote and White-throated Needletail

Following mitigation the risk this proposal poses to these species is considered low. The proposed amendment is unlikely to contribute to decrease in Swift Parrot, White-throated Needletail or Forty-spotted Pardalote populations as a result of collisions with marine farming infrastructure.

Shy Albatross

Following mitigation the risk from the proposed amendment to these species is considered low. The proposed amendment is unlikely to contribute to a decrease in Shy Albatross populations as a result of collisions with marine farming infrastructure, or entanglement/ingestion of marine farming equipment and marine debris. However, it is noted that the proposed development at Lippies may encroach on existing foraging grounds for the Shy Albatross; therefore continued liaison with BirdLife Tasmania will underpin the development of appropriate management and data collection activities to ensure that these risks are maintained at low levels.

New Zealand Fur-seal

Seals continue to be an ongoing challenge to marine farming operations with daily interactions recorded throughout the south-east of the state. Large investments are made to exclude and deter seals from affecting marine operations and stock. In addition, the use of non-lethal deterrents reduces negative seal interactions and their habituation towards fish farms. Despite the range of efforts employed to reduce these interactions, the risk of injury or mortality remains a possibility, but should be considered low due to the mitigation measures employed and recent improvements to predator-proof fish netting (i.e. use of Kikko design nets) used to prevent and exclude seals from entering cages.

Southern Right Whale

The proposal is very unlikely to pose a threat to this species.

Humpback Whale

The proposal is very unlikely to pose a threat to this species.

Giant Kelp Marine Forests of South East Australia

As there are significant stands of Giant kelp plants to the west and east of the proposed amendment, and at depths that exceed 8 m, there is the potential for some (or all) of these stands to meet the EPBC criteria of a threatened ecological community. From distributional data collected up to 1999, the D'Entrecasteaux Channel and Huon Estuary are the only regions in south east Tasmania where kelp area and number of beds was shown to increase and this was attributed to potential anthropogenic nutrient inputs. Nevertheless, Giant kelp beds have been declining more generally in waters to the north and east of the state with particularly significant declines around Bruny Island (Parsons 2012).

Based on the proposed amendment, nutrient inputs outside of the lease are considered to exist within the range of natural variation, and as such the risk to this potentially threatened ecological community is considered to be low.

6.1.7 Geoconservation

6.1.7.1 Potential impacts on sites of geoconservation significance listed on the Tasmanian Geoconservation Database

As stated in section 5.1.5, a desktop search of the LISTMap website was undertaken and indicates that there are no listed geoconservation sites located in the immediate surrounding area of the proposed amendment.

There are two listed sites 12 and 10 km from each lease: the Western blanket bogs; and Conleys Beach Pleistocene Dune, respectively (Figure 5.8).

6.1.7.2 Mitigation Measures

The land base servicing the proposed Lippies lease will be at Meads Creek, so there will be no construction work conducted in the area. All marine debris (including marine farm debris) is collected and removed from shorelines adjacent to Tassal's active marine farming leases as a component of the Shoreline Clean-up program (see Figure 40).

There are a number of factors that reduce the potential impacts of the proposed amendment.

Western blanket bogs

- this geoconservation site is not on the coast,
- salmon aquaculture activities are not listed as a source of impact/degradation,
- this geoconservation site is sufficient distance from the proposed development that is it not expected to be directly impacted.

Conleys Beach Pleistocene Dune

- salmon aquaculture activities are not listed as a source of impact/degradation,
- this geoconservation site is sufficient distance from the proposed development that is it not expected to be directly impacted.

6.1.7.3 Overall effect following implementation of mitigation measures

The amendment to Zone 25 and its associated lease is not expected to impact on either site of geoconservation significance.

6.1.8 Chemicals

6.1.8.1 History of usage at the site and details on specific activities in relation to chemical usage

Therapeutants

Tassal has records of antibiotic use dating back to 2006.

As part of Tassal's Fish Health Management Plan, 100% of smolt are vaccinated against the main bacterial diseases, which has dramatically reduced Tassal's total antibiotic use. In FY2012 Tassal's company-wide antibiotic use was less than 2% of total use in 2009. Any salmon that are treated with antibiotics must go through a lengthy withdrawal period of between 90 – 120 days to ensure the antibiotic is cleansed from their system. Prior to harvest, any group that may have been administered antibiotics is tested for residues. Tassal complies with the Australian New Zealand Food Standards Code for residue levels.

Disinfectants

Disinfectants are used in aquaculture to control spread of disease organisms. Disinfectants can potentially harm local flora and fauna if released in large amounts to waterways. Disinfectant footbaths are located at land-based facilities, but only contain a few millilitres of disinfectant diluted in several litres of water. Disinfectants are also used on farm equipment before transfer between sites. The disinfectant is diluted in water and sprayed sparingly in a controlled manner. The majority of disinfectant use by Tassal takes place at its land base operations with dedicated wash down facilities.

6.1.8.2 Proposed usage of chemicals including antifoulants, therapeutants (such as antibiotics) and disinfectants

Antibiotics will only be prescribed as required to address illness and animal welfare issues. It is not possible to forecast antibiotic use, but it is expected that use will remain low if not absent due to improved husbandry practices and effective vaccines. Should a significant new bacterial disease emerge, antibiotics may be required to control stock welfare issues and losses while a vaccine is developed.

6.1.8.3 Recognised localised and system-wide effects of chemical usage on water quality, the benthic environment and other fauna – include results/conclusions of recent research conducted by IMAS in relation to antibiotic and antifoulant usage together with relevant information emanating from any relevant research/risk assessments

IMAS has concluded a two year study involving benthic remediation of copper impregnated sediments at various marine leases of differing sediment and depositional characteristics. Tassal was actively involved in the sampling events related to this project and provided financial support. This project supports Tassal's exit from the historic use of copper based antifoulant paints in its operations.

The proposed site will not use copper based antifoulant on fish nets.

Generally the effects of disinfectants on the marine environment are poorly studied (Burridge et al. 2010); however the disinfectants and cleaning agents used are water soluble and low toxicity when used according to label instructions. Virkon is an oxygen based disinfectant containing simple organic salts and organic acids. The active ingredient decomposes in the environment, breaking down to form the harmless compounds, potassium salts and oxygen. Three quarters of the ingredients of Virkon are inorganic which decompose to naturally occurring simple inorganic salts. The remaining organic compounds are classified as readily biodegradable by OECD and EU standards.

6.1.8.4 Public health risks

There are no anticipated public health risks from the use of chemicals.

In order to address the issue of risks to human health associated with the consumption of medicated escapee Atlantic salmon or wild fish containing antibiotic residues the Tasmanian Public and Environmental Health Service (Department of Health and Human Services) engaged Food Standards Australia and New Zealand (FSANZ) in 2007 to undertake a risk assessment for Oxytetracycline (OTC) levels in both wild fish and farmed medicated Atlantic salmon (FSANZ 2013) (OTC is a prescribed antibiotic used in salmon farming). The study examined the OTC residue levels from the flesh of several fish species 10, 15 and 70 days post treatment, and related the highest found residue levels in these samples to the acceptable daily intake (ADI) for OTC in humans (0.03 milligrams per kilogram of body weight per day). The report by FSANZ concluded that, based on the residual levels observed in the fish tested, there was no public health risk for any Australian population group associated with the consumption of farmed salmon or wild fish caught near salmonid farming areas.

6.1.8.5 Mitigation Measures

6.1.8.5.1 Proponent management plan specific to the management of chemicals and environmental consequences of usage and chemical waste management

Tassal has a detailed Dangerous Goods and Hazardous Substances Procedure and Waste Management Plan created specifically for the management of chemicals and environmental consequences of usage and chemical waste management. This procedure has been validated by a third party auditor through the Best Aquaculture Practices (BAP) certification process. The BAP Salmon Farm Standard has a comprehensive section focused on the safe storage and disposal of farm supplies.

Tassal keeps Dangerous Goods and Hazardous Substances registers for all of its marine farming, hatchery and processing sites. Each substance listed has a current Material Safety Data Sheet kept in hard copy on site and electronically on Tassal's intranet.

Spill kits are located at all chemical storage areas and areas where chemicals are used, and all Tassal employees are appropriately trained in the use of spill kits. Tasmania has a State Emergency Plan that includes resources that can be deployed to contain and clean up large spills if required. Some chemicals used in aquaculture are classified under the *Environmental Management and Pollution Control Act 1994* as controlled wastes which require disposal by an appropriate licensed contractor. Commercial arrangements exist with approved waste service providers for all waste materials ensuring disposal in accordance with the appropriate regulations.

All chemicals are stored in bunded areas with the capacity to hold 110% of the volume of the largest container. This ensures that any spill that occurs is appropriately contained and the risk of spill to the environment is minimised.

All boats and equipment are serviced regularly and inspected daily with thorough "start-up" and "shut down" procedures completed to ensure that any issues are identified early and remedial action can be taken.

No antibiotics are stored on-site. Should antibiotics be required, medicated feed would be prepared at the feed mill and transported to the region in fully contained and clearly identified bags.

Tassal will continue to comply with the regulatory controls outlined below.

6.1.8.5.2 Regulatory Controls

Tassal complies with management controls as stipulated in the D'Entrecasteaux Channel MFDP and Schedule 3 of Marine Farming Licence Conditions Relating to Environmental Management of a Finfish Farm. Relevant controls are:

- **Management Control 3.4.3 (MFDP)** Lessees must provide to the Director, Marine Resources of the Department of Primary Industries, Water and Environment in each calendar year the following information for the immediately preceding year:

  - **Management Control 3.4.3.2 (MFDP)** A list specifying the names and quantities of therapeutic treatments, pesticides, anaesthetics, antibiotics, hormones, pigments, antifoulants, disinfectants, cleansers, sedatives and any other potentially harmful materials which have been used in each lease area for which they hold a marine farming licence.

- **Management Control 3.6.1 (MFDP)** All chemicals use must comply with the requirements of the Agriculture and Veterinary Chemicals (Control of Use) Act 1995.

- **Condition 1.6 (MF Licence)** Levels of antibiotics or chemical residues derived from farm therapeutic use, present in sediments within or outside the Lease Area, are not to exceed levels specified to the licence holder by prior notice in writing by either the Director or the Chief Veterinary Officer, Tasmania.

- **Condition 1.7 (MF Licence)** Prior to any stock being treated with therapeutants, the licence holder must advise the Director, and provide a copy of any medication authority specific to stock treatment that has been issued. The licence holder must comply with requirements to undertake any reasonable residue testing prescribed by the Director.

Tassal complies with management controls as stipulated in the D'Entrecasteaux Channel MFDP and Schedule 3 of Marine Farming Licence Conditions Relating to Environmental Management of a Finfish Farm. Relevant controls are:

- **Management Control 3.4.3 (MFDP)** Lessees must provide to the Director, Marine Resources of the Department of Primary Industries, Water and Environment in each calendar year the following information for the immediately preceding year:

  - **Management Control 3.4.3.2 (MFDP)** A list specifying the names and quantities of therapeutic treatments, pesticides, anaesthetics, antibiotics, hormones, pigments, antifoulants, disinfectants, cleansers, sedatives and any other potentially harmful materials which have been used in each lease area for which they hold a marine farming licence.

- **Management Control 3.6.1 (MFDP)** All chemicals use must comply with the requirements of the Agriculture and Veterinary Chemicals (Control of Use) Act 1995.

- **Condition 1.6 (MF Licence)** Levels of antibiotics or chemical residues derived from farm therapeutic use, present in sediments within or outside the Lease Area, are not to exceed levels specified to the licence holder by prior notice in writing by either the Director or the Chief Veterinary Officer, Tasmania.

- **Condition 1.7 (MF Licence)** Prior to any stock being treated with therapeutants, the licence holder must advise the Director, and provide a copy of any medication authority specific to stock treatment that has been issued. The licence holder must comply with requirements to undertake any reasonable residue testing prescribed by the Director.

6.1.8.6 Overall effect following implementation of mitigation measure

The proposed amendment is not expected to result in large quantities of chemicals used and stored on the lease. The mitigation measures put in place as detailed above (section 6.1.8.5) are designed to mitigate risk and any potential impacts from chemical use, spillage, or waste on fish farms. While there is an increase in vessel movements in the area and the carriage of chemicals associated with new farm activities in the proposed amendment area, the risk

control measures in place will ensure that the net impact from the chemicals carried on vessels and those used on the farm would be negligible.

6.1.9 Species Escapes

6.1.9.1 History of escape events within MFDP area

Tassal has records of escape events for all of their Marine Farming Regions dating back to January 2000. Historically, the existing lease at Lippies has not been farmed so there is no specific history of escapes associated with this farming region. Tassal's Dover and Huon farming regions also have leases within the D'Entrecasteaux Channel MFDP Area. Over this 14 year period there have been no significant escape events within the Huon farming region and the last escape event at the Dover region was a reported loss of 2,500 fish in 2011.

6.1.9.2 Recognised ecological effects of escaped stock

There are no wild salmon populations in Tasmania and the farmed populations of salmon are composed of all females, thus making reproduction in the wild impossible. Research also indicates that escaped Atlantic salmon do not successfully forage outside of pens and do not thrive in the wild (Steer and Lyle 2003).

Thorstad et al. (2008) have documented the incidence and impacts of escaped farmed Atlantic salmon, and the review covers all of the major commercial salmon farming regions of the world. Major topics covered in the review of relevance to Tasmanian salmon farming include:

- geographic and temporal trends in numbers and proportions of escaped farmed salmon in nature
- effects of escaped farmed salmon in regions where the Atlantic salmon is an exotic species
- technologies and other efforts for escape prevention
- technologies and efforts to reduce impacts of escapes

The report also summarises the knowledge gaps in each of these areas and suggests areas of research to better understand the issue.

Marine farming practices, farm and mooring designs and equipment specifications are designed to avoid the release of fish. However, despite the best of intentions and practices, the occasional escape of salmonids is an unavoidable occurrence of finfish marine farming operations.

There are a number of potential concerns associated with the escape of farmed salmonids into the marine environment. These include:

- establishment of feral populations
- impact on native fish populations through predation or competition for resources
- disease/parasite transfer from farmed fish to native fish populations.

The major concern for northern hemisphere farming countries – genetic pollution of wild stocks of Atlantic salmon – is not relevant in Tasmania. Although numbers of escaped fish in these countries are relatively small compared to the number stocked, they are highly significant in the context of low numbers of genetically distinct wild populations in small river systems.

Sea cage farming of salmonids (rainbow trout) in Tasmania commenced in the 1970s but did not become a significant industry until late in the 1980s with the focus moving to Atlantic salmon. To date there has been no documented evidence of the establishment of feral populations of Atlantic salmon in Tasmania. Commencing in 1865 and continuing until the 1930s, numerous attempts were made to establish self-supporting populations of both Atlantic salmon and Pacific salmon; hundreds of thousands of juveniles were released in river systems all over the state however the goal of establishing self-supporting populations for recreational purposes was never achieved (Clements 1988). In fact there is no documented evidence to suggest that Atlantic salmon have established successful breeding populations outside their normal home range in the northern hemisphere (Thorstad et al. 2008).

In 2003, researchers from the Tasmanian Aquaculture and Fisheries Institute (TAFI) in conjunction with the Tasmanian Salmonid Growers Association (TSGA) conducted preliminary research into salmonid escapees from marine farming operations in Macquarie Harbour located on the west coast of Tasmania. The study primarily focused on aspects of post-escape feeding activity and involved examination of stomach contents and condition of escaped fish. Results indicated that escapees did not appear to successfully forage outside of the farm nets and lost condition, supporting the contention that escaped fish do not appear to thrive in the wild (Steer and Lyle 2003). Some of the fish examined however, did have prey items in their stomachs that indicated they were feeding on native species. This suggested that more work was required to achieve a greater understanding of the fate of escaped salmonids in the marine environment in Tasmania.

Abrantes et al. (2011) used lab analysis techniques to determine if escaped salmonids in Macquarie Harbour feed on native fauna. They established that one Atlantic salmon (13 sampled) and one rainbow trout (38 sampled) had successfully fed on native fauna post escape. It was concluded that in general, escaped salmonids do not switch to feed on native fauna but because of the limited sample size results were not conclusive and there was still no definitive answer regarding the fate of salmonid escapees in Tasmania.

In an international context, Tasmanian farmed salmonid species are free of all the major infectious bacterial and viral diseases that cause significant management issues in other salmon farming regions. In addition, there is as yet no record of the presence of salmon lice on Tasmanian salmonids. There has been no evidence to date that farmed Tasmanian salmon are responsible for transmission of diseases to either native species or wild salmonid populations.

Tassal recently engaged the University of Tasmania to perform an evaluation of practices on salmon farms in Tasmania to mitigate escapes and ecological impacts. The assessment includes:

- an overview of current State and International policies and regulations around salmonid escapes from sea cage culture;
- identification of potential ecological impacts posed by escaped Atlantic salmon; and
- an assessment on the risk of escapes based on Tassal's current practices

While there is the potential for disease transfer from escaped fish, the low level of disease in farmed salmonids combined with relatively low escape rates in recent years means such a risk is very low.

A number of social and economic impacts both negative and positive may also be associated with escaped salmonids, but to date there has been little work done to estimate these issues. The aquaculture sector bears the direct losses in foregone revenue, loss of capital in the stock and poor public perceptions (Naylor et al. 2005). Escapes can be seen as a bonus for local recreational fishing interests and the tourism industry, providing extra revenue from new target species. This was particularly apparent in Dover in March 2000 when the loss of a significant number of salmon provided the businesses in the town with a major economic boost for several days.

Jensen et al. 2010 provide further detail on the causes, consequences and prevention of escapes from a Norwegian context. The Norwegian web site Bellona (Bellona 2014[21]) also has a comprehensive review of the topic.

6.1.9.3 Spread of disease from escaped fish

As stated above, the existing Marine Farming Lease, East of Lippies has never been farmed so there is no specific history of escapes associated with this farming region.

The rarity of escape events combined with the fact that there are no major diseases present in Tassal's salmon, means there is a low risk associated with the spread of disease from escaped fish.

6.1.9.4 Mitigation Measures

6.1.9.4.1 Risk minimisation strategies

Tassal aims to eliminate stock escapes from their marine farms within areas that can be controlled and to minimise the risk in areas where it cannot. As stated in section 3.3.1, the proposed mooring system has undergone engineering design based on a technical report by Aquastructures and is in accordance with NS 9415:2003.

The proposed lease is not expected to vary from similar leases within the southern D'Entrecasteaux Channel region in regards to impact from species escapes. Tassal intends to utilise Kikko mesh technology at this lease. The implementation of Tassal's escape prevention measures has resulted in a significant decrease in escape events. This process has been validated by third party audit through the Best Aquaculture Practices certification process which has an entire component dedicated to the management of escapes.

6.1.9.4.2 Protocols for managing escape events

Tassal has developed and implemented an Escape Prevention and Response Protocol company wide. This plan incorporates escape prevention, net inventory, weighting systems, smolt input and harvest operations as well as inventory management and incidental losses.

[21] Bellona (2014) Escaped farmed fish http://www.bellona.org/ aquaculture /tema_aquaculture/Escapes – accessed 24-Feb-2014

This process also included the development of Tassal's Escape Response Kits. These kits contain equipment for containment or attempted recapture and include a written procedure for their use. They have been successfully used in the marine farming environment, with positive feedback from operational staff.

- **Management Control 3.8.2 (MFDP)** Lessees must not intentionally release into State waters fish of the species authorised in the relevant marine farming licence.

- **Management Control 2.4 (MF Licence)** the licence holder must report to the Director any significant incident of fish escapes within 24 hours of becoming aware of the escape. A significant escape is defined as any loss of licensed species to the marine environment in excess of 500 individuals at any one time.

6.1.9.5 Overall effect following implementation of mitigation measures

The proposed lease is not expected to vary from similar leases within the southern D'Entrecasteaux Channel region in regards to impact from species escapes. Tassal intends to utilise Kikko mesh technology at this lease. The implementation of Tassal's escape prevention measures has resulted in a significant decrease in escape events. This process has been validated by third party audit through the Best Aquaculture Practices certification process which has an entire component dedicated to the management of escapes.

6.1.10 Disease

6.1.10.1 History of disease within MFDP area and bioregion

As the proposed lease is not in operation, fish health aspects for the neighbouring Dover Farming Region (currently Tassal's southernmost farming region) are discussed.

In the Dover Farming Region, Amoebic Gill Disease (AGD) is the most important fish health challenge. However, it is well managed within Tassal's program of continuous surveillance, reducing stress on stock, and freshwater bathing frequency.

Bacterial infection by *Tenacibaculum maritimum* in smolt after transfer to growout cages caused skin lesions and some mortality in 2012 and 2013. Other diseases found in the Dover Farming Region prior to 2012 were Yersiniosis, Enteric Vibriosis (SGS), and Rickettsiosis; however their incidence is currently considered to be low at Dover Farming Region.

Harmful algal blooms (HAB) and jellyfish presence is constantly monitored through daily algal trawls and associated observational on site work.

Salmon Orthomyxovirus (SOMV) was isolated with an associated mortality in the 2012 year class of smolt at Stringers Lease. Investigations into SOMV and vaccine development in collaboration with DPIPWE are on-going. There was no detection of SOMV in the Dover Farming Region in 2013.

6.1.10.2 Recognised ecological effects of disease

There have been no reported fish kills in wild fish populations within the Dover Farming Region attributed to disease agents from farmed salmon. Therefore, it is highly unlikely that the presence of any disease agents in farmed salmon in the Dover Farming Region will have the capacity to manifest in natural marine ecosystems.

6.1.10.3 Mitigation Measures

6.1.10.3.1 Fish health strategies

Tassal's focus on disease monitoring and early detection places a high importance on incorporating stock inspections into routine farming activities such as mortality collection and classification, weight checks and harvests.

Tassal is actively involved in the Tasmanian Salmonid Health Surveillance Program, which is a joint program between the Tasmanian Salmonid Industry and the Tasmanian Government. This program provides passive and active disease surveillance through regular submission of fish diagnostic samples and testing for specific disease agents of concern.

Tassal's Farm Disease Management and Biosecurity Protocol is designed to limit the transmission of existing or exotic pathogens between or within control regions as well as develop a proactive 'hygiene culture'. The Protocol is based on a two-tiered system of alert depending on the disease status of individual pens, leases or regions, with prioritised actions and monitoring processes throughout the steps.

Tassal has also implemented a South East Fish Health Management Plan (FHMP) which consists of a combination of compliance, best practice, and regulation through management controls and Marine Farming licence conditions. The FHMP addresses detailed, standard operating procedures to prevent disease from entering the region, to prevent the spread and impact of disease in farming regions and to respond to emergency disease situations. The FHMP is scheduled to be reviewed annually; however this will occur more frequently if required.

- **Management Control 3.8.1 (MFDP)** Lessees must notify the Secretary of any suspected disease in accordance with the Animal Health Act 1995.

6.1.10.4 Overall effect following implementation of mitigation measures

Tassal's antibiotic usage has significantly decreased due to vaccination and other fish health strategies.

This is due to a greater focus and knowledge towards fish health, and is not expected to change due to this amendment.

6.1.11 Waste Streams Disposed on Land

6.1.11.1 History of mortalities including effect of mass mortality events

Mortalities are collected from pens and transported in bins to an external processing plant under contract. This plant produces fish protein (typically 185 g protein/kg fish) as a liquid protein hydrosylate for export as aquafeed production and use as fertiliser, and fish oil for export as an animal and aquafeed product. Severely decomposed mortalities (10 – 20%) are segregated at the processing plant and taken to an approved composting facility as a valued additive.

During times of mass mortalities, these are removed from pens as soon as possible and treated as above.

The proposed amendment zone is not expected to produce higher mortality than the numbers produced from other regions currently. Mortalities can represent between 5% and

10% of biomass annually, which is highly dependent on the specific farm conditions and environment. The proposed amendment zone is located such that it is expected that less than average mortalities will occur due to the oceanic rearing environment and high exposure and water turnover.

6.1.11.2 Dilapidated or broken equipment

Clean unserviceable nets are given away for reuse where possible or suitable sections reused for repair of other nets. Antifoulant treated nets (presently being permanently removed from service as they become unserviceable) are cleaned and stored off site awaiting a suitable disposal option. Farm pens, which are constructed predominantly of plastic and steel, and general equipment has traditionally been disposed of at the local landfill. A recycling avenue is now available for all polypropylene materials which will be used where practicably possible.

- Steel recycling is available to all Tassal farming regions
- cage and feed pipe is often sold or given away for beneficial reuse (i.e. drainage pipe etc.) and is a recyclable product
- Kikko nets are made of plastic and are fully recyclable

6.1.11.3 Soluble and solid waste streams from land-based maintenance of antifouled nets

The solid material from the cleaning of nets containing antifoulant is currently being stored awaiting an EPA approved disposal solution. It is planned to supply this material for the recovery of copper and zinc or as calcium based feedstock for cement manufacture. There are a variety of other disposal options currently being investigated.

There will not be any copper antifouled nets used at the farming region as Tassal has phased out the use of this treatment on nets for all of its farming operations.

6.1.11.4 Bloodwater

Blood water is treated at the fish harvest processing factory at Dover in the effluent treatment system. This system is an EPA approved waste water treatment facility. Blood water from the harvest vessel is stored on board and pumped to shore when berthed at the Dover factory.

6.1.11.5 Black and grey water from on-site barges and other installations

The black and grey water from the feed barge are pumped out on a routine basis by the feed delivery vessel. This waste is discharged to an approved disposal point on-shore.

6.1.11.6 Potential Impacts

Fish Mortalities

If mortalities are not removed from the cage on a regular basis there is the potential for some impact on the environment and the populations of stock within the cage and in adjacent cages.

Potential impacts on the natural and human environment include:

- organic enrichment of the water column and the seabed from putrefying fish
- spread of disease to wild fish
- changes in water quality
- odour issues affecting public amenity

Potential impacts on stock populations within a cage and on adjacent cages include:

- spread of disease and parasites
- lowering of DO (and impact on other water quality physico-chemical parameters) due to microbial degradation of putrefying fish
- stress on existing populations and potential health impacts.

Waste from General Operations

Marine debris

There is potential that some forms of rubbish may be found within the water column or on the shorelines of the adjacent area.

Potential impacts on the natural and human environment include:

- entanglement or other physical impact on local fauna, e.g. birds and marine mammals
- public amenity and aesthetics
- hazards to navigation, e.g. propeller entanglement.

Black and Grey Water

The inappropriate discharge of black and grey water directly into the marine environment has the potential to cause environmental and human health issues including:

- impacts on physico-chemical properties leading to undesirable impacts on water quality
- contamination of seawater with faecal coliforms
- health related impacts for fish.

Other General Waste

The inappropriate disposal of other general wastes has the potential to become marine debris which can then impact on marine wildlife and wash up on the shorelines as rubbish.

Harvesting Operations

Bloodwater from fish harvesting events has the potential to organically enrich surrounding waters and potentially spread disease amongst fish stocks if released into the marine environment.

6.1.11.7 Mitigation Measures

The MFDP under which the lease operates specifies waste management control requirements that must be met:

- **Management Control 3.7.1** Lessees must dispose of wastes from:
    - harvesting;

- processing of produce;
- removal of fouling organisms; and
- production,
- in accordance with relevant Acts or regulations and tradewaste agreements and in a manner that the Secretary is satisfied will not cause an unacceptable effect on the ecology of the marine environment or nearby shorelines.

- **Management Control 3.7.2** All marine farmed fish mortalities must be disposed of, according to relevant Acts, local council by-laws, or other legally approved manner.

- **Management Control 3.7.3** The licence holder must ensure that blood resulting from the harvesting of fish is fully contained and not allowed to enter the marine environment unless authorised in writing by the Chief Veterinary Officer.

- **Management Control 3.7.4** Lessees must fallow or comply with limits upon the use of a lease area if unacceptable benthic impacts specified in the relevant marine farming licence are identified through routine monitoring.

Tassal's fish farm operations have been developed to ensure that the above is complied with fully.

Over the last two years Tassal has developed a comprehensive Marine Operations Waste Management Plan and Waste Management Policy. These have been developed to support Tassal's Environmental Policy and recognise that Tassal has a legal responsibility to ensure that waste does not enter the marine environment.

The Marine Operations Waste Management Plan and Waste Management Policy are reviewed and advised internally on an annual basis. This review process is undertaken to assess the efficacy prior to being audited as part of third party audit regimes undertaken by Tassal.

The management plan was written to address the following objectives:

- Target zero waste entering the marine environment
- Establish procedures and operating mechanisms that focus on managing the loss of farm materials into the marine environment
- Establish chains of responsibility at the farm level
- Establish monitoring procedures

The target waste types that this plan is based around are:

- Rope – primary concern
- Feed pipe – primary concern
- Cigarette butts
- Domestic waste
- Netting off cuts

- Cardboard and paper
- Used Personal Protective Equipment (PPE)

The plan ensures that all Tassal vessels are fitted with a secure and sealed rubbish bin and this is serviced as part of the daily boat start up protocol. As with all Tassal Management Plans this is monitored and reviewed to assess the efficacy and audited as part of third party audit regimes undertaken by Tassal.

Mortalities are removed from the cages promptly on a regular basis, collected in lidded sealed bins for off-site transport.

The black and grey water from the feed barge is pumped out and is monitored and routinely removed by the feed delivery vessel

6.1.11.7.1 Proponent management plan to manage mass mortality events

An industry wide mass mortality contingency plan is currently being developed. Mortality retrieval by divers and airlift systems are currently used in the event of high mortality events. Disposal of mortalities is carried out as described in section 6.1.11.1.

6.1.11.8 Overall effect following implementation of mitigation measures

With proper management of wastes as detailed above in section 6.1.11.7, including staff education, collection, containment, and prompt and efficient removal of wastes from the proposed amendment lease, the overall impacts of waste streams from farming activities are expected to be minimal to negligible.

6.1.12 Introduced Marine Pests

6.1.12.1 History of marine pest species within MFDP area

Parsons 2012 identified 49 known introduced and cryptogenic (potentially introduced) species that have been recorded in the D'Entrecasteaux Channel and Huon Estuary (see Table 26). This includes six 'target' introduced pest species, as categorised by the Australian Marine Pest Monitoring Manual (DAFF 2010), and a further 43 identified non-indigenous or cryptogenic marine species (i.e. species that have been transported to locations outside their native biogeographic ranges, or those species whose geographic origins are uncertain).

The six 'target' species listed below are included among the 55 target species in Australia that have been identified as high risk for the country as a whole, based on their invasion and impact potential, as well as human health impacts.

The European fan worm *Sabella spallanzanii* is not included as a target species for the purpose of this EIS, despite this species becoming well established in several harbours in southern Australian. Although *S. Spallanzanii* was recorded on a moored vessel in Kettering in 2008 (Aquenal 2008), subsequent surveys around this area did not detect the species and no sightings have been reported since 2009, suggesting that it may not have established in the Channel (Hamilton 2011).

Table 26. Introduced and cryptogenic marine species of the D'Entrecasteaux Channel and lower Huon Estuary (From Parsons 2012 and Aquenal 2004)

Scientific Name	Common Name
Target Species	
Asterias amurensis	Northern Pacific seastar
Codium fragile tomentosoides	Dead man's fingers
Crassostrea gigas	feral Pacific oyster
Gymnodium catenatum	toxic dinoflagellate
Undaria pinnatifida	Japanese seaweed
Varicorbula gibba	European clam
Other Introduced and Cryptogenic Species	
Salmo salar	Fish
Forsterygion varium	
Chiton glaucus	Mollusc
Corbula gibba	
Maoricolpus roseus	
Raeta pulchella	
Theora lubrica	
Venerupis largillierti	
Bugula flabellata	Bryozoans
Bugula neretina	
Cryptosula pallasiana	
Tricellaria inopinata	
Watersipora subtorquata	
Bougainvillia muscus	Cnidarians
Clytia hemispherica	
Clytia paulensis	
Halecium delicatulum	
Obelia dichotoma	
Ascidiella aspersa	Ascidians
Botrylloides leachii	
Botryllus schlosseri	
Ciona intestinalis	
Patiriella regularis	Seastars
Euchone limnicola	Polychaete worms

Scientific Name	Common Name
Carprella acanthogaster	Crustaceans
Chelura terebrans	
Elminius modestus	
Halicarcinus innominatus	
Petrolisthes elongatus	
Callithamnion byssoides	Algae
Cladophora lehmanniana	
Cladophora sericea	
Colaconema caespitosum	
Cutleria multifida	
Ectocarpus siliculosus	
Enteromorpha compressa	
Enteromorpha intestinalis	
Grateloupia turuturu	
Hincksia sandriana	
Polysiphonia brodiei	
Polysiphonia subtilissima	
Pterosiphonia pennata	
Ulva lactuca	

6.1.12.2 Assessment of the likelihood for introduced marine pest translocation by activities associated with the proposed zone

There is evidence that introduced marine species are increasing in numbers in south east Tasmania. Benthic monitoring during 1998-2003 at Tasmanian marine farm sites, a large portion of which occur in the D'Entrecasteaux Channel and Huon Estuary, found that the proportional abundance of introduced species to the total benthic community increased by 2-3% per annum (Edgar et al. 2009). The most common and widespread introduced species include the bivalves *Theora lubrica* and *Corbula gibba*, and *Maoricolpus roseus*. In addition, the adjacent Derwent Estuary is known to harbour at least 70 introduced and cryptogenic species (Aquenal 2002), and hence the likelihood of additional introduced species being identified, and the risk of further introductions occurring, is high.

DPIPWE (2007) suggests several issues regarding potential translocation vectors for introduced marine pests in the aquaculture industry, namely:

- inappropriate disposal of marine farming debris from aquaculture leases
- fouling on farm boats and ballast water discharge transferred between sites, and
- translocation of fish pens around the state that may be fouled.

Tassal will continue to adopt and adhere to biosecurity protocols at the proposed Lippies zone. It is expected that there will be minimal risks associated with the potential for translocation or spread of introduced marine pests in the southern D'Entrecasteaux Channel region.

6.1.12.3 Potential Impacts

Potential adverse impacts of introduced species include habitat alteration, changes in trophic dynamics and community composition, fishery declines, fouling of marine structures and loss of aesthetic and amenity values (Aquenal 2002). Introduced marine pests not only have the potential to harm aquaculture fish stocks through the creation of toxic and harmful algal blooms, but the potential also exists that impacts could affect natural ecosystems, including wild fisheries.

6.1.12.4 Mitigation Measures

Tassal has strict and documented internal biosecurity protocols in place for all of their marine farming areas and adheres to state regulations and management controls mitigating the risks associated with the potential for IMP incursions. These processes and systems remain current and are independently verified through Tassal's third party BAP certification audit process.

Restricting the translocation and spread of IMPs is a priority for Tassal. Internal biosecurity protocols have been implemented that require full disinfection and decontamination of all equipment and boats between designated sites and stock year classes. Similar procedures will be adopted within the amended lease to prevent the spread of IMPs and to maintain the biosecurity status within the southern D'Entrecasteaux Channel.

The following measures are employed by Tassal to minimise the risk of IMP translocation.

- The use of an on-site harvest vessel. This eliminates pen movements to and from processing sites and reduces the risk of fish pens acting as a vector for IMP translocation.
- Antifouling paint is used on all farm boats. This inhibits potential invasive biofouling species on submerged structures and hence decreases the likelihood of translocation across farming sites.
- Biosecurity protocols separate the use of most equipment between regions and any equipment that is passed between regions is thoroughly disinfected prior to transportation.
- All farming debris and broken machinery is collected and suitably disposed of on land which reduces the risk of IMP translocation.

At National and State levels, there are also various legislative controls and initiatives aimed at reducing the risks of marine species introductions and spread, focussing most recently on biofouling management requirements (DAFF 2011).

With the above mitigation measures continuing to be employed company wide, the proposed amendment is not anticipated to lead to an increase in the risk of IMP translocation in the D'Entrecasteaux Channel region or surrounding waters.

Annual ROV compliance survey databases record the presence of IMPs in and around lease areas as part of the annual video surveys.

Regulatory Controls contained within Marine Farming Licence Conditions for other marine farming leases in the D'Entrecasteaux Channel include:

i. reporting requirements relating to the immediate notification of the presence of any unusual or uncharacteristic marine flora or fauna found within lease areas, and
ii. the movement or deployment of marine farming equipment between MFDP areas.

It is anticipated that similar management controls would also be included as licence conditions for the Lippies lease.

6.1.12.5 Overall effect following implementation of mitigation measures

In concert with existing biosecurity practices and implementation of the above mitigation measures, the potential for the spread or translocation of IMPs as a result of the proposed amendment is considered low.

6.1.13 Marine and Coastal

6.1.13.1 Effects of structures on sediment dynamics regarding channels and sand bars in proximity to the proposed zone

The proposed zone may be characterised as an exposed site. Depth in the water is approximately 35 - 50 m and is subject to: wind chop generated from north west around to south westerly winds; current movements from the Southern Ocean; and northerly current movements from the D'Entrecasteaux Channel. The seafloor throughout this area is predominantly sand of a medium to large particle size, characteristic of exposed oceanic conditions.

There is a sandbar approximately 4.5 km from the proposed zone between Butlers Beach and Partridge Island. There is also a sand bar at the mouth of Southport Lagoon approximately 8 km from the proposed zone.

Due to the geographical separation from the proposed zone to these areas, impacts on these sandbars resulting from the proposal is predicted to be negligible.

6.1.13.2 Mitigation Measures

As there is no expected effect of structures on sediment dynamics regarding channels and sandbars in proximity to the proposed zone, no mitigation measures are required and no overall effects predicted.

6.1.13.3 Overall effect following implementation of mitigation measures

As there is no expected effect of structures on sediment dynamics for local channels and sandbars in proximity to the proposed zone, no mitigation measures are required.

6.1.14 Climate Change

6.1.14.1 Sea level rise

The ranges of possible sea level rises are unlikely to have any effect on salmon growing operations in the proposed farming region. Sea level rises are more likely to affect coastal infrastructure and coastal landforms that are not associated with salmon operations.

While Tassal is aware of predictions regarding global and local sea level rises; due to the negligible effect sea level rise is expected to have on salmon growing operations, a detailed assessment of the potential effects associated with sea level rise has not been taken into account nor is it considered necessary by Tassal.

6.1.14.2 Changes in weather patterns (rainfall and wind)

Winter wind speeds increasing by up to 5% and summer rainfall decreasing by 5% (Battaglene et al. 2008) are noted by the GCMs for Tasmania's three salmon growing regions. Wind and rainfall changes of this magnitude are not expected to have any effect on salmon growing operational responses in the proposed farming region; therefore no consequent environmental effects on the environment by the industry are expected in response to this issue.

6.1.14.3 Water temperature and chemistry

A report by the Tasmanian Aquaculture and Fisheries Institute and CSIRO Climate Adaptation Flagship (Battaglene et al. 2008) predicts that average temperatures in southern Tasmanian waters could increase by 1 to 3°C by 2030. The probability of this temperature increase has been considered by the industry and due to its limited predicted range current management prescriptions or procedures will not change with any significance.

To put the predicted sea temperature rise in perspective, the industry already works with an annual fluctuation in temperature of over 10°C. In addition there are daily fluctuations in temperatures as well as different temperatures in different regions and at different depths.

Venturation (pumping cooler water from moderate depths – 5 to 8 m) with upwelling pumps is a mitigation measure for warmer water periods that the industry in Tasmania already employs when necessary.

While it is recognised that in ocean systems 'climate change can strongly influence the distribution and abundance of marine species through changes in growth, survival, reproduction, or response to changes at other trophic levels' (Doubleday et al. 2009), the salmonid industry is already well adapted to responding to dynamic systems.

Salmonids are grown all over the world in varying ranges of temperature and sunlight. Managing performance in different environmental conditions is an ongoing husbandry focus for all salmonid farmers. Therefore the potential effects of climate change on ocean temperatures is only one of many factors that Tasmanian salmonid growers already factor into their on-going business and environmental planning strategies.

Increased water temperature is expected to 'impact on salmonid growth and nutrition directly through the influence of temperature on growth and indirectly via specific nutritional and physiological process that affect growth' (Battaglene et al. 2008).

While it is clear that rising water temperatures associated with global climate change will increase thermal stress and disease outbreaks, there is a general lack of knowledge about the effects of higher water temperatures and other environmental changes related to global climate change on farmed salmonids. An increased research effort is required to address this knowledge gap (Battaglene et al. 2008).

6.1.14.4 Mitigation Measures

Tassal is preparing for climate variability and climate change and even in the face of this challenge sees potential opportunities that are emerging for Tassal and the aquaculture industry in general.

As a primary producer the climate plays an important role in Tassal's operations. The majority of the climate-related challenges are associated with the direct and indirect impacts on the salmon. Understanding the potential impacts and the probability of those long term impacts and potential opportunities is an important sustainability focus for the company.

Tassal plans 15 years in advance and has a sophisticated and well maintained risk register to assist with benchmarking progress in all areas of risk mitigation.

It is difficult to predict how a changing climate will modify oceans systems; most evidence suggests that the net effect will be negative (André et al. 2009). The Tasmanian salmonid industry is thus acutely aware of the possible effects of climate change on its future sustainability and consequently is working closely with the local research community on a variety of issues aimed at supporting the sustainability of farmed Tasmanian salmonids.

Any challenges that may arise, for example, effects on fish health and nutrition, can be offset and improved through selective breeding. Selective breeding for increased tolerance to higher water temperatures is now possible with the establishment of an industry breeding program.

Breeding salmonids to tolerate higher temperatures will become integral to the general selection strategy for maintaining the excellent growth rates and fish wellbeing currently achieved.

Genetically modified organisms and the use of transgenic salmonids have been completely ruled out by industry as potential solutions to climate change challenges (Battaglene et al. 2008).

Venturation (as discussed above) is already employed as a management tool and could be employed further as a mitigation activity if necessary.

6.1.14.5 Overall effect following implementation of mitigation measures

As noted above, Tassal already manages significant annual ranges in temperature fluctuations throughout the year and has the capacity to manage further minor fluctuations in temperature due to climate change. Climate change mitigation measures are not expected to contribute to any negative effects on the environment in the proposed farming region.

In addition to planning to mitigate any potential risks, it is reasonable to see opportunities emerging for Tassal from climate change. As other global food productions feel the stress of climate change it is likely that a proactive organisation like Tassal may be able to capitalise on providing a reliable source of protein well into the future.

Opportunities also exist for Tassal to extend its knowledge of adaptive practices to third world countries as part of a company volunteer scheme. The company is currently investigating such an approach.

6.1.15 Greenhouse gases and ozone depleting substances

Food producers are under increasing pressure to provide for a growing population that is demanding good quality, nutritious foods that have minimal environmental footprint. At the same time, they face significant supply-side constraints as the costs of inputs required to produce food reach record highs.

Tassal has undertaken a detailed 'cradle to grave' Life Cycle Assessment (LCA) of Tassal's supply chain to gain a better understanding of the environmental impacts of producing Tassal products and to highlight areas of improvement. LCA is an environmental accounting tool that quantifies the cumulative environmental impacts and natural resources embodied in a particular product or service from 'cradle-to-grave'. It provides an evidence-based approach to assist businesses in making the transition to more sustainable ways of managing its operations.

The LCA incorporated upstream and downstream impacts associated with the production of Tassal product and included greenhouse gas emissions, fuel use, water use and eutrophication potential. Tassal intends to perform an LCA every two reporting years.

6.1.16 Environmental Management

Tassal has a robust integrated management system (TIMS) in place incorporating environment, quality assurance and workplace health and safety. Under this system Tassal has implemented environmental policies and procedures relevant to all aspects of the business.

Tassal has recently gained Global Aquaculture Alliances (GAA) BAP certification across all six of its Marine Farming Regions and Primary Processing Facility. Gaining independent third party certification has allowed Tassal to validate integrated management system across these areas and annual recertification ensures continuous improvement.

Tassal is entering into its second year of partnership with WWF Australia. This partnership underpins Tassal's mission to improve environmental practices. Through this partnership Tassal aims to be the leader in responsible aquaculture production in Australia.

Tassal is demonstrating its commitment to environmental and social sustainability through the development and growth of its Environmental and Sustainability department. This department is led by the Head of Sustainability and covers wildlife management, marine and land based environmental compliance, environmental certification and community engagement.

Tassal has also introduced a System Team Leader role into all six of its Marine Farming Regions. This role acts as a TIMS representative on each site and is responsible for providing a link between Quality Assurance, WH&S and Environmental and Sustainability departments within Marine Operations. System Team Leaders are also responsible for all internal compliance with TIMS requirements, including monthly WH&S inspections and environmental checklists.

To ensure an appropriate response to operational environmental concerns, documented procedures and instructions are provided to employees (including contractors) on

minimising adverse environmental effects of their activities, as well as applicable employee induction and education programs.

All Tassal employees are required to sign off on relevant environmental policies and procedures to demonstrate their understanding.

The Tassal induction process includes a detailed presentation which explains systems and environmental commitments and responsibilities. This is given to all new employees.

Tassal has a detailed Contractor Management Procedure. This procedure details the process that must be adhered to at Tassal to ensure that contractor work is controlled and coordinated. Correct application of this procedure ensures that good coordination, cooperation, communication and alignment with facility operations exist between contractors and Tassal employees. This procedure will also ensure that the only contractors that display the highest level of safety, quality and environmental management work at Tassal.

The marine farming industry in Tasmania is regulated by the Department of Primary Industries, Parks, Water and Environment (DPIPWE) under the *Marine Farming Planning Act 1995* (MFPA) and the *Living Marine Resources Management Act 1995* (LMRMA).

Prior to commencing marine farming operations on lease areas, leaseholders are required to collect baseline environmental data on sediment biology, chemistry, current flow and habitat characteristics within and outside lease areas at various compliance and control sites.

Management controls within the D'Entrecasteaux Channel Marine Farm Development Plan (MFDP) 2002 require all marine farming leaseholders to comply with an environmental monitoring program as prescribed in marine farming licence conditions.

Marine Farming licences are issued to lease holders on an annual basis. Licence conditions specify environmental standards, recording and reporting requirements that are dependent on the species being licensed. For finfish licence holders, production data must either be reported or made available for audit on request. Production data includes information on feed, smolt inputs, production planning and food conversion ratios and this can be used in conjunction with other environmental monitoring data to assist in site specific or regional management of sustainability issues across the MFDP area.

In addition to production related reporting, licence holders must also undertake underwater video surveys to assess sediment health either 12 monthly or in accordance with their stocking and fallowing regimes.

Finfish companies have been required to participate in this benthic monitoring program since 1997 in order to monitor compliance against licence conditions and management controls specific to benthic impacts.

The program has led to the compilation of a comprehensive, area-specific dataset, providing information on environmental conditions within marine farming lease areas, at 35m compliance sites and control sites. This information has been used to assist in the adaptive management of regulatory monitoring.

The results of monitoring in finfish lease areas around the State have confirmed that pen positioning, stocking duration and intensity are the major factors affecting detectable impacts on the benthos. Current flow is typically low and survey assessments have revealed that visible benthic impacts are localised, with solid particulate waste settlement forming distinct footprint zones directly under pens.

Unacceptable impacts when detected through monitoring can be broken down into two main categories; any visible farm derived impact at a compliance site 35 m outside the lease boundary, or any significant visual impact within the lease area. These impacts are largely due to either or both of the following occurring within a lease area.

- Detectable impact at a 35 m compliance point – poor pen positioning leading to the presence of a pen footprint at a compliance point.

- Significant impact within the lease area – the cumulative impact of overfeeding stock and or stocking a single pen bay for an extended period of time. This leads to excessive feed and faecal deposition, deterioration of sediment health and eventual spontaneous gas bubbling from sediments.

In cases where a breach of licence conditions is detected by DPIPWE as a result of these surveys, immediate action can be taken as required to ascertain the level and extent of the breach and the cause of the specific problem. DPIPWE can then require changes to the management of the lease and where relevant, stipulate an increased frequency and intensity of monitoring to assess the rate of recovery of an impacted site. This regulatory program employs adaptive management principles, enabling performance based monitoring for individual lease areas, with the frequency and intensity of monitoring surveys being adjusted according to the level of compliance and monitoring history of individual farm sites.

Tassal will continue to uphold its environmental management protocols for this newly farmed lease, continuing to build on the company's outstanding compliance record.

6.2 Impacts on the Human Environment

6.2.1 Visual

Tassal engaged an independent third party consultant to conduct the visual impact survey for the proposed amendment to the Lippies lease. All information provided below is available in the Environmental Dynamics Report 2014 as Appendix 11.

6.2.1.1 Specific visual impact assessment for proposed zone

The study followed a standard visual impact methodology for facilities proposed for regions with both landscapes and seascapes, based on the *Guidelines for Landscape and Visual Impact Assessment, 2nd ed.* (Landscape Institute and Institute of Environmental Management & Assessment, 2002); and the *Guide to Best Practice in Seascape Assessment* (Countryside Council for Wales, Brady Shipman Martin, and University College Dublin, Marine Ireland / Wales INTRERREG Report No. 5, 2001). The method has been applied previously to the Macquarie Harbour salmon aquaculture industry EIS.

In brief, the method first assesses the impact of the proposed lease on the local landscapes, without considering whether or not an observer is present, in order to quantify its potential visual impact. It then assesses the visual impact of the proposed lease on observer groups, such as residents, bushwalkers and mariners. Tables of assessment criteria are included in the appendix to the study report.

6.2.1.1.1 Proposed infrastructure (including height above sea level and colour)

Fish pens are the most visible marine lease infrastructure. The proposed lease will have 28 fish pens arranged in herring bone mooring system. The pens will be a little larger than usual, with a diameter of 53 m. The perimeter of a pen is about 0.5 m high, and most of the pen is less than 1.5 m high, although its central part is about 4 m high.

Fish pens, by regulation, are grey/black in colour (see Figure 6.6). From sea level, the bird net and associated stands are the most visible elements of the entire cage assemblage; these are approximately 4.2 m at their highest point. Other visible infrastructures are cage handrails (approximately 1.2 m in height), feed pipe, and the collar of the cage itself. The visibility of these structures is largely dependent on the elevation of the observer; this effect is lessened as an observer's height approaches sea level.

Figure 6.6. Fish cages at Tassal's Redcliffs Lease showing bird netting and birdnet stand in centre of cages at close proximity – similar to those to be deployed at the proposed lease (Photo taken off Roaring Beach)

Additional infrastructure consists of a feed barge, which will be a low-lying facility that will be permanently in the middle of the lease; a fish bathing platform (barge); and vessels serving the lease.

Most observers of the proposed marine lease have views of it from low elevation and at distances of more than 4 km. Figure 6.7, taken from the visual impact study report, shows how difficult it is to see a marine lease at such distances, even under ideal viewing conditions.

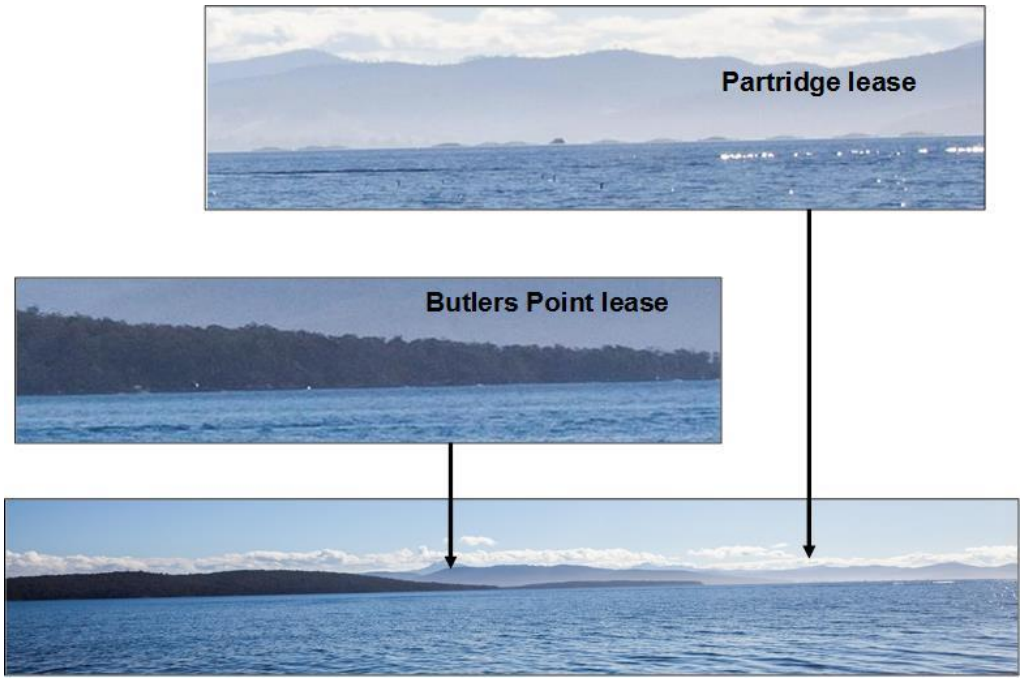

Figure 6.7. View looking from the deck of a vessel at two existing marine leases. The leases are not visible, or barely visible to the naked eye, but can be seen by enlarging the relevant parts of the high-resolution photograph. The Butlers Point lease is just under 4 km from the vessel, and the Partridge lease is about 5 km from the vessel.

6.2.1.1.2 Sensitive receptors having direct view lines to the proposed zone including detail on scale of increase in number of sensitive receptors

Figure 6.8 shows the location of the proposed Lippies lease at the southern end of the D'Entrecasteaux Channel. The nearest residences are at Lady Bay, north of Browns Point, as shown in Figure 6.9**,** and a subdivision not yet developed at Browns Point.

These are also the only residences with view lines to the proposed lease. The land north of Lady Bay is State Forest (as stated in section 5.3.5), with no residences in the direct vicinity of Lippies Point. To the east lies Bruny Island's Labillardiere Peninsula and Partridge Island, that form part of the South Bruny National Park.

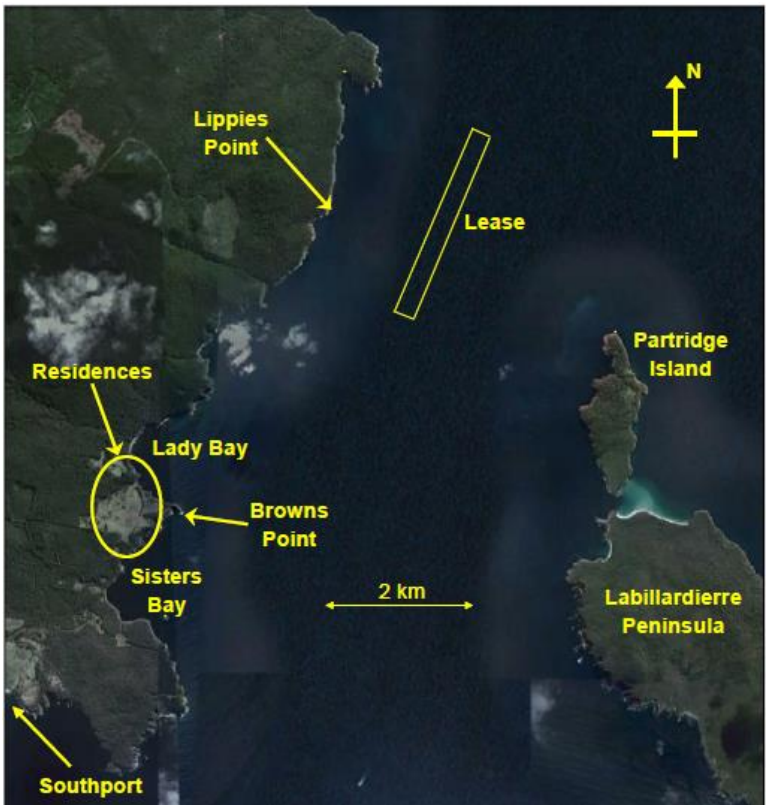

Figure 6.8. Nearest potential sensitive receptors to the proposed Lippies lease

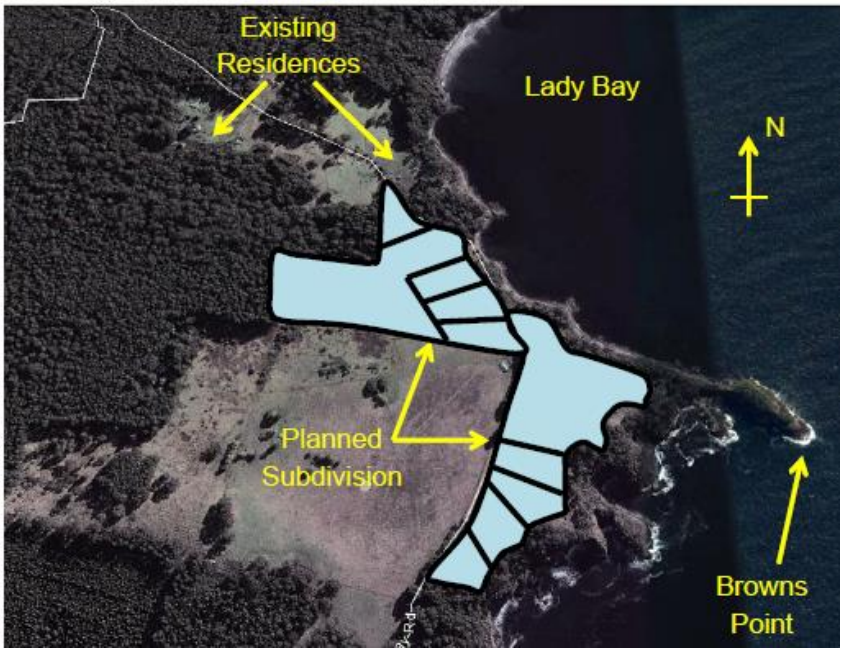

Figure 6.9. Planned subdivision details at Lady Bay

On the Bruny Island side of the channel, people walking on the Pineapple Rocks track, or visiting the area by boat, will have views NW towards the proposed Lippies Point lease. The proposed lease will be visible to the NW from the vantage point of Mount Bleak (elevation 140 m), at a distance of 6 km to the closest part of the lease. The only observers in the immediate vicinity of the lease will be mariners passing the marine lease.

6.2.1.1.3 Likely visual impact (include photomontages, images, plans and elevations)

Figure 6.10 shows the proposed lease straddles the imaginary boundary between two regions that have distinctly different land and seascape characteristics. The northern region has significant coastal development, especially on the western shores of the Channel between Dover and the Huon Estuary, and it has numerous marine leases such that fish pens are visible from most locations.

The D'Entrecasteaux channel in the southern region, from Lippies Point to Burnett Point, is narrower (about 6 km wide), and there is far less coastal development. On the east shore, Partridge Island and the Labillardiere Peninsula together form a state reserve, with a coastal walking track. On the west shore, the residences of Lady Bay and Sisters Bay are not easily seen, and there is only state forest and no development north of Lady Bay.

Landscape (including seascape) impact assessment considers the sensitivity of the landscape to changes, and the scale of the proposed changes. The two factors are then combined into a landscape impact assessment. The southern landscape region has a "High" sensitivity to change in the form of the proposed marine lease, but the scale of that change will be "Minor', only a relatively small encroachment on the overall landscape. The overall impact is thus considered to be "Minor Adverse". The northern landscape region has only a "Moderate" sensitivity to change in the form of the proposed marine lease, and the scale of that change is "Negligible", such that the impact is "Neutral".

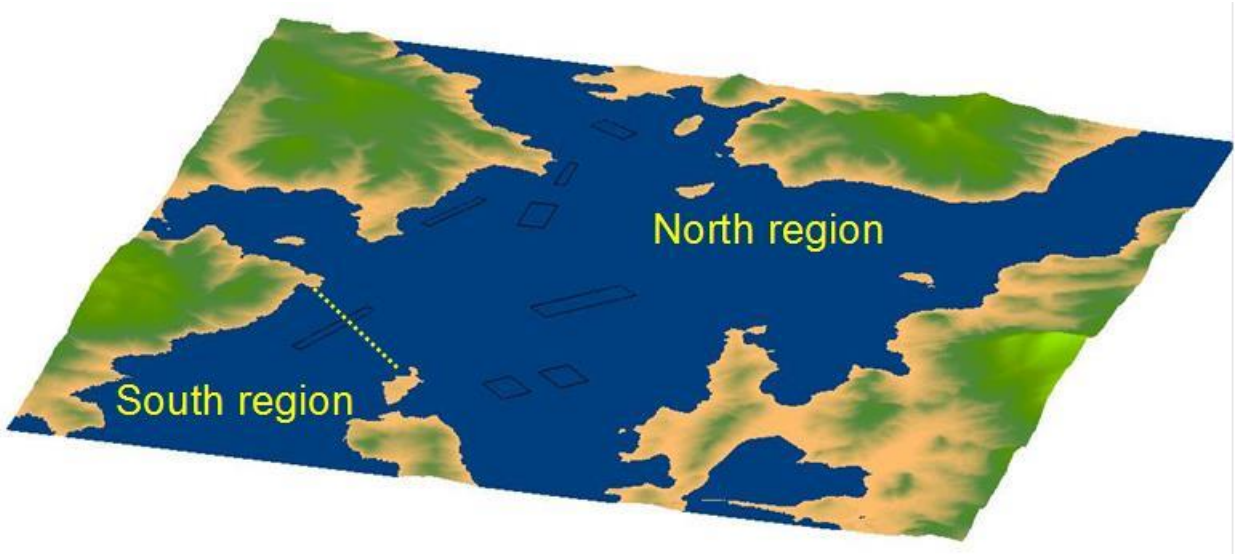

Figure 6.10. Oblique aerial digital terrain model view looking NW at a 23 km x 23 km area, showing the proposed lease straddling the imaginary boundary (dashed yellow line) between northern and southern visual assessment regions.

Visual impacts on observers relate to changes in available views of the landscape, and the effect of these changes on people's visual amenity. The visual impact of the proposed marine lease is assessed by considering the sensitivity of an observer, or observer group, and the scale of the visual impact.

In the northern visual assessment region, the visual impact study found that no observer groups will experience anything worse than very low negative visual impact. In the southern visual assessment region, the present and future Lady Bay residents are the observer group with most interest in the proposed Lippies Point lease. The residences further south, in Sisters Bay, are not able to see the proposed lease, and there are no other residences in the southern visual assessment region. The only other land-based observer group are people walking on the coast track along the Labillardiere Peninsula. In addition, there are water-based observers, some passing the marine lease as they travel through the area, and others exploring the coast.

The visual impact study report (Appendix 11) examines the likely impact on the visual amenity of these observer groups, using high-resolution photographs of existing leases (see Section 3 of the report), and photomontages prepared with the aid of a digital terrain model (see Section 4 of Appendix 11). The report's appendix sets out the tables of criteria used in the visual impact assessment exercise.

The sensitivity of the present and future Lady Bay residents observer group is "High", but the scale of impact is considered to be "Low", because the number of people affected is low, and because the change in their visual amenity that will be caused by the proposed lease is relatively minor. The proposed lease will be almost impossible to see for observers who are not elevated. For elevated observers, the proposed lease will not affect views across the channel to Bruny Island, or views along the coast to the south. Views along the west coast to the north will only be slightly affected, with the proposed lease being a minor peripheral visual component. For "High" sensitivity and "Low" scale of impact, the overall visual impact is "Medium".

On the east side of the region, walkers on the Pineapple Rocks coastal track and people exploring the coast by boat will have views to the NW from many locations. The sensitivity of these observer groups is "Medium". A sensitivity of "High" is not justifiable, since the

principal visual amenity is associated with the coast, not the view NW along the channel. The scale of impact is "Low", because the number of people affected is low, and the change in their visual amenity that will be caused by the proposed lease is between minor and none, depending on the location of the observers. Observers will not be able to see, or will barely be able to see, the proposed lease from low elevations, although it will be visible from the Mount Bleak lookout, at a distance of 6 km. The overall visual impact class is thus "Low", as determined by the criteria given in the visual assessment study report.

Mariners in the immediate vicinity of the marine lease will experience the largest change to the existing views of the seascape. Some mariners will be used to marine farming leases, for example people on commercial vessels. Others will be on the water for recreational purposes, and may not have seen a marine lease before. Whether observers will consider the proposed lease to have a positive or negative visual impact is not a question with a simple yes or no answer. People concerned about the negative visual impact of a marine lease tend to see merit only in a land and seascape that is free of non-natural visual components. But visitors to southern Tasmania include many people have never seen marine farming activities, which can be extremely interesting to observe, especially since there is a good chance of also seeing seals and other marine life. The operators of the catamarans that take tourists on trips around Macquarie Harbour consider the marine leases in the harbour to be a tourist attraction, and they visit the marine leases to let tourists see farming in action.

6.2.1.1.4 Overall assessment

The proposed marine lease lies across the imaginary boundary that separates a northern visual assessment region characterised by many existing marine leases and significant coastal development, from a southern visual assessment region with no existing marine leases and very little coastal development.

The visual impact study report (Appendix 11) does not say whether the visual impact of the proposed marine lease is acceptable or not acceptable. Some environmental impacts can be assessed by reference to accepted standards, for example air quality and noise, but there are no formal guidelines in Tasmania regarding visual impact assessment standards.

However, the overall visual impact of the proposed lease on the northern visual assessment region is clearly very low. The impact on the region's landscape and seascape visual amenity is assessed as "Neutral", and the visual impact study found that no observer groups in the region will experience anything worse than very low negative visual impact.

The visual impact study found that the proposed marine lease will constitute a fairly small encroachment on the southern visual assessment region, and will have overall "Minor Adverse" impact on the region's landscape and seascape visual amenity. Most observers in the region will view the proposed lease from low elevations, and only from distances greater than 4 km. These observers will not be able to see, or will barely be able to see, the proposed lease, and the overall visual impact assessment is thus "Low", grading to no impact.

This finding holds for low-elevation observers in Lady Bay. However, observers in Lady Bay who are elevated will be able to see the lease. Their sensitivity to changes in visual amenity is "High", but the proposed lease will not affect their principal visual amenity values, namely the views east to Bruny Island, or the views of the local coastline (e.g. Browns Point), and it will only be a peripheral and indistinct visual feature in views NE along the west coast of the channel. The scale of visual amenity impact for this elevated observer ground in Lady Bay is therefore considered to be "Low", giving an overall visual impact of "Medium".

6.2.1.2 Mitigation Measures

Although the proposed lease is situated further from sensitive visual receptors than the existing lease, impacts to permanent residences are classified as minor adverse. Incidental recreational users of the area and users north of the Scott Point – Partridge Island line are rated as being neutral. Whilst land-based structures can be coloured to blend in with the background, the colour of the water can vary substantially from deep blue to silver grey dependent on sun, cloud and wind conditions.

The D'Entrecasteaux Marine Farm Development Plan places the following regulatory controls on licence holders (controls listed are those relevant to salmonid farms):

- **Management Control 3.9** Visual Controls
  - **Management Control 3.9.1** Lessees must ensure that all marine farming structures and equipment on marine farming lease areas conform to the following controls:
    - **Management Control 3.9.1.1** All fish cages, buoys, netting and other floating marine structures and equipment on State Waters, other than that specified for navigational requirements, must be grey to black in colour, or be any other colour that is specified in the relevant marine farming licence
    - **Management Control 3.9.1.2** Marine farming structures and equipment must be low in profile and be of a uniform size and shape to the satisfaction of the Secretary.
    - **Management Control 3.9.1.5** The lease area must be kept neat and tidy to a standard acceptable to the Secretary
  - **Management Control 3.9.2** Lessees are to ensure that light generated from marine farming operations does not cause a nuisance. The Secretary will determine what constitutes a nuisance.

Tassal will also take height above water into consideration during the design phase of the feed barge for the proposed lease. By nature, object with a long, low profile tend to be difficult to distinguish at any great distance, and as such, the barge will be designed with this in mind.

6.2.1.3 Overall effect following implementation of mitigation measures

The visual impact study assumed the above mitigation measures will be applied, since they are standard requirements of all marine leases. As the lease has not been utilised, this amendment will be viewed as a new landscape element, and thus impact to users south of Scott Point is deemed to be minor adverse.

6.2.2 Navigation

Lippies lease runs parallel to the western shoreline, on an alignment of approximately 30°NE. There are navigable passages to the east and west of the proposed lease. To the east, the navigable channel is between the lease and the Labillardiere Peninsula/Partridge Island which lies approximately 2 km further east. To the west, the navigable channel is approximately 1.5 km at its narrowest point. Under prevailing north-westerly to south-westerly wind conditions, the shoreline to the west of the lease provides a lee for vessels.

The corners of marine farming lease areas are marked with International Association of Lighthouse Authorities (IALA) markers. The safe and effective marking of lease areas will continue to be managed and regulated by the DPIPWE Marine Farming Branch. Compliant boundary markers will clearly identify the proposed lease area and facilitate the safe navigation of boaters in both night and day.

6.2.2.1 Results of consultation with maritime stakeholders – Tasports, MAST and local boating clubs

TasPorts advised Tassal that the proposed amendment will not interfere with commercial shipping in the D'Entrecasteaux Channel or the lower Huon Estuary.

Marine and Safety Tasmania (MAST) advised Tassal that the proposed lease amendment does not present any navigational concerns.

Consultation with yachting and boating clubs (refer section 4.2) revealed that some recreational boaters have navigation concerns directly related to the proposal, especially at night when lights from farms can be confusing.

As stated in section 4.1.5, the growth of the salmon industry in the waterways of south eastern Tasmania has driven the need for a staged and strategic approach to navigation risks in the surrounding waterways.

Tasmania's salmon industry has driven the development of a navigational risk assessment for the D'Entrecasteaux Channel, which is an ongoing process, and overlaps with a number of regulatory bodies. The aim of this program is to reduce confusion around the regulatory lighting of salmon aquaculture leases in D'Entrecasteaux Channel (see Appendix 5).

6.2.2.2 Potential Impacts

Some mariners will be inconvenienced by the proposed amendment, however navigation impacts are considered minor. Altering course to avoid the lease when under way is unlikely to add noticeable time or distance to vessels travelling the most common navigable paths.

6.2.2.3 Mitigation Measures

No mitigation measures are proposed, other than continuing consultation with regulatory and boating organisations to ensure smooth transition to the proposed lease arrangement.

Lighting and shapes on corner markers conforms to IALA requirements, as well as those of MAST and DPIPWE.

6.2.2.4 Overall effect following implementation of mitigation measures

Proper maintenance of leases and compliance with authorities such as MAST and the DPIPWE's Marine Farming Branch will ensure that there are minimal impacts to navigating mariners resulting from the proposed lease amendment.

The proposed amended Lippies lease is positioned such that impacts on navigation are minimised, with navigable passages on both sides of the proposed lease.

6.2.3 European and Other Heritage

There is no listed European and other cultural heritage sites or areas, nor places within or in close proximity to the proposed amendment area.

6.2.3.1 Potential Impacts

There will be no impacts on places of heritage significance as a result of the proposed amendment area.

6.2.3.2 Mitigation Measures

No mitigation measures are proposed.

6.2.3.3 Overall effect following implementation of mitigation measures

It is considered that the proposed amendment would not impact on the sites/features of historic cultural and natural heritage significance.

6.2.4 Aboriginal Heritage

6.2.4.1 Consideration of places within the area listed on the Tasmanian Aboriginal Site Index (maintained by Aboriginal Heritage Tasmania) including consideration of cultural landscapes

Aboriginal Heritage Tasmania (AHT) has advised that the proposed amendment area would not have an impact on any areas of Aboriginal significance.

6.2.4.2 Potential Impacts

The proposed amendment area would not have an impact on any areas of Aboriginal significance.

6.2.4.3 Mitigation Measures

Given the advice from AHT, no mitigation measures are proposed.

6.2.4.4 Overall effect following implementation of mitigation measures

It is expected that there will be no impacts on areas of Aboriginal Heritage as a result of the proposed amendment area.

6.2.5 Reservations

6.2.5.1 World Heritage Area properties and values

There are no World Heritage Areas in or near the proposed amendment area.

6.2.5.2 Ramsar site properties and values

There are no Ramsar sites in or near the proposed amendment area.

6.2.5.3 Marine Reserve properties and values

There are no Marine Reserves in or near the proposed amendment area.

6.2.5.4 National Park properties and values.

The South Bruny National Park is the only reservation that may be impacted by the proposed amendment area.

The potential impacts include:

- noise
- visual amenity
- on-shore farm debris

6.2.5.5 Mitigation Measures

As discussed in section 6.1.11 above, Tassal have a comprehensive Marine Operations Waste Management Plan and Waste Management Policy in place to minimise farm debris.

Noise is not expected to impact the amenity of the Park due to the distance from the proposed lease, however noise mitigation will be employed in order to minimise impact on other receptors and is discussed in section 6.2.6.

The proposed lease is not a dominant feature in the view from the Park. Noting that the moderately densely vegetated shoreline to the west of the proposed lease obscures the horizon, and as a consequence, is predicted to somewhat limit the visual impact at this location (see section 6.2.1).

6.2.5.6 Overall effect following implementation of mitigation measures

Tassal does not expect any significant impacts on the South Bruny National Park.

6.2.6 Noise

Tassal engaged an independent third party consultant to conduct the noise impact study for the proposed amendment to the Lippies lease and followed methodology for assessing or predicting noise from marine farm leases, developed in consultation with EPA. Additional information is provided by *Tassal Operations Pty Ltd Proposed Fish Farms Marine Farming Leases 78 Noise Impact Study, August 2014* as Appendix 12.

6.2.6.1 All sources of noise should be identified and described

There are five main operations that produce the noise associated with the marine farming of finfish. These operations are described below.

The noise impact assessment methodology first determines the noise emissions from each operation individually, and then uses a model to predict the noise levels at distant locations. The assessment assumes a worst-case scenario of farming operations, whereby all the operations happen at the same time, and are all located at the southern boundary of the proposed marine lease, which is closest to the nearest residents, in Lady Bay.

The equipment and infrastructure in the newly developed lease will be similar to that found currently onsite at other Tassal leases in the area – one feed barge, coupled with feeding infrastructure, cages and a bathing barge.

6.2.6.1.1 Feed barge

A feed barge will be permanently moored on the lease and will be of either steel or concrete construction with a feed silo storage capacity of 180-200 tonnes. The barge will contain a centralised feeding system, feed storage, a sound proofed generator room and amenities for the work crew. Facilities will consist of an operator station and a small mess area, with kitchen and toilet facilities; there will be no overnight accommodation on the barge. The barge will normally operate during daylight hours; i.e. working hours as listed previously in section 3.3.4.

The barge will be customised to mitigate noise emissions from the generator and the feeding system. Noise mitigation measures are designed and built to meet marine farming licence conditions, lessening the level of noise reaching receptors within the surrounding areas. With any application for the deployment of a newly constructed feed barge in a marine farming lease, DPIPWE requires noise prediction modelling to be carried out prior to deployment.

6.2.6.1.2 Support vessels

Tassal operates support vessels associated with marine farming to access the farming zones. This noise source is mainly generated during the day time period.

6.2.6.1.3 Pen lighting

Pen lighting is not expected to be utilised at the proposed Lippies lease. Stock will be input 'out of season' – July onwards, and thus not require photoperiod manipulation to combat precocious maturation.

6.2.6.1.4 Venturation and Air Lift

Venturation is the process of raising Dissolved Oxygen (DO) levels in the water for fish health management purposes during the warmer summer months, by forcing air into the water using a compressor. Venturation is not expected to be employed at night (and only rarely during the day) at the proposed Lippies lease due to its high level of oceanic exposure.

6.2.6.1.5 Net washing

Unless removed for cleaning on-shore, nets are cleaned in-situ to remove biofouling and maintain the water flow through the cages for fish health. In-situ net washing is generally a quiet operation and is only undertaken during the day time period.

6.2.6.1.6 Harvesting

The intensity of noise produced from harvesting operations has been significantly reduced, with mufflers on the stunners. As such harvesting is now a much quieter operation.

Harvesting operations for the proposed lease are planned to generally begin in September and finish in January.

6.2.6.1.7 Shore facility

There is no new shore facility associated with this lease. However, the marine traffic associated with this lease will work from Tassal's shore facility at Meads Creek, Strathblane, and related marine traffic noise will increase to and from this facility.

6.2.6.2 Foreseeable variations in noise generated during the start-up phase should be identified and any temporary mitigation requirements specified.

All noise producing equipment introduced to the proposed amended lease will undergo a thorough noise evaluation, with mitigation measures taken if the equipment exceeds WH&S and environmental requirements. Refer to section 6.2.6.3.

6.2.6.3 Potential for noise emissions (during both the construction and operational phases) to cause nuisance for nearby sensitive receptors. The assessment of potential nuisance should take into account changes in noise frequencies and tonal components, increases in ambient noise levels, the time varying nature of emissions (e.g. modulation, impulsive or intermittent noise) and the temporal span of the noise emissions

The EPA advises that the standard noise limits specified for a new rural facility are;

- Day (0700 to 1800 hrs) 45 dBA
- Evening (1800 to 2200 hrs) 40 dBA
- Night (2200 to 0700 hrs) 35 dBA

Slightly more stringent noise limits may be specified for new facilities in rural areas that have occasionally very low background noise levels, but the southern part of the D'Entrecasteaux Channel is not such an area.

To ensure that potential noise impacts are thoroughly identified Environmental Dynamics evaluated potential noise from the proposed amendment area, potential noise impacts, and provided recommendations to avoid nuisance noise. The subsequent report titled *Tassal Operations Pty Ltd Proposed Fish Farms Marine Farming Leases 78 Noise Impact Study, August 2014* is provided in Appendix 12.

Work conducted previously for Tassal's Sheppards Point lease has shown that any intrusive qualities of the noise emissions from fish farming activities are limited to weak tonalities that are not particularly attention-grabbing. The Environmental Dynamics (2014) survey found that there is no apparent modulation in the noise emissions from farming operations; low

frequency noise is reduced by spreading over large distances (>1500 m), and the only impulsive characteristics of noise emissions associated with salmon aquaculture is from the acoustic stunners used in the harvesting of salmon, which are not audible at distances greater than 1500 m.

All sources of noise were identified in the Environmental Dynamics report, and were based on detailed noise measurements taken by the 2012 noise level survey of the Sheppards Point marine farm lease (see Table 27).

Table 27. Detailed noise level measurements of marine farm operations

	Lw	**Leq levels (dBA re 20µPa)**		
Operation	dB re 1 pW	30 m	4.5 km (spread)	4.5 km (spread and air)
Feed Barge	98	57	13	6
Fish Bathing	104	71	28	19
Net Washing	108	67	23	15
Harvesting	111	70	27	15
1 Vessel	107	65	21	13
5 Vessels	114	72	28	20

Further from the study conducted (Environmental Dynamics 2014), it was concluded that if noise mitigation measures are applied in a similar manner to which they've been applied at other Tassal leases, compliance with noise level limits is confidently predicted (Environmental Dynamics 2014) i.e. worst-case total noise levels of 6 + 19 + 15 +15 + 20 = 24 dBA at 4.5 km from the lease, with worst-case assuming all operations happening at the same time, and all on the southern boundary of the lease, closest to the nearest residences. Although this is a day-time noise level prediction (because these operations are all day-time operations), it is 11 dB lower than the expected night-time noise level limit of 35 dBA.

A target noise level of 50 dBA is usually considered to be acceptable when assessing noise impact on people engaged in recreational activities near an industrial facility [see Table 1 of the *Environment Protection Policy (Noise) 2009*]. In the above worst-cased situation, noise levels are predicted to be above 50 dBA at distances closer than about 480 m from where the combined farming operations are happening. People on the shore (e.g. the Labillardiere peninsular), and people on vessels or kayaking along the coast are some 2 km or more from the lease. Only people in vessels passing close to the lease on a busy day may experience noise levels above 50 dBA, and at a speed of 10 kts they will move through the high-noise area in less than two minutes.

Construction issues

There will not be major construction undertaken within the proposed lease area as pens and moorings will be constructed on land and brought to the site.

Installation of farm infrastructure such as feedpipe, moorings, pens, and navigation markers will take place during daytime hours. This work is much the same as regular farm work and is not expected to be unduly noisy. Deployment of moorings would require the use of a large company workboat with a crane to lift and deploy mooring blocks.

6.2.6.4 Mitigation Measures

Noise levels from the amended lease are not expected to cause nuisance noise given:

- The deployment of Kikko design nets will minimise net cleaning requirements which will minimise noise associated with net cleaning equipment and activity, and will also minimise the need for seal mitigation and associated noise.
- Due to advances in the selective breeding program, the necessity to bathe fish and operate fish bathing equipment is decreasing.
- As pen lighting is not expected to be required at Lippies, there will be no noise associated with this activity as at other sites around the state. If any operation procedures were to change, Tassal will liaise with Marine Farming to ensure that noise impact from any such activity is assessed.

Furthermore, the following recommendations have been made by Environmental Dynamics (2014). These are recommended to be adopted by Tassal for the development and management of the proposed amendment area. The recommendations are that:

- Construction work should avoid carrying out noisy activities early or late in the day; Lady Bay residents should be advised of the expected timing and duration of construction work.
- Tassal deploys noise loggers at Lady Bay, to confirm that the area has background noise levels that are typical of rural areas, and the area does not experience the very low background noise levels that sometimes happen in more sheltered locations of the D'Entrecasteaux Channels.
- Tassal should work to address any such unexpected noise issues as soon as possible; the company now has substantial experience of noise mitigation. In addition, Tassal should notify residents of Lady Bay of any expected unusually high noise emissions from the marine lease, for example due to the need to operate power equipment for infrastructure maintenance. This will allows residents to know what is happening, and how long the operations will last.
- Tassal seeks input to the bathing barge design, the feed barge design, and equipment selection, from an appropriately qualified acoustics specialist.
- Tassal engage an appropriately qualified acoustics specialist to carry out a compliance noise survey once the lease has been commissioned, following the methodology developed for such fish farms.

Environmental Dynamics 2014

Tassal proactively works with community members should any noise issues arise; Tassal has successfully resolved such issues in the past and will continue to employ an acoustic specialist to assist with noise mitigation across all sites as required.

Tassal is also required to comply with guidelines on noise emission made under the *Environmental Management and Pollution Control Act 1994* for marine farming operations.

6.2.6.5 Overall effect following implementation of mitigation measures

It is anticipated that with due diligence and care, adoption of the independent recommendations stated in Section 0, and with open community liaison that noise will not have a nuisance impact and adversely affect amenity for residents in Lady Bay and nearby. This will also ensure that there is no significant impact on the South Bruny National Park visitors that walk to the western end of the peninsula. Tassal's experience of noise control will enable any unexpected noise issues to be addressed in a thorough and timely manner.

Noise emissions from the proposed lease are confidently predicted to result in a worst case level of 24 dBA at the nearest residences and on the Labillardiere Peninsula. This level is approximately 20 dBA lower than the expected day time noise level limit of 45 dBA. Tassal generally commences noise producing tasks at its marine operation sites from 0700 hrs onwards, however, if work was to commence prior to this, the worst-case predicted noise level of 24 dBA is still 11 dBA below the expected night time noise level limit of 35 dBA.

The appropriate design and engineering of the feed barge, coupled with the remote location of the proposed lease, will limit noise impacts resulting from the proposed amendment.

6.2.7 Odour

6.2.7.1 Potential sources of odour emissions

Salmon farming activities have the potential to be a concentrated source of odour due to the large volume of organic matter associated with these operations. Potential sources of odour from salmon farming operations within the proposed amendment include:

- storage of dead and decaying fish
- spilled or incorrectly stored feed
- organic fouling on equipment
- chemicals including petroleum products
- engine exhausts from vessels and other machinery.

6.2.7.2 Potential for emissions to cause environmental and health effects should be evaluated

There is not expected to be any issues associated with odour at the proposed lease. Potential odour impacts from salmon farms can vary in nature depending on the type and intensity of individual farming operations and odour impacts may result from land and marine-based farming activities.

6.2.7.2.1 Land-based

There is no land base exclusively associated with the lease. Land based activities will be conducted at Tassal's major operational centre at Dover (Meads Creek).

6.2.7.2.2 Marine-based

There are generally no odour issues associated with marine-based operations. Loss of amenity due to odour would have to be very close to the source (i.e. feed storage), and this proximity would be unlikely to occur from outside the lease boundary.

6.2.7.3 Mitigation Measures

Tassal currently operates in accordance with specific strategies on a company-wide basis to mitigate potential odour impacts. The specific strategies include:

- timely removal of dead stock from farm cages – dive teams currently collect dead stock from cages twice per week and they are placed in sealed plastic bins for transport to shore
- appropriate transport of stock mortalities
- delivery of feed directly to the farm feed barge where it is stored in a sealed hopper from which the feed is directly dispersed to the fish pens
- management of equipment to ensure it is kept clean and in good working order
- secure and appropriate storage of chemicals including petroleum products.

6.2.7.3.1 Regulatory Controls

The following regulatory control is contained in the D'Entrecasteaux Channel Marine Farming Development Plan November 2002.

- **Management Control Section 3.11.1** Lessees are to ensure that odour generated from marine farming operations does not create an odour nuisance as defined by the Secretary.

6.2.7.4 Overall effect following implementation of mitigation measures

Given the mitigation measures and distance of the proposed lease to potential sensitive receptors, odour impacts resulting from the proposed amendment are considered negligible.

6.2.8 Commercial Fishing

As outlined in section 5.5.3, the main target species of commercial fishing near the Lippies lease is blacklip abalone. Commercial fishing of scalefish and rock lobster also occur, but only relatively small amounts are taken.

The Tasmanian Seafood Industry Council (TSIC) has been contacted during the preparation of this EIS, TSIC members have been informed of the proposal via "Fishing Today" magazine (Vol. 27 No 1. April/May 2014). No feedback has been received from the Seafood Industry Council.

Tassal initiated discussions with representatives of the Tasmanian Abalone Council (TAC) in regards to this proposal, in a meeting conducted on 18th February 2014. Concerns raised by the TAC included impacts on abalone stocks and habitat, and are discussed further throughout this section. Details of these ongoing discussions are detailed in sections 4.1.3 and 4.2.3.

The Tasmanian Rock Lobster Fishermans' Association (TRLFA) was contacted early in the preparation of this EIS. Representatives of the TRLFA also attended the workshop on 17 June 2014 described in section 4.1.3.4.2. No formal feedback was received as of 10 October 2014, however, Tassal staff are due to meet the TRLFA Board in late October 2014.

6.2.8.1 Effects on commercial fishing activities

The proposed amendment has the potential to affect commercial fishing in a number of ways, including:

- displacement from fishing grounds;
- disrupted transit to/from fishing grounds; and
- impacted (positively or negatively) commercial fish stocks.

Displacement from fishing grounds

Access to marine farming leases is exclusive to the leaseholder; therefore any commercial operators that have previously accessed the Lippies lease area for fishing grounds will be displaced. The physical displacement of fishers from fishing grounds is not thought to be an issue for rock lobster or abalone fishers, as the proposed lease and zone will be located over sediment not reef, and therefore will not impede access to these fishers' targeted habitat. The displacement of scalefish fishers from fishing grounds could pose a potential conflict; however this is thought to be minimal as the lease area has not been identified as an area of high value to commercial scalefish fishers, or high historical catches.

Disrupted transit to/from fishing grounds

Transit through marine farming leases is prohibited, therefore any commercial operators that have previously transited through the proposed Lippies lease area will be disrupted and forced to alter course. Incidental above-water equipment, shallow-submerged equipment and aquaculture support vessels operating in the area may also cause disruption to commercial vessels transiting to and from fishing grounds.

Impacted commercial fish stocks

Within the eastern zone of abalone fishing, the most productive harvest region is the Actaeons (Tarbath and Gardner 2012). A number of concerns have been highlighted during ongoing engagement with the TAC (see section 4.1.3.4) including:

- Displacement from fishing grounds
- Disrupted transit to/from fishing grounds/navigational hazard
- Impacts on commercial fish stocks
- Impacts on water quality
- The effect of salmon farming on algal blooms
- The effect of salmon farming on macroalgal assemblages

6.2.8.2 Mitigation Measures

Displacement from fishing grounds

The proposed location of the new lease is not considered to affect any known commercial fishing hotspots. TAC has raised concerns regarding abalone fishing in the Acteon reef system. Due to the distance (approximately 14 km) between the proposed lease and the reef system, the likelihood that these fishing grounds will be adversely impacted by the proposed amendment is low.

Disrupted transit to/from fishing grounds/navigational hazard

Marine farming lease areas are marked with International Association of Lighthouse Authorities (IALA) markers. The safe and effective marking of lease areas will continue to be managed by Tassal and regulated by the DPIPWE Marine Farming Branch. Compliant boundary markers will clearly identify the expanded lease area and facilitate the safe navigation of boaters at both night and day. Further, the salmon aquaculture industry is currently undertaking a risk assessment based review of navigational marking of actively farmed leases. This process is established as an ongoing activity, including advice on international best practice from regulatory bodies, i.e. MAST. It is expected that this is the most effective way for developing appropriate strategies to maintain safe navigation around active leases.

Impacted commercial fish stocks

Tassal is engaging collaboratively with the commercial fishing industry to provide synergistic options for the management of shared marine resources. For example, Tassal conducts daily algal trawls on all its sites as part of their water quality monitoring program; this algal monitoring program could be beneficial to the abalone industry as the data obtained may be used as an indicator/early warning system for PST producer blooms.

Impacts on water quality

The effects of salmon farming on the marine environment have been shown to result in changes to water quality, the severity of which depends on the type and intensity of the farming activity and the capacity of the receiving environment to assimilate any impact (Black 2001). As previously stated, there have been a range of improvements over the last 20 years, which have been observed through improvements in feeding practices, feed formulation, understanding fish behaviour (Price and Morris 2013) and the correct siting of farming leases. The TPDNO continues to be the primary management tool for maintaining suitable water quality within the D'Entrecasteaux Channel MFDP area.

Algal bloom events

In most studies there is usually insufficient data to link nutrient availability to algal growth. Despite this uncertainty, the incidence of algal bloom events in Tasmanian waters, particularly those comprising harmful species, have become a major concern for both wild fishing and aquaculture sectors.

Harmful algal blooms (HABs) are known to cause widespread mortality in natural populations of invertebrates and fishes, as well as aquaculture species. In addition, some HABs can present significant public health and human impact issues.

In 2006, the Scottish Executive and Environmental Group (SEEG) reviewed harmful algal bloom communities as they relate to fish farming in the coastal waters of Scotland. The review found that, in general, there was little indication that harmful algal blooms were developed, or sustained, by the nutrient inputs associated with salmon aquaculture facilities.

It also found that waste composition, water quality and oceanographic conditions required to initiate and sustain a harmful algal bloom are very complex and very much species specific (SEEG 2006, Buschmann et al. 2007).

Phytoplankton assessment forms a key component of the BEMP and on-site daily water quality monitoring, as stated in section 3.4.3, will occur at the proposed lease and form a potential early warning system for such bloom events.

Impacts on macroalgae

Initial research and monitoring activities undertaken to date suggest that there may be some change to ecological communities within close proximity to actively farmed leases. For instance, the work of Oh (2009) suggested that the composition of macroalgal assemblages varied to include more ephemeral algal species (such as epiphytic green algae) within this localised area.

However, in a study to examine the potential impacts of marine farming activities on subtidal macroalgal assemblages located within MPAs in the D'Entrecasteaux Channel, Crawford et al. (2006) found no consistent patterns of changes in community composition for annual surveys conducted between 1992 and 2002. Each species changed over the 10 year time period in different ways, depending on the location and site. The study suggested that each species and the community as a whole were subject to random change over time, most likely a result of local conditions and recruitment processes. No impact of increased nutrients as a result of expansion of salmon farming in the area could be detected. No specific mitigation measures are suggested on the basis that there is unlikely to be a significant impact to macroalgal assemblages from the proposed amendment.

6.2.8.3 Overall effect following implementation of mitigation measures

There is limited commercial fishing activity in the waters immediately surrounding the proposed lease location. Whilst the key Tasmanian wild fishery sectors (i.e. abalone, rock lobster and scalefish) continue to record catches from fishing blocks adjacent to the proposed lease area, these catches represent a minor component of overall fisheries production for each of these sectors.

A key management and compliance control from the D'Entrecasteaux Channel MFDP area requires that significant adverse environmental impacts do not extend beyond 35 m from the lease boundary. These managed impacts are unlikely to influence recognised commercial fishing activities, as the spatial separation of the two activities is considered sufficient to mitigate any impacts.

Implementation of the proposed mitigation measures will assist in minimising the potential overall impact on commercial fishing.

6.2.9 Recreational Fishing

Tassal is mindful that fishing grounds and waterways are a public resource for recreational users and access will be unavoidably reduced due to the proposed amendment and the existing leases.

Recreational fishing in the Lippies lease region is predominantly by boat. Key target species include flathead, rock lobsters, squid, abalone, tuna, gurnards, black bream, cod and wrasse. Popular fishing methods include line fishing, potting, dive harvesting and gill-netting.

The Tasmanian Association for Recreational Fishing (TARFish) met with Tassal in relation to the proposed lease (see section 4.1.3.2).

6.2.9.1 Effects on recreational fishing activities

The proposed amendment may affect recreational fishing in a number of ways, including:

- Displacement from fishing grounds;
- Entanglement of fishing lines and anchors in farm mooring lines;
- Disrupted transit to/from fishing grounds/navigation hazard;
- Impacts/alterations on recreationally targeted fish stocks; and
- Increased interactions between seals (attracted to area by salmon pens) and recreational fishers.

Displacement from fishing grounds

Under the proposed amendment the area accessible by recreational fishers will be reduced by less than 1 ha of the total area currently covered by the existing Lippies and Browns leases. Within lease boundaries, no public access is allowed; therefore any recreational fishers that have previously accessed the proposed Lippies lease area as fishing grounds will be displaced.

Entanglement of fishing lines and anchors in farm mooring lines

Within zone boundaries (surrounding leases), there are no formal access restrictions, but fishers have an increased risk of fouling lines or anchors on submerged marine farming equipment (mooring lines, anchor blocks, etc.).

Disrupted transit to/from fishing grounds/navigational hazard

Transit through marine farming leases is prohibited, therefore any recreational or commercial fishers that have previously transited through the proposed Lippies lease area will be disrupted.

Impacts on recreationally targeted stocks

The presence of fish farming has the potential to alter community assemblages in a localised way, mainly below the cage array and within the lease boundary.

Anecdotal evidence indicates recreational fishers sometimes target existing lease boundaries as there are increased numbers or species of fish in this vicinity, perhaps attracted by the farm infrastructure or increased fish activity.

Salmon escapees

Marine farming practices, farm designs and equipment specifications are designed to avoid the release of fish. However, despite preventative measures and best practice, salmon may escape.

Increased seal – fisher interactions

The increase of marine farming activities could potentially result in a higher incidence of interactions between seals and fishers, as seals may be attracted to marine fish farms.

6.2.9.2 Mitigation Measures

Displacement from fishing grounds

The proposed amendment of the existing lease was not considered to affect any known fishing hotspots. Given that no specific concerns regarding displacement from fishing grounds were identified during consultation with major stakeholders no mitigation measures are proposed.

Entanglement of fishing lines and anchors in farm mooring lines

Mooring lines do extend outside the lease area, but are contained within the marine farm zone. Within zones, all equipment must be submerged at a minimum depth of 5 m. The potential for entangling gear or anchors is a risk within any marine farming zone.

Disrupted transit to/from fishing grounds/navigational hazard

The corners of marine farming lease areas are marked with International Association of Lighthouse Authorities (IALA) markers. The safe and effective marking of lease areas will continue to be managed and regulated by the DPIPWE Marine Farming Branch. It is expected that compliant boundary markers will clearly identify the amended lease area and facilitate the safe navigation of boaters at both night and day.

Tasmania's salmon industry has driven the development of a navigational risk assessment for the D'Entrecasteaux Channel, which may be used to develop a range of management controls to mitigate potential hazards to recreational and commercial boaters (see Appendix 5).

Impacts on recreationally targeted stocks

Tassal is continuously looking to improve methods of feed delivery to minimise feed loss to the environment. All farms employ underwater sensors to monitor and minimise feed loss and there have been significant improvements in this area. While not necessarily a concern for recreational fishers, industry is continuing to work on better ways to ensure the feed reaches the salmon and reduces wastage.

Increased numbers of salmon escapees

Tassal is always working to minimise the risk of salmon escapes. Improved mooring systems, stronger sea-cages, stronger nets, reduced seal interactions and better staff training programs all combine to reduce the risk of a breach that can allow salmon to escape.

Tassal has developed and implemented an Escape Prevention and Response Protocol at each of its farm sites. This plan incorporates escape prevention, net inventory, weighting systems, smolt input and harvest operations as well as inventory management and incidental losses.

This process also included the development of Tassal's Escape Response Kits. These kits contain equipment for containment or attempted recapture and include a documented procedure for their use. They have been successfully used in the marine farming environment, with positive feedback from operational staff.

Kikko net technology will be utilised at the proposed lease.

Increased seal – fisher interactions

Tassal continues to work on improving technology to seal-proof its marine farm sea-cages. The company's ongoing transition to Kikko net mesh technology will further reduce the

potential for seals to enter salmon cages, and this may assist in mitigating against habituate behaviour and the attraction of seals to marine farms. Traditionally, nets have been strengthened, stiffened and tensioned below the water and 'seal fences' have been installed above the water. If seals cannot gain access to the salmon within the sea-cages, they are less likely to frequent the area.

6.2.9.3 Overall effect following implementation of mitigation measures

Although restricting access to some fishing which currently may occur in this area of the proposed amendment, impacts are predicted to be negligible due to the proposed amendment.

6.2.10 Recreational Activities

Recreational activities that are undertaken in the vicinity of the proposed lease amendment include on-water activities (boating/sailing, fishing, and kayaking), in-water activities (diving, snorkelling, and swimming) and on-land activities (fishing, camping, walking, wild-life watching, and general sight-seeing).

An information day was held at Dover District High School that was open to all members of the public. The turn-out was approximately 15-20 community members. No concerns regarding recreational amenity were raised at this information day. However, conversations with Lady Bay residents resulting from the mail-out in March 2014 indicate that people using the Lady Bay, Sisters Bay areas for recreation will be impacted by the proposed amendment of the existing lease.

An information/consultation session between Tassal and representatives of local boating and yachting clubs was organised and held at the Derwent Sailing Squadron Club rooms on 3 February 2014. Boating club representatives have previously raised concerns regarding navigation, visual and noise impacts and compliance, but this was not thought to be an issue for this lease.

6.2.10.1 Effects on recreational activities

The proposed amendment may potentially affect recreational activities in a number of ways, including:

- reduction in available on-water area for recreation;
- increased visual impact of marine farming activities;
- increased noise impact of marine farming activities;
- increased on-water activity/traffic associated with marine farming activities; and
- increased rubbish/debris from marine farming activities.

Potential impacts on recreational fishing are discussed in section 6.2.9. There is no impact predicted for diving activities as the proposed amendment occurs over sand at a depth greater than 30 m, and is considered unfavourable for diving.

Reduced available on-water area for recreation

Under the proposed amendment the area of surface water accessible by recreational users will be reduced. Within lease boundaries, no public access is allowed; therefore any users

that have previously accessed the Lippies lease area for recreation will be displaced. Displacement is not expected to cause conflict, as there is no indication that the expanded lease area of Lippies is particularly valued for recreational activities.

Increased visual impact

The proposed amendment will result in the installation of one feed barge, and up to 28 cages at the Lippies lease area. The proposed lease will be located over 4 km from the South Bruny National Park, and not readily visible from this area (see section 6.2.1).

Increased noise impact

The proposed amendment will result in increased noise associated with marine farming activities including vessel movement, compressor operation, net washing, fish feeding and fish harvesting. This may affect the regional ambience for recreational users. Given the location of the lease relative to any potential noise receptors, the impact of increased noise is considered very low.

Increased on-water activity/traffic associated with marine farming activities

The proposed amendment will result in an increase in on-water activity and traffic associated with marine farming activities and is estimated to be 9 trips per day.

Increased rubbish/debris from marine farming activities

There is an increased potential for more marine farming-associated rubbish and debris to enter the environment as a result of the proposed amendment.

6.2.10.2 Mitigation Measures

Reduced available on-water area for recreation

The proposed location of the new lease was not considered to affect any known hotspots for recreational activities. Given that no specific concerns regarding displacement from recreational areas were identified during consultation with major stakeholders no mitigation measures are proposed.

There remain numerous adjacent areas suitable for all types of marine pursuits, and sheltered waters close by in a range of weather conditions.

Increased visual impact

For a detailed discussion of visual impact effects and mitigations, refer to section 6.2.1

Increased noise impact

Tassal operations comply with guidelines on noise emission under the *Environmental Management and Pollution Control Act 1994* for marine farming operations. Noise-producing construction work will be limited to daylight hours. For more detail on mitigations relating to noise impact, refer to section 6.2.6.

Increased on-water activity/traffic associated with marine farming activities

No specific mitigation measures are proposed to address the potential increase in on-water activity associated with marine farming activities. However, Tassal vessels will continue to comply with navigation regulations regarding vessel speed and lighting; all Tassal vessels are

in commercial survey. Tassal has the capacity to limit vessel traffic to specific operational times as required.

Increased rubbish/debris from marine farming activities

Refer to section 6.1.4.5.4.

6.2.10.3 Overall effect following implementation of mitigation measures

For a detailed explanation of effects on recreational activities resulting from this proposal, see sections 6.2.1, 6.2.2, 6.2.6, and 0.

6.2.11 Tourism

Section 5.7.2.1 highlights both marine and land based tourism operations in the area of the proposed amendment. Marine-based tourism is limited in the immediate area of the Lippies lease. Some marine-based tourism operators utilise the area intermittently, but to the best of our knowledge there are no regular tours operating in the vicinity at the time of writing.

6.2.11.1 Results of stakeholder consultation undertaken

Over-the-phone consultations were conducted by Marine Solutions with four tour operators that are known to utilise the area periodically: Pennicott Wilderness Journeys, Peppermint Bay Cruises, Tasmanian Air Adventures and Roaring 40°S Kayaking.

As stated in section 4, all consulted tourism providers advised Tassal that they have no objections to the proposed amendment. Pennicott Wilderness Journeys conduct frequent marine debris clean-ups around the Labillardiere Peninsula with groups of school students. Tassal currently provide support for these shoreline clean-ups and will continue to work with the tourism provider.

6.2.11.2 Effects on tourism activities

No negative effects on current tourism activities in the area are anticipated as a result of the proposed amendment. In adjacent waterways there are tourism businesses which have incorporated salmon farm tours as part of their on-water tour experience. The opportunity will be equally available in this region.

6.2.11.3 Mitigation Measures

As a result of feedback received, no mitigation measures are proposed.

6.2.11.4 Overall effect following implementation of mitigation measures

It is considered that the proposed amendment would not impact on current tourism operations within the southern D'Entrecasteaux Channel/Huon Estuary, Labillardiere Peninsula or South Bruny National Park.

As addressed in section 6.2.1 there will be some loss of visual amenity as a result of the proposed amendment.

6.2.12 Land Use and Development

6.2.12.1 Effects on existing or proposed tourist or recreation activities, such as camping areas, picnic areas, walking tracks, horse riding tracks, heritage trails

The proposed amendment area is at least 4km from a walking track in the South Bruny National Park and it is unlikely that there would be any significant visual impact at that distance.

Conversations with some landholders from Lady Bay have revealed the existence of a new subdivision in Lady Bay, for which lots are currently being sold. At least one of these lots and one existing holding in Lady Bay are planned to be used as small eco-accommodation facilities and will promote the area for eco-tourism. One gallery and artists' retreat is also planned. The proposed amendment will impact visual amenity, however there are also potential for tourism opportunities with this new development.

6.2.12.2 Effects on residential activities

As residences are at least 4.5 km from the nearest proposed amended lease area it is considered that significant impacts from noise would be unlikely to occur. There will be impacts to visual amenity for some residents as discussed in section 6.2.1. There are no other sources of effects on residential activities in relation to the proposed amendment lease area and proposed farming activities.

6.2.12.3 Effects on industrial activities

There are no industrial activities relevant to this proposal.

6.2.12.4 Effects on other commercial activities

There are no identifiable commercial activities relevant to this proposal.

6.2.12.5 Mitigation Measures

Mitigation measures for noise are provided in section 6.2.6. It is considered very unlikely that significant impacts from noise on residences would occur.

6.2.12.6 Overall effect following implementation of mitigation measures

The proposed lease has the potential to impact on proposed developments and land use in some parts of Lady Bay and Sisters Bay.

6.2.13 Socio-Economic Aspects

Commencing in 2013, Tassal embarked on a South East Region Site Optimization Plan, which is designed to deliver sustainable growth, improved fish health and performance and improved environmental management. As a company Tassal are focussed on delivering better returns economically and socially, and at the same time, minimising impacts to the environment.

The plan will involve the amendment of a number of existing sites and in some cases enlarging them; the plan will also involve the development of a new region. The concept is to set up the sites for the best fish health, best fallowing potential and best fish performance. Tassal realises there is a limit to how many new sites they can operate in the existing marine farm plan areas and will optimise existing lease considering all factors.

Amending the existing Lippies lease will take this historically sited, existing lease and configure and upgrade it as a modern salmon farming region in scale and production. The existing lease has the advantage of being under the existing D'Entrecasteaux Channel TPDNO, located near one of the BEMP monitoring sites and historically sited in an area deemed acceptable for salmon aquaculture.

The proposed amendments to this lease will allow Tassal to develop a new farming region in Dover which will result in significant regional and State economic activity. Coupled with the $7.86 million invested in new infrastructure, this new proposed region will result in 22 new operational jobs which will generate over $1.3 million in fulltime annual salaries plus benefit packages. Another $1.8 million will be spent on local vessels and a $2 million wharf development on Meads wharf by local contractors.

Tassal continues to invest in training programs - developing future leaders of the industry focused on balanced outcomes around safety, sustainability and commercial return. Tassal are extremely proud to have received the Tasmanian Government's Employer of Choice award in 2013, and believe this is a reflection of the company's ongoing focus on employees.

Based on a conservative 1:3 ratio of supporting positions, i.e. primary processing, value added processing, and spin off in the local community services; these 22 operation jobs will easily translate to over 60 full time jobs in Tasmania. Another multiplier is the cash that flows from a region to supply and services; Tassal's marine operations currently operate at a 1:1 ratio of labour to overhead – effectively suppliers and services. This would result in $1.4 million being injected annually into the economy for goods and services, this does not include feed which is a further multiplier as Tassal purchase over 90% of salmon diets locally milled at Skretting Cambridge plant.

Salmon farming typically attracts an educated, younger demographic meaning that it is probable to assume that this proposed new farming region will inject or retain young families in this rural area, potentially increasing land values and demand in the region. Tassal also invests donation and sponsorship money into the areas in which they operate, creating additional opportunities for the community.

The *Your Marine Values Study* commenced in 2012 with the aim of identifying what is important about the local marine environment for communities with a direct interest in the marine system. The study included a series of workshops and a survey to engage community members and record their views. This included people from the general public, marine industries and managing agencies with the aim to identify what is valued about the marine environment of the D'Entrecasteaux Channel and lower Huon Estuary. Seventeen key marine values were identified throughout the study, summed up in four main categories: ecological, aboriginal, economic and social values. The study concluded that the key values for all of these groups significantly overlap (Your Marine Values Public Report, 2013). There are particular values relating to environmental use and sustainability that overlap between communities and the Tasmanian aquaculture sector. Both groups require a healthy, functioning marine environment delivering opportunities for community health and well-being, and providing opportunities for aquaculture to contribute meaningfully to regional growth and employment. Tassal is committed to ensuring that these values remain central to the company's vision for a thriving, world class and environmentally responsible salmon farming industry in Tasmania.

Last year Tassal generated over $270 million in revenue for the State and this year's half term results predict an even stronger year upcoming. Salmon farming is fast becoming the most economically important fisheries sector in Australia and more importantly, a significant sector in the Tasmania economy. Tassal's goal is to be a long term, sustainable and reputable company in Tasmania. Tassal has invested heavily in its people, environmental management and certification processes in order to gain the confidence of the State and the Tasmanian public. This proposal is an important piece of Tassal's sustainable growth strategy.

7 Summary of Effects and their Management

Table 28. Summary of potential effects and their management

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
6.1.1	**Water Quality**		
	Increased nutrient release into surrounding waters at Lippies from additional feed input into the proposed lease area Deterioration in water quality from nutrient emissions - eutrophication of the water column and impacts on the ecology of native flora and fauna	Feed inputs to Lippies will be governed by the D'Entrecasteaux Channel TPDNO Management controls from D'Entrecasteaux Channel Marine Farming Development Plan February 2002 and marine farming licence conditions BEMP– ongoing independent monitoring of the Lippies area (Site 9) On-site daily monitoring of DO, temperature, salinity and turbidity. Periodic monitoring of associated with the BEMP Application of *"Environmental Best Practice for in-situ Net Cleaning"* Protocols Feeding procedures and company policies to minimise feed wastage Continued BAP and ASC Standard certifications and associated third party audit	Due to the addition of pens and associated stock, there is expected to be a minor localised impact from increased nutrient emissions – however, these impacts are not expected to translate into adverse broadscale effects to water quality Ongoing adherence to the TPDNO will not result in an unacceptable impact
6.1.2	**Substrates and Fauna**		
	Organic enrichment of sediments directly beneath cages from feed, faeces and net wash effluent Reduction in oxygen component of sediments	Feed inputs to Lippies will be governed by the D'Entrecasteaux Channel TPDNO Depositional modelling undertaken to assess	Ongoing adherence to the TPDNO will not result in an unacceptable impact Tassal does not anticipate any adverse effects

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
	directly beneath cages Bacterial matting build up directly beneath cages Changes in species number, diversity, abundance and biomass of benthic faunal and meiofaunal assemblages directly beneath cages Hypoxia in the water overlying the sediment Increased sulphate reduction Build up and release of methane and hydrogen sulphide gas from sediments	depositional impacts associated with production strategies Internal ROV surveys and management controls from D'Entrecasteaux Channel Marine Farming Development Plan February 2002 and marine farming licence conditions Appropriate management responses will continue to be adopted if unacceptable changes are observed from annual ROV monitoring surveys. • Key faunal indicator species are databased annually Feeding procedures and company policies to minimise feed wastage Continued BAP standard certification and associated third party audit Application of *"Environmental Best Practice for in-situ Net Cleaning"* Protocols	beyond 35m from lease boundary The use of DEPOMOD to model solid particulate emissions deposited on the underlying substrate will assist Tassal to; • Understand the nature of the emissions footprint • Understand ways in which feed practices can be altered to minimise the emissions footprint (i.e. reduce feeding during particular conditions to limit enlarging this footprint)
6.1.3	**Marine Vegetation**		
	Broadscale effects on intertidal and subtidal macroalgal assemblages from marine farm emissions (i.e. nutrient loads) causing a change in community structure and function Physical damage caused by the placement of marine farm structures and moorings Shading from marine farming structures causing reduced growth	Feed inputs to Lippies will be governed by the D'Entrecasteaux Channel TPDNO Stocking density will not exceed those prescribed in the D'Entrecasteaux Channel MFDP Internal ROV surveys and management controls from D'Entrecasteaux Channel Marine Farming Development Plan	As the proposed amendment at Lippies represents a new marine farming development, marine farming emissions will impact upon the marine environment in the immediate vicinity of the lease area. Total emissions for the MFDP will be maintained below the prescribed TPDNO. The nearest macroalgal assemblages adjacent to

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
	Suppression of marine plant assemblages through sedimentation from marine farm emissions Net wash effluent related nutrients can potentially impact on surrounding marine vegetation	February 2002 and marine farming licence conditions Appropriate management responses will continue to be adopted if unacceptable changes are observed from annual ROV monitoring surveys. • Key faunal indicator species are databased annually to characterise impact/recovery stages of sediment condition and benthic health Zone and lease placement over sandy unvegetated substrates Continued BAP and ASC Standard certifications and associated third party audit Application of "*Environmental Best Practice for in-situ Net Cleaning*" Protocols Commitment to collaborative research around intertidal and subtidal macroalgal assemblages and ecosystem structure and function. Continued monitoring of marine vegetation assemblages in the Lippies area and surrounding waters – spatial extent of Giant kelp assemblages within surrounding waters to be monitored and compared to initial distribution survey in 2014	Lippies are located approximately 1.4 km from the lease boundaries, the potential for adverse environmental effects from the proposed amendment are considered to be low. All mooring infrastructure to be housed within marine farming zone
6.1.4	**Birds**		
	Habitat loss – prevents normal feeding, breeding,	Bird exclusion control through sea cage aerial	Following implementation of these mitigation

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
	foraging or roosting behaviour and activities Behavioural changes – birds may be attracted by fish and feed resulting in changes to home ranges or increased potential for interactions (e.g. entanglement) with marine farming operations Entanglements – birds may be injured or killed in bird netting Bird strike and collision – birds may be injured or killed if they strike farming infrastructure (including night time strikes due to artificial lighting) Marine debris impacting on nesting and roosting sites on adjacent shorelines Predation of stocked fish	netting On site (enclosed) feed storage and management Company-wide adherence to Tassal's internal Wildlife Interaction Plan, including SOPs to minimise bird interactions Shoreline clean-up of marine debris (undertaken outside of breeding season to prevent nest disturbance). Kikko net roll-out reduces rope used to configure pens, therefore reducing the potential onshore impacts of farm debris Limit night lights deployed onsite Provide information to staff on how to treat and release birds found on farming infrastructure and vessels Staff training / operational practices to decrease marine debris Management controls from D'Entrecasteaux Channel Marine Farming Development Plan February 2002 and marine farming licence conditions Continued BAP standard certification and associated third party audit Ongoing liaison and professional guidance from BirdLife Tasmania Development and implementation of bird escape hatches across all marine sites.	measures, it is considered that the proposed amendment will not have a significant or adverse impact on birds in the southern D'Entrecasteaux Channel.

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
6.1.5	**Marine Mammals**		
	Entanglement of marine mammals in netting, ropes or mooring lines resulting in injury or death Marine debris causing entanglement or ingestion by marine mammals Modification of behaviour – the presence of marine farms may affect the foraging behaviour of marine mammals, particularly in the open waters of the southern D'Entrecasteaux Channel Modification of seal behaviour e.g. habituation to marine farms and/or through translocation practices Predation of farmed fish Negative impacts on fish performance Risk of fish escapes from damaged nets WH&S risk to farm staff Negative welfare issues for seals	Tassal's strategy for seal interactions is to implement technology (e.g. Kikko nets) for total exclusion Seal exclusion – sea cage netting/net tensioning, Seal proof bird nets • Weekly subsurface inspections of nets, mooring lines and cage infrastructure integrity, and daily inspection of aerial bird netting Implementation of Kikko net technology (and associated decrease in potential for nets to be damaged or accessed by seals) Company-wide implementation and adherence to procedures contained in the Tassal Wildlife Interaction Plan DPIPWE seal management protocols Staff training and compliance with wildlife management procedures Management controls from D'Entrecasteaux Channel Marine Farming Development Plan February 2002 and marine farming licence conditions WWF partnership protocols Continued BAP standard certification and associated third party audit Site records of marine mammals sightings and company policy to potentially reduce/halt work when within 500 m of operations	The proposed amendment at Lippies is expected to attract seals, however Tassal's seal management strategy of total exclusion and non-lethal deterrents will mitigate negative interactions The likelihood of negative interactions occurring with dolphins or whales is considered low

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
		e.g. towing cages	
6.1.6	**Threatened Species**		
	Entanglement - marine farming equipment, ropes, marine debris, netting, mooring lines have the potential to entangle birds and marine mammals resulting in injury or death Bird collisions with marine farming infrastructure Habitat loss – the deployment of marine farming equipment at Lippies may impact on habitat requirements and habitat quality for a range of listed threatened and migratory species. Additional impacts affecting habitat include effects from sedimentation below cages from farming emissions and deployment of mooring blocks affecting infaunal and demersal marine species Behavioural change – the addition of cages to the Lippies lease areas may cause some listed threatened species to alter their behaviour, particularly foraging behaviour of seals and birds Physical interactions – the potential for artificial lighting to disorient birds at night and for collisions with marine farm infrastructure Predation – potential predation of threatened species and/or threatened species prey by escaped salmonids Alteration of breeding behaviour – marine farming operations may interrupt breeding or diminish	Shoreline clean-up of marine debris in accordance with BirdLife Tasmania to protect nesting shorebirds (always undertaken outside of breeding season) Feed inputs to Lippies will be governed by the D'Entrecasteaux Channel TPDNO Use of feeding management protocols to minimise feed wastage and emissions Use of fallowing and rotational stocking practices to promote sediment recovery Regular monitoring of seabed characteristics (annual ROV surveys) and water quality monitoring Discourage positive association with marine farms (e.g. birds and seals) Fish escape prevention, particularly during handling procedures, as a result of predator attacks, or equipment failure, through the establishment of emergency procedures Regular net inspections and routine maintenance by divers, MIC and marine operations personnel Prevent the introduction of diseases and marine pests through best practice farm	No significant effect from the proposed amendment on the following Listed Threatened or Migratory Species (identified as potentially being impacted by the proposed development) White-bellied Sea-Eagle – Low risk Wedge-Tailed Eagle – Low risk Forty-spotted Pardalote – Low risk Swift Parrot – Low risk Shy Albatross – Low risk White-throated Needletail – Low risk New Zealand Fur seal – Low risk Southern Right Whale – Very unlikely Humpback Whale – Very unlikely Giant Kelp Communities of South East Australia – Low risk

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
	breeding success (e.g. nest disturbance) Reduction in the ecological integrity of an ecological community (e.g. Giant Kelp Marine Forests of South East Australia) – degradation of water quality	hygiene and biosecurity protocols Minimise discharge of waste and emissions into the marine environment No disposal of fish mortalities to the marine environment, only land-based disposal and reuse Continual improvement in the design and installation of mooring systems and transition towards the company-wide use of Kikko net technology Tassal employs a dedicated Wildlife Management Team to continue to reduce negative interactions with wildlife, and train other staff with best practice wildlife management skills. This group has recently developed a Wildlife Interaction Plan & updated procedures to record whale interactions. Monitor for any interactions with threatened species and reassess risk ratings	
6.1.7	**Geoconservation**		
	Disturbance to significant geological features	No mitigation proposed Avoidance due to: • location of proposed marine farming zone • continued BAP standard certification and associated third party audit • routine shoreline clean-up of marine debris	No impacts are expected on recorded geoconservation sites

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
6.1.8	**Chemicals**		
	Chemicals such as fuel, disinfectants, therapeutants can potentially harm local flora and fauna if mishandled or spilled	Any chemicals that are classified under the *Environmental Management and Pollution Control Act 1994* as controlled wastes require disposal by an appropriate licensed contractor - approved waste service providers dispose of chemicals in accordance with the appropriate regulations All chemicals used on marine farming sites are stored in bunded areas with the capacity to hold 110% of the volume of the largest container Spill kits and training – Tassal's policy is to have a spill kit on every company vessel, barge, and at all fuel-fill stations Regular servicing of all boats and equipment; daily inspection and appropriate start up and shut down procedures ensuring early identification of issues and appropriate remedial action WH&S and Environmental policies and procedures in place for correct storage and handling Management controls from D'Entrecasteaux Channel Marine Farming Development Plan February 2002 and marine farming licence conditions Continued BAP standard certification and associated third party audit	The proposed amendment are not expected to result in large quantities of chemicals used and stored on the lease It is expected that existing mitigation measures implemented would restrict the likelihood of impacts occurring from these chemicals

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
6.1.9	**Species Escapes**		
	Establishment of wild populations Impact on native fish populations through predation or competition for resources Disease/parasite transfer from farmed fish to native fish populations	Comprehensive diving regime to routinely monitor net integrity • Weekly subsurface inspections of nets, mooring lines and cage infrastructure integrity, and daily inspection of aerial bird netting Kikko net technology is stronger than traditional monofilament net types Regular net tension testing conducted Newly deployed nets to be dived prior to fish stocking All stock transactions conducted in weather conditions that do not present an unacceptable risk of fish escape All cages, nets and mooring systems appropriate for the prevailing weather conditions, currents, water depths and seabed characteristics at each site Mooring system engineering and design in accordance with NS 9415:2003 to account for site positioning in exposed locations Integrity of all farm systems checked and repaired after severe weather events Appropriate procedures, staff training and education are implemented regarding key processes that pose a higher risk of an escape event if not performed correctly	Tassal implemented protocols to manage the associated risks has significantly reduced the likelihood of escapes and Tassal remain committed to continually improving these practices Due to all female stock being used and the inability to successfully forage for feed in the wild - the risk of wild populations becoming established is very low

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
		Continued third party certification audit process verifies Tassal escape mitigation procedures Company Wide Escape Prevention and Response Protocols in place Escape Response Kits on all work and feed barges MIC Net Cleaner conducts regular net inspections while cleaning Low history of escape events in the D'Entrecasteaux Channel Marine Farming Development Plan Area – this is expected for Lippies Management controls from D'Entrecasteaux Channel Marine Farming Development Plan February 2002 and marine farming licence conditions Tassal recently engaged the University of Tasmania to perform an evaluation of practices on salmon farms to mitigate escapes and ecological impacts	
6.1.10	**Disease**		
	Antibiotic use Mass mortality event Transmission of an existing salmonid disease to wild fish	Strategies to mitigate against the threat of disease in farmed fish are employed at all stages of fish production from the hatchery through to the full marine production cycle including harvesting (see Fish Health Management Plan – South East) Measures aimed at minimising the spread of	There is a low risk that presence of existing disease causing agents to farmed salmon will have any effect on the natural environment Measures aimed at minimising the spread of pathogens working together to minimise any potential impact on native fish populations There is a major effort to prevent the introduction of new diseases both at the Tasmanian border

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
		pathogens include disinfection procedures, effective control of mortalities and bloodwater, optimal nutrition and husbandry procedures Adherence to Tasmania's strict biosecurity and quarantine regulations Tasmanian Biosecurity and Surveillance Program Management controls from D'Entrecasteaux Channel Marine Farming Development Plan February 2002 and marine farming licence conditions	and from other Tasmanian sites which significantly reduces the risk of new diseases being introduced into the Lippies lease area
6.1.11	**Waste Streams Disposed on Land**		
	Farmed fish mortalities – impacts on natural and human environment: spread of disease to wild fish; organic enrichment of water column and seabed from putrefying fish; odour issues (public amenity and aesthetics); water quality changes Farmed fish mortalities – impacts on other farmed fish: spread of disease and parasites; lowering of DO (and impact on other water quality physio-chemical parameters) due to microbial degradation of putrefying fish; stress on existing populations and potential health impacts Marine debris – entanglement of fauna; public amenity and aesthetics; hazards to navigation Inappropriate discharge of black and grey water – physio-chemical effects on water quality; increased faecal coliforms; fish health impacts Dispersion of organic material from in-situ net	Fish mortalities – avoidance through best practice husbandry, biosecurity measures, utilisation of only the best available stock identified through the industry's Selective Breeding Program (SBP), seal exclusion, vaccination, increased company focus on fish health, appropriate disposal of mortalities Marine debris - clean-up of existing marine debris through Shoreline Clean-up program; staff training and operational practices to decrease marine debris Black and grey water discharge - is collected by service vessel and discharged to sewer Organic material from in-situ net cleaning – waste emissions determined from externally funded study has quantified	Implementation of mitigation measures would restrict likelihood of impacts occurring from grey and black water and bloodwater from harvesting operations and other waste streams The proposed amendment may result in an increase in the quantity of marine farming-derived marine debris – shoreline clean-up program to assess through monitoring, data collection and follow-up where required

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
	cleaning into the receiving environment Bloodwater from harvesting - potential to organically enrich surrounding waters; potential to spread disease amongst fish stocks	MIC removal and dispersal of fouling Marine operations Waste Management Plan and Waste Management Policy Continued BAP standard certification and associated third party audit Application of "*Environmental Best Practice for in-situ Net Cleaning*" Protocols Procedures to ensure bloodwater is not released to the environment Recent WWTP upgrade to Dover processing facility to ensure environmental requirements and regulation standards are met Management controls from D'Entrecasteaux Channel Marine Farming Development Plan February 2002 and marine farming licence conditions Draft Industry Mass Kill Contingency Plan	
6.1.12	**Introduced Marine Species**		
	Potential for marine farming activities to translocate marine pest species or extend their known range Potential for translocation of introduced marine pests from marine farming operations to alter ecological structure and function of native marine communities	Use of antifouling paint on vessel hulls – prevents fouling growth on marine hulls (potential source of marine pests) Company-wide adherence to biosecurity protocols and disinfection procedures at all farming and processing sites Collection of marine debris and appropriate disposal on land Continued BAP standard certification and associated third party audit	The potential for the spread or translocation of IMPs as a result of the proposed amendment is considered low

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
		Monitoring for marine pest species through annual underwater ROV video surveys - regulatory annual ROV compliance species database records the presence of any IMPs in and around lease area	
6.1.13	**Marine and Coastal**		
	Sediment dynamics regarding channels and sand bars	No mitigation required	No overall effect expected
6.1.14	**Climate Change**		
	Sea level rise Changes in weather patterns – decreased summer rainfall and increased winter wind Increased water temperature and changes to water chemistry	Selective breeding for increased tolerance to higher water temperatures Venturation of pens through susceptible periods Continual water quality monitoring Appropriate change to health and nutrition requirements Industry supplied with temperature trends and long range forecasts through CSIRO Company plans 10 years in advance and maintains a comprehensive risk register system Purpose built mooring systems are designed to withstand severe weather events	The salmonid industry already manages significant annual ranges in temperature fluctuations throughout the year and has the capacity to manage further minor fluctuations in temperature due to climate change Climate change mitigation measures are not expected to contribute to any negative effects on the proposed lease
6.2.1	**Visual**		
	Loss of amenity of sensitive receptors	Management controls from D'Entrecasteaux Channel Marine Farming Development	Residents and users of the Lady Bay and Browns area are deemed to have minor adverse impact

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
		Plan February 2002 and marine farming licence conditions Barge design will consider height above water to limit its visual impact	resulting from the proposed amendment Long low profile barge will be difficult to view at any great distance
6.2.2	**Navigation**		
	Some impact on mariners as navigation around the proposed amendment area will be required.	Altering course to avoid the lease Navigational lighting/lease markers compliant with MAST and DPIPWE requirements Management controls from D'Entrecasteaux Channel Marine Farming Development Plan February 2002 and marine farming licence conditions Tassal vessels and staff are always available to assist in safety at sea incidents Industry and Tassal navigation risk assessments completed Consultation with marine, regulatory and recreational boating organisations	There is expected to be negligible impact to safe navigation Despite the proposed amendment resulting in some potential change to navigational routes of recreational boaters and other mariners, through the application of mitigation measures (i.e. navigational aids and lighting), the overall effect is considered to be low
6.2.3	**European and Other Heritage**		
	There are no recorded sites of European and other heritage value	No mitigation measures are proposed	As there are no recorded European or other heritage sites within the immediate vicinity of Lippies, there will be no overall effect from the proposed amendment
6.2.4	**Aboriginal Heritage**		
	Aboriginal Heritage Tasmania advised that there are no recorded sites of Aboriginal heritage value	No mitigation measures are proposed	As there are no recorded Aboriginal Heritage sites within the immediate vicinity of Lippies Point and, there will be no overall effect from the

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
			proposed amendment
6.2.5	**Reservations**		
	Loss of visual and noise amenity and farm debris on-shore at the South Bruny National Park	No specific mitigation measures are proposed (but refer sections, 6.1.11, 6.2.1, 6.2.6,)	As there are no reservations in the area of the Lippies lease, there will be no overall effect to reserves from the proposed amendment
6.2.6	**Noise**		
	Loss of amenity of sensitive receptors Barge generator power source for: • Sea cage lighting • Venturation • Fish feeding • Net washing • Support vessels • Harvesting Residents and users of the Lady Bay and Browns Point Area were deemed to be potential noise sensitive receptors relevant to the proposed amendment	Compliance with guidelines on noise emission under the Environmental Management and Pollution Control Act 1994 for marine farming operations Prior to deployment compliance monitoring and noise modelling will be undertaken to ensure that noise emissions do not exceed prescribed limits Tassal staff adherence with noise protocols Implementation of Kikko net technology will reduce noise associated with in-situ net washing Noise producing construction/mooring system installation work will be limited to day time hours The offshore location of the lease area is expected to dissipate noise of marine farming operations Community consultation to assess noise and any noise issues. Employ acoustic specialist to monitor and assess noise impacts and assist in noise	The location of the lease off shore 2 km from the nearest potential sensitive receptor coupled with appropriate design, engineering, and management, the proposed amendment is expected to minimise noise impacts on all potentially sensitive receptors. Noise levels are confidently predicted to be 24 dBA at residences at Lady Bay/Browns Point. This level is well within the stringent night time noise limits imposed by the EPA on new rural industry

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
		mitigation as required.	
6.2.7	**Odour**		
	Loss of amenity to sensitive receptors Dead and decaying stock Spilled or incorrectly stored feed Organic fouling on equipment Harvesting wastes Chemicals including petroleum products Engine exhausts	Timely removal of mortalities from farm cages – dive teams currently collect mortalities from cages approximately twice per week and they are placed in sealed plastic bins for transport to shore Appropriate removal and disposal of stock mortalities Feed stored in sealed hoppers on the feed barges Management of equipment to ensure it is kept clean and in good working order Secure and appropriate storage of chemicals including petroleum products Management controls from D'Entrecasteaux Channel Marine Farming Development Plan February 2002 and marine farming licence conditions	There is not expected to be any odour related impacts from the proposed amendment
6.2.8	**Commercial Fishing**		
	The proposed amendment has the potential to affect commercial fishing in a number of ways, including: • displacement from fishing grounds; • disrupted transit to/from fishing grounds; and • impacted (positively or negatively) commercial fish stocks.	Compliant boundary markers will clearly identify the expanded lease area and facilitate the safe navigation of boaters during both night and day.	Implementation of the proposed mitigation measures will assist in minimising the potential overall impact on commercial fishing An unavoidable impact of the proposed amendment is the spatial displacement of commercial fishing from the Lippies lease area; potential effects on fisheries are not considered to be significant

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
6.2.9	**Recreational Fishing**		
	The proposed amendment may affect recreational fishing in a number of ways, including: • Displacement from fishing grounds; • Entanglement of fishing lines and anchors in farm mooring lines; • Disrupted transit to/from fishing grounds/navigation hazard; • Impacts/alterations on recreationally targeted fish stocks; and • Increased interactions between seals (attracted to area by salmon pens) and recreational fishers.	Compliant boundary markers will clearly identify the expanded lease area and facilitate the safe navigation of boaters in both night and day. Use of Kikko nets at the proposed lease	Reduction of access to some currently accessible recreational fishing grounds An unavoidable impact of the proposed amendment is the spatial displacement of recreational fishing from the Lippies lease area; potential effects on recreational fisheries are not considered to be significant Reduction of salmon escapee events
6.2.10	**Recreational Activities**		
	Visual and auditory impact of marine farming activities Increased marine debris from marine farming activities Reduced available on-water area for recreation Increased on-water activity associated with marine farming	Tassal staff must comply with guidelines on noise emission made pursuant to the *Environmental Management and Pollution Control Act 1994* for marine farming operations. Management and monitoring of noise making equipment with proposed amendment (see section 6.2.6) Marine debris - clean-up of existing marine debris through Shoreline Clean-up program; staff training and operational practices to decrease marine debris Tassal vessels will continue to comply with navigation regulations regarding vessel speed and lighting; all Tassal vessels are in commercial survey	The proposed amendment is expected to have some impact on recreational activities. Increased on-water activity associated with marine farming should not significantly impact on recreational on-water activities.

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
6.2.11	**Tourism**		
	No negative effects on tourism activities in the area are anticipated as a result of the proposed amendment. In adjacent waterways there are tourism businesses which have incorporated salmon farm tours as part of their on-water tour experience..	No mitigation measures are proposed	There are no negative effects anticipated as a result of the proposed amendment.
6.2.12	**Land use and development**		
	As this is a marine based development there are no potential effects or threats to land use and development as residences are at least 2km from the nearest proposed lease, and there are no relevant commercial or industrial activities identified.	No mitigation measures are proposed	Not applicable as there will be no land based activities for the proposed amendment
6.2.13	**Socio-Economic Aspects**		
	There are socio-economic benefits directly resulting from the proposal The salmon farming Industry is a growth industry in Tasmania and one the most important seafood producers in Australia – Atlantic salmon accounts for approximately 73% of the total annual seafood production in Tasmania	No mitigation measures are proposed	Optimisation of fish performance ensures the future viability of Tassal The overall socio-economic impact from the proposed amendment will be bolstered through: – The creation of 22 new marine jobs ($1.5million in wages annually) and >60 indirect jobs in the region – An injection of $1.4 million into the State for supply and services – An investment of $7.86 million in the establishment of the proposed leases with these services sourced locally within

SECTION	POTENTIAL THREAT/EFFECT	AVOIDANCE & MITIGATION	OVERALL EFFECT
			Tasmania – An investment of $1.8 million on local vessels to service the proposed leases – An investment of $2 million for a wharf upgrade at the Meads Creek land base

8 Conclusion

Commencing in 2013, Tassal embarked on a South East Region Site Optimization Plan, which is aimed at delivering sustainable growth, improved fish health and performance and improved environmental management. As a company Tassal is focussed on delivering better returns economically and socially, and at the same time, minimising impacts to the environment.

The proposed amendment is driven by the need to match growing consumer demand with farm site performance. This, in turn, will have positive implications for the Tasmanian economy.

The proposed amendment will allow Tassal to develop a new farming area south of Dover which will also result in significant regional and State economic activity. Coupled with the $7.86 million invested in new infrastructure, this new farming area will result in 22 new operational jobs which will generate over $1.3 million in fulltime annual salaries plus benefit packages. Another $1.8 million will be spent on local vessels and a $2 million wharf development on Meads wharf by local contractors.

Based on a conservative 1:3 ratio of supporting positions, i.e. primary processing, value added processing, and spin off in the local community services; these 22 operation jobs will easily translate to more than 60 full time jobs in Tasmania.

Last year Tassal generated over $270 million dollars in revenue for the State. Salmon farming is fast becoming the most economically important fisheries sector in Australia and more importantly a leading sector in the Tasmanian economy.

The existing and proposed lease has the advantage of being under the existing D'Entrecasteaux Channel TPDNO; nutrient emissions will continue to be constrained within sustainable levels. The proposed lease at Lippies is located near BEMP water quality and sediment monitoring sites, therefore any broadscale ecosystem effects from the proposed amendment may be readily detected under the current monitoring program. All current monitoring requirements and management practices will continue to be applied to the proposed lease at Lippies Point. Tassal will continue to actively engage in research and seek continual improvement in the management of their marine operations.

There are some potential impacts that have been discussed within this document. Tassal has demonstrated an ability to manage complex environmental issues through significant experience at leading edge marine farming within the south east and west coast of Tasmania.

Tassal's goal is to be a long term, sustainable and reputable company in Tasmania. Tassal has the recognized ability to work with stakeholders and has invested heavily in its people, environmental management, compliance and third party certification processes in order to gain the confidence of the State and the Tasmanian public. This proposal is an important piece of Tassal's sustainable operations and growth strategy.

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10 Appendices

Appendix 1. Tassal Sustainability Report 2013-14

Appendix 2. Global Aquaculture Alliance's (GAA) Best Aquaculture Practices (BAP)

Appendix 3 28 pen bay herring bone mooring system

Appendix 4 Environmental Best Management Practice for in-situ Net Cleaning

Appendix 5 Tassal Stakeholder Information Package

Appendix 6 IMAS zone assessment reports and other environmental survey assessments

Appendix 7 Frequency histograms of current velocity and direction

Appendix 8 EPBC Act Protected Matters Report

Appendix 9 Tasmanian Natural Values Atlas Report

Appendix 10 Marine Farming Licence 78 East of Lippies Point

Appendix 11 Visual Impact Study

Appendix 12 Noise Impact Study