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Pindimar Abalone Farm
MP10_0006

Response to Submissions Report

November 2014

SUITE 2 GROUND FLOOR, 14 WATT ST NEWCASTLE NSW 2300 | TEL 02 4925 3286 | FAX 02 4925 3403 | WWW.CITYPLAN.COM.AU
CITY PLAN STRATEGY & DEVELOPMENT P/L ABN 58 133 501 774
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ABBREVIATIONS USED

AEA	Aquatic Ecology Assessment
AHAA	Aboriginal Heritage & Archaeological Assessment
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ANZECC	Australian and New Zealand Environment Conservation Council
AS	Australian Standard
ASS	Acid Sulphate Soils
ASSPA	Acid Sulphate Soil Preliminary Assessment
ARRF	Advanced Resource Recovery Facility
BDMP	Biosecurity & Disease Management Plan
BPA	Bushfire Protection Assessment
cm	Centimetre
DA	Development Application
dB	Decibels
DP	Deposited Plan
DCP	Development Control Plan
DGRs	Director-General's Environmental Assessment Requirements
DPI	NSW Department of Primary Industries
DP&E	NSW Department of Planning & Environment and its predecessors
EA	Environmental Assessment report
EEC	Endangered Ecological Community
e.g.	Example
EPBC Act	Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*
EP&A Act	NSW *Environmental Planning & Assessment Act 1979*
EP&A Regulation	NSW *Environmental Planning & Assessment Regulation 2000*
EPI	Environmental Planning Instrument
EPL	Environment Protection License
ESD	Ecologically Sustainable Development

FM Act	NSW *Fisheries Management Act 1994*
F&F Report	Statement of Effects on Threatened Flora and Fauna (Flora & Fauna Report)
GLLEP	Great Lakes Local Environmental Plan
ha	Hectares
HAZCHEM	Hazardous Chemicals
HDPE	High Density Polyethylene
kg	Kilogram
KL	Kilo litre (1,000 litres)
LEC	NSW Land & Environment Court
LEP	Local Environmental Plan
LGA	Local Government Area
L/min	Litres per minute
kW	Kilowatt
MHWM	Mean High Water Mark
MLWM	Mean Low Water Mark
MNES	Matters of National Environmental Significance (pursuant to the EPBC Act)
MSDS	Material Safety Data Sheets
m	Metre
ml	Millilitre
m^3	Cubic metre
mg/L	Milligrams per litre
ML	Megalitre (1,000,000 litres)
ML/day	Megalitres per day
NA-2003	Noise Assessment (2003)
NIA-2011	Noise Impact Assessment (2011)
NSW	New South Wales
NV Act	NSW *Native Vegetation Act 2003*
OEH	NSW Office of Environment & Heritage
OISAS	NSW Oyster Industry Sustainable Aquaculture Strategy
PASS	Potential Acid Sulphate Soils

PSLEP	Port Stephens Local Environmental Plan
POEO Act	NSW *Protection of the Environment Operations Act 1997*
ppm	Parts per million
ppt	Parts per thousand
PSNL	Project Specific Noise Levels
RF Act	NSW *Rural Fires Act 1997*
RTS	Response to Submissions Report (this document)
SEPP	State Environmental Planning Policy
SMP	Stormwater Management Plan
SOC	Statement of Commitments
TACC	Total Allowable Commercial Catch

Job No/ Document No	Description of Issue	Prepared By/ Date	Reviewed by Project Manager/Director	Approved by Project Manager/Director
N-12014	Prelim Draft	SG/1.9.14	MG/15.8.14	
N-12014	Draft	SG/3.9.14	GF&MG/3.9.14	
N-12014	Final	SG/5.9.14	MG/5.9.14	
N-12014	Rev A Draft	SG/29.10.14	MG/29.10.14	
N-1204	Rev A	SG/3.11.14	MG/3.11.14	
N-1204	Rev B	SG/7.11.14	MG/7.11.14	
N-1204	Rev C	SG/19.11.14	MG/7.11.14	
Note: This document is preliminary unless it is approved by a Project Manager or Director of City Plan Services				

1 INTRODUCTION

1.1 Background

Austasia Leefield Pty Ltd proposes to develop a land-based Abalone aquaculture farm at 180 Clarke Street, North Pindimar, on the northern shore of Port Stephens in coastal New South Wales. Austasia Leefield Pty Ltd is a small, Australian-owned and locally-based company. The farmôs aquaculture operations are proposed to be managed by a qualified marine ecologist with over 20 yearsôexperience in marine ecology research.

A proposal for an Abalone farm on the site was originally granted development consent (under Part 4 of the *Environmental Planning & Assessment Act 1979* [**EP&A Act**]) by Great Lakes Council in 2006. However an objector appealed to the Land & Environment Court under Section 98 of the EP&A Act against the granting of consent. During the Court hearing, detailed documents were requested which were not able to be immediately produced, and the applicant had concerns about the financial implications of the legal proceedings. The applicant therefore agreed to the making of consent orders allowing the appeal, and the proposal was withdrawn.

Since that time, a decision to make a new application was made due to the ongoing commercial viability of the proposal and the anticipated scientific, environmental, social and commercial benefits of the development. The farm proposal has been refined by the proponent and it is considered that all documents that would reasonably be required to allow determination of the Project have been produced. The proposal is essentially the same as the previously approved development, with the exception of an increase in the proposed yearly production rate (i.e. to 60 tonnes p.a.) and certain amendments and improvements resulting from ongoing research and development.

A Major Project Application was lodged on 11th January 2010 and Director Generalôs Requirements received on 26th May 2010. The proposal is being assessed under the transitional Part 3A provisions of the EP&A Act as a ôMajor Projectô. An Environmental Assessment (**EA**) report was prepared for the Project and submitted to the NSW Department of Planning and Environment (**DP&E**) on 28th February 2014 (reference MP10_0006).

This Response to Submissions Report (**RTS**) has been prepared by City Plan Strategy and Development (**CPSD**) on behalf of the applicant, in response to issues raised in submissions received during the EA exhibition period as required by Section 75H(6) of the EP&A Act.

1.2 Exhibition Stage

The EA was on exhibition for 54 days from 20th March 2014 until 12th May 2014. The EA was made available for public viewing through the DP&E website and copies of the full document were made available at Great Lakes Council, Port Stephens Council and Tea Gardens Library.

1.3 Consultation

GOVERNMENT CONSULTATION

As part of the preparation of the EA, feedback and advice was sought from the following government authorities and groups via a formal letter, email or telephone:

- Great Lakes Council;
- Port Stephens Council;
- NSW Office of Environment & Heritage;
- NSW Department of Industry & Investment;
- NSW Office of Water;
- Hunter-Central Rivers Catchment Management Authority;
- Maritime NSW;
- NSW National Parks & Wildlife Service;
- NSW Advisory Council on Recreational Fishing;
- NSW Department of Primary Industries - Crown Lands;
- NSW Department of Primary Industries - Fisheries;
- NSW Environment Protection Authority;
- NSW Food Authority;
- NSW Marine & Estuarine Recreational Charter Management Advisory Committee;
- NSW Rural Fire Service; and
- Port Stephens & Myall Lakes Estuary Management Committee.

Additional feedback was sought from government agencies through informal means. All issues raised were addressed within the EA.

COMMUNITY CONSULTATION

Prior to the formal public exhibition and in addition to required consultation, the proponent elected to undertake voluntary consultation with the local community and interested

stakeholders. The purpose was to ensure the community was made aware of the proposal early on, so they could be involved in identifying key issues of concern and could provide constructive input into the design and assessment process based on local knowledge and experience. This consultation involved:

- Hand-delivery of letters to about 250 dwelling houses within Pindimar, Bundabah and selected businesses within Tea Gardens and Hawks Nest (June 2012). The letters contained information on the Project, plans, and an invitation to attend a Community Feedback Session;
- Posting of the information letters in several public locations, including the notice board of the local community association (June 2012);
- Delivery of the letters to key stakeholders, including the Pindimar-Bundabah Community Association; the NSW Oyster FarmersôAssociation; the Commercial Fishermenôs Co-Operative; and local State and Federal Members of Parliament (June 2012);
- The holding of a Community Feedback Session (July 2012), involving a presentation about the Project and the environmental assessment process, and an invitation to raise issues of concern to be addressed within the EA;
- Hand-delivery of an additional information / update letter to about 250 dwelling houses (similar to the previous distribution list) in April 2013;
- Distribution of letters to local Fishing Co-Operatives seeking information on local fishing grounds (May 2013);
- Operation of a dedicated community feedback email address; and
- Holding of a Community Drop in Session during the EA exhibition stage at the Rural Fire Service Hall in Pindimar on Thursday 27th March 2014. Two Sessions were held from 10am to 1pm and then 3pm to 6pm. The drop in session provided opportunity for the public to speak directly with the proponents and members of EA consultant team.

As a result of the consultation, several queries and submissions were received. Queries were addressed immediately where possible, and the issues raised were considered throughout the environmental assessment process.

1.4 Summary of Response to Submission Report

A total of 228 submissions were received by the close of the public exhibition period. Of these, 217 were from members of the community and 11 were agency submissions. An individual response to each agency submission has been provided in this RTS report, including comments on further information requested and agency conditions of consent.

1.5 Format of Report

This RTS report is structured to clearly summarise agency and community feedback and succinctly respond to the issues raised:

Section 1 – provides background on the process to date

Section 2 – summarises the issues raised by government agencies and the proponentôs responses thereto

Section 3 – summarises the issues raised in supportive submissions

Section 4 – summarises the issues raised by the community and the proponentôs responses thereto

Section 5 – concluding comments and summary of revised commitments

Section 6 – references

Appendices – technical studies on biodiversity and effluent management, responses to agencies recommended conditions of approval, revised statement of commitments and Dr Sandersonôs CV.

2 AGENCY SUBMISSIONS

Agency comments received during the exhibition period are summarised below in **Table 1** with responses. A response to recommended conditions of approval received by agencies is provided in **Appendix 3**.

Table 1: Agency Comments

Comments	Response
Great Lakes Council (GLC)	
Council recommend that Planning & Environment request lodgement of an amended application to enable a complete assessment of the proposal in accordance with S79C of the EP&A Act, with regard to the following matters:	The EA provides a detailed and thorough assessment of environmental impacts. Detailed responses below adequately address all issues raised. Council is not the determining authority pursuant to Part 3A of the EP&A Act and therefore the application does not need to be re-lodged.
The applicant shall be required to identify an on-site effluent disposal area on the site not located in areas identified as being affected by flooding or sea level rise; or within development buffers to the identified watercourse, coastal waters of the state, the adjoining SEPP 14 Coastal Wetlands or the proposed conservation area.	An ñOnsite Effluent Disposal Assessmentò was undertaken by Douglas Partners (2014) and is provided in **Appendix 2**. The assessment identifies an area suitable for installation of an onsite aerated wastewater treatment system (AWTS) within the proposed clearing footprint in accordance with Great Lakes Council's On-Site Management System Development Assessment Framework.

Comments	Response
The applicant shall be required to provide information on the proposed on-site effluent management system and any associated geotechnical report required to determine suitability of the system for the proposed development on the subject site in accordance with Great Lakes Council's On-Site Management System Development Assessment Framework.	See response immediately above.
It is recommended that the pipe infrastructure for the development be moved to the west, along the existing disturbed track in order to avoid any likely impact of construction on the potential Aboriginal midden located on the foreshore of the site.	The pipeline location avoids the known extent of the midden and is supported by the Local Aboriginal Land Council (LALC). OEH have advised (correspondence provided in **Appendix 3**) they would be satisfied that Aboriginal cultural heritage within the development has been appropriately managed provided the midden is secured to the satisfaction of the LALC and a Heritage Management Plan is prepared post-consent.
It is recommended that the bin structures and pumphouse are both relocated to achieve the required 50m setback to all property boundaries.	The pump house and bin structures are approximately 50m from the property boundary. Additional separation to nearby property boundaries is provided by Carruthers Avenue. The pump house and bin structures can be re-located (within reason) to further maximise distance to the property boundaries.

It is recommended that a new Bush Fire Management Report be obtained on the following grounds: a) The author of the Bush Fire Management Report does not appear to be an Accredited Bushfire Consultant (BPAD). b) The report states that the buildings will be classified as class 7 under the Building Code of Australia (BCA) and it is recommended this be reviewed as a classification as class 8 buildings may be more appropriate. c) The fire safety requirements of the BCA need to be addressed given there is no mains water supply to or on the site. d) The report proposes the secondary access to be a walkway only whereas the Planning for Bushfire Protection Guidelines require the provision of "alternate access road". e) Detailing the upgrading of internal roads, bridges and turning areas to the requirements of the Rural Fire Service. f) While the author of the report indicates that the RFS has been consulted during the preparation of the report it is recommend that a formal written response to this report should be provided by the RFS prior to determination.	(a) The author of the report is suitably qualified and experienced to prepare the bush fire management report. (b) The building will comply with Sections 3 and 8 (BAL 40) Australian Standard AS3959-2009 ôConstruction of buildings in bushfire prone areasôand section A3.7 Addendum Appendix 3 of ôPlanning for Bush Fire Protectionô Roofing will be gutterless or guttering and valleys are to be screened to prevent the build-up of flammable material. Any materials used will be non-combustible. (c) RFS have provided specific conditions in relation to water and firefighting supplies, access and construction requirements (refer **Appendix 3**). (d) RFS raised no concern with the walkway as the secondary access from the site. (e) Como Street and Challis Avenue will be upgraded as required by RFS: *Internal access roads shall comply with the layout and details identified on the drawings numbered Figure 14 in the Bushfire Protection Assessment report prepared by Australian Bushfire Protection Planners Pty Ltd, dated 3 Feb 2014, with the 'property access road' to be constructed and maintained in accordance with the section 4.1.3(2) of Planning for Bushfire Protection 2006, except that a reversing bay may be provided in lieu of a loop road or a turning circle. Where a reversing bay is provided it shall be not less than 6 metres wide and 8 metres deep with an inner minimum turning radius of 6 metres and outer radius of 12 metres.* Further detail on the road upgrade plans is provided in **Section 4.4.2** below. (f) RFS has reviewed the Bushfire Management Report provided in the EA and provided recommended conditions of approval based on this report (refer **Appendix 3**).

Comments	Response
There is evidence of both potential and core Koala habitat as defined by State Environmental Planning Policy 44 - Koala Habitat on the subject land therefore the Applicant should be required to commission a qualified ecological consultant to prepare and submit a Koala Plan of Management (KPOM) pursuant to SEPP 44.	SEPP44 does not apply pursuant to cl.6(b) of the SEPP, since the project is not subject to a development application under Part 4 of the EP&A Act. Regardless, Koala habitat will be included in the site Vegetation Management Plan to be prepared in consultation with Council and OEH prior to construction.

The Conservation Area proposed is significantly under-sized, inappropriately located and would not (ecologically or practically) adequately compensate for the negative effects of the proposal either by "avoided clearing" or the permanent enhancement of an area of habitat of sufficient size. It is therefore recommended that the Conservation Area be revised and enhanced. The revision should address significant inadequacies with regards to compensating development impacts on specific ecosystems and threatened species habitat, particularly the Koala and Wallum Froglet.	Umwelt (2014) conducted a peer review of the proposed conservation area and concluded the following (refer **Appendix 1**): ñThe key ecological impacts of the Project include the loss of 0.14 hectares of Swamp Mahogany Paperbark Forest EEC which is proposed to be offset with 0.21 hectares of Swamp Mahogany Paperbark Forest EEC to the north of the impact area, which is considered to comprise an adequate ólike-for-likeô offset at an approximate 2:1 ratio. While the loss of remaining woodland and open forest communities are not proposed to be offset in a strictly ólike-for-likeô sense, the provision of 4.92 hectares of structurally and floristically similar vegetation communities is considered to adequately compensate for the loss of these communities and is considered to be in accordance with OEHôs NSW offset principles for major projects (state significant development and state significant infrastructure). The proposed offset area provides a direct, ólike-for-likeô offset for the threatened fauna species that are expected to be impacted as a result of the Project. The proposed offset provides approximately 5.1 hectares of foraging habitat for the affected species and the modification of existing habitat within the proposed offset area with nest boxes ensures that the loss of roost/nesting trees is adequately compensated. The proposed offset strategy provides a high quality, appropriately located conservation area to compensate for the residual impacts of the Project on biodiversity, that meets the NSW offset principles for major projects policy.ò

Comments	Response
	ñThe wallum froglet (*Crinia tinnula*) was not recorded within the proposed offset area, however the area was not surveyed for amphibians during the flora and fauna surveys. The vegetation community in which the wallum froglet was recorded in the Project Area (Swamp Mahogany Paperbark Forest) does occur within the proposed Offset Area and it is considered likely that this species will occur in the proposed offset area.ò
There remains uncertainty with respect to some details of the actual ecological impacts of the proposed work due to a lack of detail or an ambiguity in the discussion of construction issues. It is recommended that a Construction Management Plan is required to detail appropriate construction methodologies prior to formal determination. A key aspect of this CMP should focus on the pipeline establishment and associated avoidance, mitigation and compensation strategies in pipeline establishment and maintenance.	The site issues are not considered unmanageable and therefore, it is considered appropriate that the Construction Management Plan will be prepared post approval but prior to construction.

Comments	Response
An integrated water management plan is to be prepared for the development having particular regard to the impacts of particulates and nutrients on aquatic ecosystems, within the waters of Port Stephens.	The water treatment process has been amended to incorporate a three stage algae bio-filter, which represents industry best practice and achieves water quality consistent with ANZECC guidelines. The water treatment methods are shown in **Figure 1** and described in **Table 2** below. The treatment process was designed by Graham Housefield who has over 20 yearsô experience in aquaculture as a qualified biologist and research scientist employed with NSW Fisheries. The treatment process represents industry best practice as evidenced by facilities across Australia and overseas. The treatment process was developed in consultation with specialists in the field including Patrick Hone (Fisheries Research and Development Corporation), major abalone farmers Mark Gervis (Sou' West Seafoods Pty Ltd), Anton Krsinliph (Great Southern Waters Pty Ltd) and major prawn farmer (Alistair Dick of Pacific Reef Fisheries) using a comparable treatment system.
A proper assessment to be undertaken on the impact upon the Glossy Black Cockatoo and the Green Turtle.	Umwelt (2014) prepared 7 Part Tests in accordance with Section 5A of the EP&A Act and concluded the Project is unlikely to result in a significant impact on the glossy black cockatoo or green turtle (refer **Appendix 1**).

Comments	Response
Environment Protection Authority (EPA)	
More detail is needed on treatment methods and justification that the assumptions made about the effectiveness of the treatment train are realistic and/or achievable.	More detail on the water treatment methods is shown in **Figure 1** and described in **Table 2** below. Conservative estimates of treatment efficiencies have been used based on extensive review of domestic and international research, 20 years of professional industry experience and product specifications. The proponent has committed to water quality parameters which will be regularly monitored and reported. Performance against criteria will be a requirement of an Environment Protection Licence. Furthermore, maintenance of high quality water is imperative for the success of the aquaculture farm and will be strictly monitored and controlled to ensure product health and optimum production.

Comments	Response
An indication of potential variation in performance of treatment methods and the implications of this for effluent quality.	The water treatment processes rely predominately on physical processes (swirl separators, sedimentation ponds, etc.) that are not affected by biochemical (e.g. salinity) changes. The ozone, UV and biological treatment processes for disease control are also not compromised by biochemical changes. The algae bio-filter maintains a consistent ammonia and phosphorous concentration. Algae growth will be synchronous with the growth in the biomass of the abalone as it is limited by the abaloneôs production of Nitrogen (principally as Ammonia (dissolved)). Therefore, the amount of algae increases (up to N saturation at approximately 2 weeks), maintaining a consistent treatment efficiency commensurate with the amount of ammonia in the effluent. In addition, the treatment systems will be regularly monitored and maintained to ensure optimum performance. Therefore, variation in the performance of the water treatment processes are not likely.

Comments	Response
Given the ecological significance of the proposed discharge location and the proximity to sensitive seagrass populations (*Posidonia*), it would have been prudent to assume more conservative estimations of effluent quality at the discharge point.	Modelling used in the Dilution Assessment (**Appendix 19 of EA**) and remodelled in Section 4.1.2 below, assumed conservative effluent concentrations: • assuming 30% of feed remains uneaten, contributing to nutrient loads • based on full farm capacity • excluding the role of natural bio-filtering • excluding wind-forcing in the model simulations (hence effluent concentrations were maximised) • conservative *Ulva spp* nitrogen uptake rates. Even in a worst possible case modelling outlined in the Dilution Assessment report, the Ammonia is still within the ANZECC marine ecosystem guidelines.

Comments	Response
No account of potential variation in effluent quality has been made due to the effects of seasonal variation in factors such as food conversion, treatment efficient etc.	There is little variation in effluent quality from the proposed operation of the Abalone farm. The likely causes of these minimal variations include: i. Effluent production is commensurate with Abalone biomass, which will continually increase until peak production is reached after approximately 3 years. At this time, the farm will be at capacity, with constant biomass maintained and therefore stabile effluent production rate achieved. ii. Minor seasonal variation in the feeding rate affecting excrement production rates. Cold weather slows Abalone metabolism and therefore there will be decreasing feeding rates and consequent N addition to the effluent. Relatively consistent incoming water quality combined with monitored portioned feeding rates provides a regularity in effluent composition for efficient operation of the various treatment systems. The algae bio-filter maintains a consistent ammonia and phosphorous concentration. Algae growth will be synchronous with the growth in the biomass of the abalone as it is limited by the abaloneôs production of Nitrogen (principally as Ammonia (dissolved)). Therefore, the amount of algae increases (up to N saturation at approximately 2 weeks), maintaining a consistent treatment efficiency commensurate with the amount of ammonia in the effluent.

Comments	Response
The EA suggests biological uptake of nutrients in the ponds is an important nutrient removal mechanism, whereas in practice these systems can become ósaturatedôafter a period of time.	**Section 5.4.3.1** of the EA describes biological uptake in the settlement ponds and qualifies its role as supplementary: *ñNote - while beneficial, the farmôs water treatment regime does not rely on the biological treatment or settlement expected to occur within the Settlement Ponds (i.e. the calculations of potential impacts on water quality at* ***Appendix 19*** *exclude consideration of biological treatment and settlement).ò* The addition of the three-stage algae bio-filter (refer **Section 4.1.1**) will perform an important nutrient removal function. Biological ósaturationôof the *Ulva sp.* occurs at approximately 2 weeks, at which time the algae will be removed from the settlement ponds and fed to the abalone. Algae remaining in the ponds will grow synchronous with the growth in the biomass of the abalone as it is limited by the abaloneôs production of Nitrogen (up to N saturation at approximately 2 weeks).
EPA recommends that the design of treatment trains be carried out by highly qualified and experienced personnel, and that this is also closely scrutinised by independent review.	The treatment process was designed by Graham Housefield who has over 20 yearsôexperience in aquaculture as a qualified Biologist and research scientist employed with NSW Fisheries. The treatment process represents industry best practice as evidenced by facilities across Australia and overseas. The treatment process was developed in consultation with specialists in the field including Patrick Hone (Fisheries Research and Development Corporation), major abalone farmers Mark Gervis (Sou' West Seafoods Pty Ltd), Anton Krsinliph (Great Southern Waters Pty Ltd) and a major prawn farmer using a comparable treatment system (Alistair Dick of Pacific Reef Fisheries). All elements of the treatment train are presented to the EPA for review and assessment, and can be incorporated into the EPL.

Comments	Response
The assumption of a flat effluent concentration (78µgL^{-1} ammonium) takes no account of likely variation in effluent quality. Further the assumption of no oxidised nitrogen in effluent needs to be justified, as this fraction would significantly increase the effective bio-available nitrogen concentration of effluent.	The Environmental Assessment (EA) did not make "the assumption of no oxidized nitrogen in effluent". Rather, it pointed out that abalone excrete nitrogen in the form of ammonia and particulate material (as do most aquatic animals that obtain their energy by oxidizing carbon) and that this was consistent with ammonia being elevated in the receiving waters of other abalone farms, whereas the source of any increase in oxidised nitrogen (NOx) was not clearly resolvable. Bacteria in the sea water of the Bay convert Nitrogen from ammonia to NOx. Some of the bacteria species present in the farm also have this ability however they tend to live on surfaces, are relatively inefficient in marine waters and thus would require a large surface area and residency time to undertake this function and produce a significant result. Therefore as seen in the results for other similar aquaculture farms, the high water turnover and low surface area to volume ratio result in NOx's being unresolvable from background levels. The presence of NOx in the effluent is not the concern, rather it is the extent to which NOx is elevated from the background levels. Background NOx levels are much higher than the modelled concentration of 78 µg/L. It is true to say that the "[NOx] fraction would significantly increase the effective bio-available nitrogen in the effluent" but this is only so because NOx levels are high at the intake and is not the result of effluent from the proposed abalone farm, which produces nitrogen in the form of ammonium, not NOx.

In addition the EPA disagrees with the conclusions reached that winds in the area do not influence nutrient enriched water being directed towards sensitive seagrass beds (Posidonia). The proponent has assessed the wind data for Williamtown and averaged data, however if weather data from a more appropriate station (e.g. Nelson Bay) was used and daily wind variation assessed a different conclusion could have been reached.	"Averaged data" was not used in the EA, instead a plot was used showing the frequency distribution for wind as a function of speed and direction. Winds from the WNW dominate the frequency distribution at Williamtown (which is to say they are the most common wind). The frequency distribution plot clearly shows secondary lobes corresponding to winds from the NE and SE. Such winds are consistent with the well-known afternoon and morning sea breezes - whether observed at Williamtown RAAF Base BOM station or Nelson Bay Marine Rescue NSW ï Port Stephens Unit volunteer station. Tidal transport is much larger (110 thousand megalitres per day) than that driven by these typically light winds. Note that sea breezes attenuate with distance from the sea and that the proposed outlets are further than the monitoring stations at approximately 9 kilometres (km) from the sea, Williamtown is 7km and Nelson Bay is 2km from the sea. Winds from the SE blow from the outlet point to the Posidonia meadow. Wind stress acts upon the top of the water column so surface water above the outlet pipe is blown to the Posidonia meadow (putting aside tides). However, the outlet pipe is at depth, below the vertical level of the Posidonia meadow. In enclosed and semi-enclosed water bodies, the wind drives surface currents downwind but continuity constraints cause hydrostatic pressure gradients which act throughout the water column (as opposed to wind stress acting only at the top of the water column) and drive return flows in the deeper waters. Thus the SE wind does not directly drive water from the outlet pipe over the Posidonia meadow because hydrostatic pressure gradients drive currents in deeper waters. Rather, effluent at depth is transported away from the Posidonia meadows. In order for such effluent to be "blown" onto the Posidonia meadow it must first mix upwards through the current shear in in the water column. Therefore, any effluent transported downwind by surface currents will have been diluted by the shear-diffusion mechanism (**Appendix 19** of the EA provides further references for these physical processes).

Comments	Response
	The important point is that wind-driven currents are strongly sheared in the vertical dimension and so the influence of the wind is to add mixing (without much transport compared to that of the tide). Tides are quite different because they are driven by hydrostatic pressure gradients which are the same throughout the water column. The model simulations (and also the drifter measurements) do show some tidal transport across isobaths. Thus, by not including wind-forcing in the model simulations we actually make a worst-case calculation in which effluent concentrations are maximized. Showing that even in a worst possible case modelling the Ammonia is still within the ANZECC Aquatic ecosystem guidelines.
The contention made in the EA and Dilution Report that the proposed effluent discharge is similar to urban stormwater discharge is incorrect. Rainfall events over urban areas tend to cause brief pulses of stormwater whereas the proposed effluent would be discharged continually, greatly increasing the potential for impacts on the ecology surrounding the discharge location.	Urban runoff events are (arguably) more discontinuous with respect to time but their impact is over a bigger spatial area, that is, they are more continuous with respect to space. Urban discharges from septic tanks continuously seep into the intertidal zone which provides habitat for fixed organisms to grow (and grow older) and increase nutrient concentrations in a way that is more continuous with respect to both space and time. While the proposed pipe flow is continuous, the strong and variable tidal currents ensure that the concentrations are not continuous at locations a short distance away from the point of discharge. Given the rapid dilution, only a very local area is affected and it is affected in a discontinuous way with respect to both space and time. Further, given that the discharge is at depth, uptake by fixed organisms will be minimal near the discharge point, although there would be uptake by planktonic organisms that are subsequently dispersed in much the same way that the nutrient would be otherwise dispersed.

At the adequacy stage of the assessment the EPA advised that the EA needs to investigate options of tunnelling / burying the discharge pipe to prevent direct impacts on seagrass. The EA discounts any impacts of shading due to the effluent pipeline. The EPA disagrees with assessment and in any subsequent provision of conditions the EPA will recommend that a comprehensive survey of seagrass within the shading footprint of the pipeline be undertaken prior to any construction works and at regular three month intervals after construction.	The EA investigated the option of tunnelling or trenching of the pipes under the subtidal seagrass beds as an alternative method to raising the pipes above the seagrass. It was considered this option would have more significant impacts on the seagrass in the long term because of disturbance during construction, direct removal of more seagrass and the slow recovery likely within the disturbance footprint as a consequence of the species of seagrass present. *Posidonia* recovers very slowly after disturbance taking many years to re-establish and efforts in the past to replant *Posidonia* have only had minimal success. In addition, the proposal to raise pipelines over the seagrass beds rather than being positioned directly over the top of beds has been generally supported by Department of Primary Industries (Fisheries) officers (email- Carter, 6 June 2013): ó*The construction of the pipeline over the Posidonia is expected to cause little harm to the marine vegetation due to the ability of the seagrass to grow around and under the suspended pipeline'.* The Aquatic Ecological Assessment recognises the impact of shading to seagrass from the placement of the pipeline (pg23) but compares the proposed pipeline to existing pipelines in similar habitats where impacts of shading were limited to the footprint of the pipeline. This implies that seagrass growing adjacent to the installed pipeline will be unaffected by shading but seagrass growing directly under the pipe may be affected if insufficient light reaches these areas. The need for additional surveys is not considered necessary with respect to the seagrass within the shading footprint as this will be equivalent to the area immediately beneath pipeline which can be estimated from existing information.

Comments	Response
	A monitoring program will be designed for seagrass which will include parameters of seagrass density and condition in areas adjacent to the pipeline along with appropriate reference sites. The monitoring program will include collection of baseline data prior to construction for detection of changes to seagrass communities in association with the pipeline (under and adjacent).
Detail the monitoring locations within the receiving environment (and at reference site elsewhere) in order to establish a zone of influence. Consideration should be given to the use of deployed gels which accumulate pollutants over time (thereby providing a time-integrated measure of pollutant exposure at the site).	Detailed modelling undertaken by renowned geoscientist Dr Brian Sanderson (CV in **Appendix 5**) in **Appendix 19** of the **EA** established the zone of influence, noting nutrient discharges will be *"rapidly diluted by tidal currents near the outlet location"*. The report provides extensive citations of local studies to inform the model. Dr Sanderson has remodelled the nutrient dilution contours (see **Figure 2**) and confirmed the only location where the average ammonia-N concentration (average with respect to time and depth of the water column) exceeds 10µg/L is approximately 25m x 25m. Averaging N concentration only over time, the time-averaged ammonia-N concentrations above 10µg/L are confined close to the discharge point and close to the discharge depth. Three water-based monitoring locations are proposed, each within 10 metres of the Posidonia seagrass bed. Reference site elsewhere are not considered relevant. The localised water quality baseline is well established by extensive research and management plans (BMT WBM, 2011; Umwelt, 2000 etc.). Appropriate monitoring technologies will be discussed with EPA during application for the EPL.

Comments	Response
Monitor the health of the *Posidonia* beds adjacent to the outfall and compare these to reference sites nearby. Parameters should include: • Morphometrics (biomass, leaf area index, shoot length) • Photosynthetic efficiency (measured by PAM) • Epiphytic growth • Sediment properties (organic matter, nutrients, sulphides)	Yes. The Seagrass monitoring program proposed by BioAnalysis (2014) in **Appendix 16 of the EA** will be refined in consultation with OEH and DPI. The monitoring program will include assessing the effects of laying the pipes within the seagrass meadow using a ôBeyond BACIô experimental design. The subtidal seagrasses adjacent to the abalone farm site will be sampled at least twice before and at least twice after the pipes are placed on the seabed. A number of randomly nested sites will be sampled at the disturbed location and at least two independent reference locations at the same spatial and temporal scales. At each site, the density of seagrass (number of shoots), percent cover of seagrass and leaf length would be estimated from within five replicate 0.25m^2 quadrats.
Contingency/response action plan for unexpected increases in nutrient concentrations around the seagrass vicinity of the discharge location is required. Specific remedial actions that will be implemented if the ecological impacts are greater than those predicted in the EA.	Responses/ameliorative measures for unexpected nutrient concentrations of discharge water are described in **Table 5** below. These on-farm responses will also be implemented in response to Port based monitoring results. Ecological changes over time are expected in the natural environment. The ecological condition of the receiving environment is affected by an infinite number of external factors. The contribution of the proposal is limited to pipeline installation and discharge water quality, concentration and rate. Maintaining the discharge water quality parameters, the impact of the proposal on the local ecology will be as modelled.

Comments	Response
Department of Primary Industries – Marine Parks Authority (MPA)	
Vegetation removal should be kept to a minimum, including understorey and shrubs.	Vegetation removal has been minimised in layout and access design. Clearing is limited to the development footprint as described in the EA. The impact of this clearing has been assessed and independently reviewed by Umwelt (2014) **(Appendix 1)** as being not significant.
An appropriately managed vegetation buffer should be retained between the farm and the foreshore.	Yes. A Vegetation Management Plan will be prepared prior to construction.
Water quality monitoring and/or sampling should be undertaken.	Yes. Detailed ecology monitoring plans will be developed prior to construction in consultation with relevant government agencies.
MPA support the proposed mitigation measures for vegetation during installation and maintenance of the pipes.	Yes. A Vegetation Management Plan will be prepared prior to construction.
Department of Primary Industries – NSW Fisheries (Aquatic Biosecurity)	
There will be some loss of seagrasses from the footprint of the supporting structures which will require an ecological offset determined in accordance with Fisheries NSW Policy for environmental offsets.	Impacts are not expected to be significant with only ñshort-term disturbance to mangroves and intertidal sandflats as a result of trenching however these habitats will recover quickly. There will be direct impact to approximately 40m^2 of *Posidonia australis* seagrass as a result of laying inlet and outlet pipelines into the estuary. This will not have any significant impact on the viability of the local population of *Posidonia australis* within the Port Stephens estuary or result in a net loss of *Posidonia australis* seagrasses within the coastal and estuarine waters of NSW. There will be minimal impacts to aquatic ecology as a result of the construction of an access boardwalk across Pig Station Creekò(Umwelt 2014).

Comments	Response
Biosecurity plan should emphasise an obligation for staff to contact NSW DPI in the event of any unexplained mortality.	Yes. Will be incorporated into procedures.
Aquatic Biosecurity notes that formal quarantine provisions under NSW legislation are the decision of the Minister or their delegate. It is suggested that references to the Director of Fisheries and Chief Veterinary Officer in these sections be replaced with relevant State Minister to accommodate administrative differences in delegations levels applying to different functions.	Yes. Changes will be made to the operational documents.
Biosecurity NSW would support the proponent committing to a stand-alone procedure that supports on-farm biosecurity and quarantine requirements, to ensure that the quarantine provisions on-farm are satisfactory. Such a procedure could be clearly articulated in the context of the EA to ensure that biosecurity risks are identified and appropriate treatments applied to mitigate the impact.	Yes. The proponent will liaise with DPI in finalising the Biosecurity protocols for the facility.
It is recommended that any biofouling removed from new broodstock to the facility (that is not of suspected marine pest origin), be disposed of away from the waterway to general waste/landfill.	Noted. Will be incorporated into procedures. All non-liquid waste will be disposed of in general waste/landfill.
Cleaning of new abalone is amended to include that áany effluent from cleaning new broodstock should be treated/decontaminated effectively prior to appropriate disposalô	Noted. Will be incorporated into procedures.

Comments	Response
The EA includes a proposed sentinel program to alert the operator to possible disease in new broodstock that are to be monitored over an 8 week period prior to new stock being moved to general tanks for conditioning. It is suggested that the proponent should consult with relevant NSW DPI epidemiology and virology expertise to ensure that this program is adequate for the purpose intended.	Noted. The proponent will liaise with DPI in finalising the Biosecurity protocols for the facility.
Discussion around suspected disease events ï again, it is suggested that a separate and clear procedure should be developed to outline the steps that farm staff must take if óôis observed or óyôis observed. This could relate to the NSW DPI publication at Appendix 2.	Noted. Will be incorporated into procedures.
The EA mentions various procedures that will be applied for disinfection of liquid waste. It is suggested that the proponent also investigates as to whether these protocols would adequately deactivate Abalone Viral Ganglioneuritis and, if not, include relevant protocols (with input from appropriate technical expertise for de-activation of Abalone Viral Ganglioneuritis).	Noted. Will be incorporated into procedures.
All filtered residues, filters and other solid waste outputs should also be disinfected in accordance with any permit for the aquaculture facility.	Noted. Will be incorporated into procedures.
The department does not generally specify a óthresholdô for levels of mortality beyond which they should be reported, but instead indicate that reports should be made to the department for any unexplained mortality event. The department suggests this should be changed.	Noted. Amendments will be made.

Comments	Response
Discusses baseline of mortality (background levels) ï It is not certain if there is a standard in abalone farming for this, or whether it would be required to be developed in collaboration with the farm and DPI over time (suggesting the latter may be beneficial)? Advice should be sought.	Noted.
Unexplained mortalities must first be investigated by NSW DPI, then any stock remaining to be disposed of according to EPA requirements.	Noted. Will be incorporated into procedures.
It would be useful to outline detection of AVG in NSW facility in the first section of AVG discussion similar to :ðAVG has been detected in retail seafood facilities in region of Sydney, after importation from infected premise in Tasmania during 2011. Decontamination of all affected premises (post tracing and surveillance) was completed under direction of NSW DPI.ð	Noted. Amendments will be made.
NSW DPI disease factsheet for abalone is appropriately appended to Appendix 5. However, it is suggested that it would be of benefit to include this advice to a training package of all farm staff, and to have available for quick reference (i.e. on notice board).	Noted. Will be incorporated into procedures.

Comments	Response
Note that AVG and Perkinsus are on the NSW Declared Disease list in legislation, in addition to the OIE & National Reportable Disease list.	Noted. Amendments will be made.
The declaration of the quarantine areas will be performed with the collaboration of the field veterinarian and Chief Veterinary Officer and Government staff.	Noted. The proponent will liaise with DPI in finalising the Biosecurity protocols for the facility.
Department of Primary Industries – NSW Fisheries (Aquaculture Management)	
Fisheries NSW supports the Oyster Industry Sustainable Aquaculture Strategy (OISAS) identifies Priority Oyster Aquaculture Areas (oyster leases) in Port Stephens and incorporates agreed water quality needs of the oyster industry.	The OISAS identifies the key water quality issue for oysters being sewage disposal. In response to NSW Fisheries request, an onsite aerated wastewater treatment system (AWTS) has been designed for the facility that will ensure protection of waters (refer **Appendix 2**). Suspended solids, pH, salinity, iron and aluminium are also identified as risks to ôhealthy growthô of oysters. Water discharges from the facility will not contribute to the existing pH, salinity, iron, aluminium or faecal coliform concentrations of the Port. The suspended solids concentrations of discharge water of approximately 0.18mg/L is significantly less than the OISAS threshold of 75mg/L. For all other parameters OISAS references the ANZECC Fresh and Marine Water Quality Guidelines, to which the discharges comply.

Comments	Response
Fisheries NSW considers that pump out removal should only be installed if no other feasible disposal options can be identified for the site. It is requested that the proponent undertake an onsite sewage management assessment outlining why the pump out system had been chosen over an onsite sewage treatment system.	A detailed onsite sewage management assessment has been undertaken by Douglas Partners (refer **Appendix 2**) and onsite aerated wastewater treatment system (AWTS) recommended in that report will be used instead of the previously proposed pump out system.
Department of Primary Industries – Crown Lands	
Supports the Monitoring Plans outlined in the EA and the developerôs commitment to on-going monitoring.	Noted.
Crown Lands must be notified immediately of any impacts on Crown Land or its ecosystems resulting from the proposed development.	Yes. Will be incorporated into procedures.
Long term seagrass monitoring and commitment to on-going habitat rehabilitation is required.	Noted. A seagrass monitoring program is proposed in **Appendix 16 of the EA** and will be refined in consultation with OEH and DPI.
A commercial licence would be required for the placement of the proposed marine discharge and uptake pipes on Crown Land or Crown waterways.	Yes. This will be sought prior to works on Crown Land.
Full life-of marine pipelines including maintenance, repairs and any associated rehabilitation of marine ecosystems is required before commercially licensing the marine pipelines.	Full details of pipeline maintenance schedule and works will be provided with the licence application.
Any structure failure must not negatively affect Crown land or Crown waterways.	Yes. Will be incorporated into procedures.

Comments	Response
Any transplantation of Mangroves or Seagrasses, or other environmental works on Crown Land would also require Crown Lands consent.	Yes. Approvals will be obtained prior to construction.
Monitoring of benthic-fauna will be required as a condition of commercial licence, with a similar condition relating to commitment to rehabilitation, if required.	Yes. Detailed ecology monitoring plans will be developed prior to construction in consultation with relevant government agencies.
Any anchoring of structures on Crown Lands must not cause or contribute to any acid sulphate related impacts.	Yes. Prevention, monitoring and management of acid sulphate soil during construction will be incorporated into the Projectôs Construction Environmental Management Plan (CEMP).
Sedimentation must be mitigated so to not impact Crown Land or Crown waterways.	Yes. Erosion and sediment control during construction and operation will be addressed in the Projectôs Construction and Operational Environmental Management Plans.
Construction of the pipeline must involve the use of geofabric, to prevent the spread of suspended sediments to surrounding areas. Methods are to be employed that minimize impacts on mangroves. Crown Lands would require that NSW DPI (Fisheries) consent has been obtained, to cover any harm to any Marine Vegetation during the proposed operation.	Yes. Approvals will be obtained prior to construction. Sediment controls will be incorporated into the Projectôs CEMP.
Means to mitigate any Acid Sulphate Soils disturbance, as outlined in the EA, must be followed.	Yes. Prevention, monitoring and management of acid sulphate soil during construction will be incorporated into the Projectôs CEMP.

Comments	Response
Erosion and sediment control measures both during construction and the life of the Farm must be in place and maintained such that no increased water or sediment affect any Crown land or Crown waterway. This includes Potential run-off via Pig Station Creek and its tributaries into the Port Stephens Crown waterway. Any anticipated increase in flow or sediment yields must be mitigated.	Yes. Erosion and sediment control during construction and operation will be addressed in the Projectôs Construction and Operational Environmental Management Plans.
Crown Lands requires that no damage to ecosystems on Crown land would result from increases in either sediment or nutrient loads, produced by the Farm.	Yes. Environmental impacts during construction and operation will be addressed in the Projectôs Construction and Operational Environmental Management Plans. Detailed ecology monitoring plans will be developed prior to construction in consultation with relevant government agencies.
Crown Lands seeks assurance that no negative medium or long-term impacts will occur in these marine vegetation ecosystems on Crown land.	Yes. Detailed ecology monitoring plans will be developed prior to construction in consultation with relevant government agencies.
Concerned about impacts on marine vegetation where seasonal, compounded or cumulative effects related to nutrient behaviour and eutrophication occur ï such as impacts of Ammonium on Seagrass under potentially varied water pH. More information is required about key individual nutrients, in relation to warm weather conditions, and water quality when potential resultant algal blooms occur.	Yes. Detailed ecology monitoring plans will be developed prior to construction in consultation with relevant government agencies. The discharge concentrations have been reduced to below ANZECC marine ecosystem criteria with the addition of the three stage algae bio-filter. Combined with the rapid dispersion and tidal flushing, it is considered unlikely discharge waters will affect nearby seagrasses.

Comments	Response
Key general Crown Lands concerns in relation to this matter include: i. Accelerated increases of nutrient inputs threatening marine ecosystem resilience and integrity ï potentially leading to loss of biodiversity and shifts in community structure. ii. Increased risk of marine algal blooms, scums, odours and other water quality problems, in response to locally increased Nitrogen inputs. iii. Increased risk of localised, decreased oxygenation in Crown land managed waters and habitats.	Yes. Detailed ecology monitoring plans will be developed prior to construction in consultation with relevant government agencies.
Impacts on neighbours, of pipe discharge effects, must be mitigated.	There are no likely impacts on neighbours, fishers or swimmers from the discharge of suitably treated marine water back into the Port due to the low nutrient concentrations rapidly dispersing beyond the mixing zone. The localised area of elevated nutrient concentrations is not likely to affect recreational use of the Port, since the small mixing zone is located away from usual swimming locations (450m from the shore) and at depth. Navigational signs to be installed above and around the pipes, will also direct water craft away from the discharge areas. The 63cm diameter pipes will not demonstrably restrict access to the shoreline for recreational fishing, being exposed for only 1 hour periods of neap low tide 12 times per year (6 times per year in daylight hours).
Water quality must not exceed recreational ANZECC contact trigger values, in areas where swimming and recreational uses are possible.	

Comments	Response
Rural Fire Service (RFS)	
RFS does not authorise the clearing of vegetation for asset protection zones. Appropriate approvals should be obtained.	Noted. An approval by the Department of Planning and Environment under Transitional Part 3A authorises the associated vegetation clearing, as provided by Section 75U of the EP&A Act.
NSW Office of Environment and Heritage (OEH)	
OEH acknowledges that the proponent has provided a Biodiversity Offset to compensate the loss of biodiversity, including threatened species, ecological communities and their habitat, located in the northern part of the property (i.e. to the north of the proposed development) and as schematically shown on ôFigure 29 ï Northern portion of study area showing the location of the proposed offset areaõ. However, OEH is uncertain if the proposed offset area has been determined in accordance with OEHõs offset principles, particularly in regards to quantum (i.e. size) and its ôlike-for-likeõnature with respect to vegetation types.	ñWhile the loss of remaining woodland and open forest communities are not proposed to be offset in a strictly ôlike-for-likeõsense, the provision of 4.92 hectares of structurally and floristically similar vegetation communities is considered to adequately compensate for the loss of these communities and is considered to be in accordance with OEHõs NSW offset principles for major projects (state significant development and state significant infrastructure). The proposed offset area provides a direct, ôlike-for-likeõoffset for the threatened fauna species that are expected to be impacted as a result of the Project. The proposed offset provides approximately 5.1 hectares of foraging habitat for the affected species and the modification of existing habitat within the proposed offset area with nest boxes ensures that the loss of roosting/nesting habitat is adequately compensatedò(**Appendix 1** Umwelt, 2014).

Comments	Response
Assess the proposed biodiversity offset against OEH guidelines / policies: i. OEHôs *NSW offset principles for major projects (state significant development and state significant infrastructure)*, or ii. Biobanking Assessment Methodology (DECC 2008) utilising the ôBiobanking Assessment Methodology and Credit Calculator Operational Manualô(DECC 2009), the Assessorsô guide to using the Biobanking Credit Calculator v2 (OEH 2012), and OEHôs 2011 policy *'NSW OEH Interim policy on assessing and offsetting biodiversity impacts of Part 3A, State Significant Development (SSD) and State Significant Infrastructure (SSI) projects'* (OEH 2011).	The Project is not seeking a BioBanking agreement due to the lack of suitable credits required by the Project being on the market and the availability of suitable BioBanking offset sites in the region. The Project is therefore subject to an assessment in accordance with the *NSW offset principles for major projects (state significant development and state significant infrastructure)*, in accordance with the DGRs. Detailed assessment of the proposed Biodiversity Offset Strategy against the NSW Government (August 2013) biodiversity offsetting principles for State Significant Development has been undertaken by Umwelt (2014) and provided in **Appendix 1**. Umwelt determined the Biodiversity Offset Strategy is consistent with the principles for the use of biodiversity offsets in NSW.
Any impact on Coastal Saltmarsh EEC should be included in any offset.	ñIt is not proposed to place the proposed pipeline route underground and adverse impacts to Coastal Saltmarsh EEC are not predicted as a result of the Project. The impact of the Project on Coastal Saltmarsh EEC is limited to the construction of pylon locations for the emergency egress across Pig Station Creek as discussed in Section 1.2 in the Wildthing (2013) report. Additional offsets for Coastal Saltmarsh EEC are therefore not required.ò(Umwelt, 2014 ï **Appendix 1**)

Comments	Response
Identify the conservation mechanisms to be used to ensure the long term protection and management of the offset sites.	The Project is not seeking a BioBanking agreement due to the lack of suitable credits required by the Project being on the market and the availability of suitable BioBanking offset sites in the region and OEH note that that they are currently unlike to support a Conservation Agreement under the NPW Act. Austasia Leefield Pty Ltd will work with OEH and Department of Planning to determine the most appropriate mechanism to secure the agreed offset area for the long-term conservation of the site.
The Vegetation Management Plan should be provided with the EA or provided pre-approval.	The Vegetation Management Plan will be prepared in consultation with OEH and the Department of Planning and Environment and will consider the range of factors identified in OEHôs submission on the Project. The site issues are not considered unmanageable and therefore, it is considered appropriate that the Vegetation Management Plan will be prepared post approval but prior to constructionô (**Appendix 1** Umwelt, 2014).
No further archaeological testing of the midden is required. Heritage Management Plan required prior to construction. Secure the midden to the satisfaction of the Local Aboriginal Land Council.	Note these comments are sourced from email dated 16th June 2014 and supersede those in the OEH letter dated 10th April 2014.

Comments	Response
Port Stephens Council	
Concerns regarding the potential impact on the marine environment from discharges of nitrogen and acid sulphate soils.	The water treatment process has been amended to incorporate a three stage algae bio-filter, and now represents industry best practice and achieves water quality consistent with ANZECC guidelines. All discharge concentrations are below the ANZECC marine water quality criteria.
Assessment must ensure the proposal does not negatively affect the viability of existing oyster, prawn and fishing industries operating within the area.	ñNutrients in farm water will be almost immediately diluted to well below background levels and ANZECC trigger levels once released from the farm. No impacts on nearby seagrass beds, oyster farming areas or other ecological or aesthetic values are anticipatedò(**Appendix 1** Umwelt 2014)
The proposed wastewater management system is considered appropriate.	Noted. However, NSW Fisheries and Great Lakes Council requested use of an onsite sewage management system. A detailed onsite sewage management assessment has been undertaken by Douglas Partners (refer **Appendix 2**) and an onsite aerated wastewater treatment system (AWTS) recommended in that report will be used instead of the previously proposed pump out system.
Any approval should require ongoing and independently assessed monitoring of environmental impacts.	Yes. Conditions of the Environment Protection Licence (EPL) will include as a minimum, regular monitoring and reporting of environmental performance against licenced criteria.

Comments	Response
Department of Trade and Investment – Mineral Resources Branch (MRB)	
MRB has no resource issues concerning the project.	Noted.
Petroleum Exploration License (PEL) 458 held by Macquarie Energy Pty Ltd exists over a broad region al area including this site.	Noted.

3 OVERVIEW OF SUPPORTIVE SUBMISSIONS

The supportive submissions noted the benefits of infrastructure, tourism, employment, environmentally friendly, economic benefit to the area and consistency with local zoning.

Infrastructure

- The proposal will provide upgrades to existing roads to the benefit of the local community.

Tourism

- The proposal will provide an opportunity to showcase sustainable aquaculture and attract more visitors for educational purposes to the area.
- The proposal fits perfectly with Port Stephensô rebranding as a fresh produce destination.

Employment

- The proposal provides much needed employment in the area.

Environmentally Sustainable

- Sustainable aquaculture will protect the native Abalone populations.
- The EA confirms the project will not have an environmental impact.

Economic benefit

- Economic benefit provided to the local commercial communities of Tea Gardens and Hawks Nest.

Consistent with land zoning

- The proposal is consistent with the LEP provisions.

4 COMMUNITY ISSUES AND RESPONSES

Issued raised in submissions received from the community and government agencies are summarised in this section. Issues are grouped in broad topics, with sub-set issues listed below.

4.1 Water Quality

4.1.1 WATER QUALITY

Issue

Raised by: Community x 25

- General concern regarding potential for water pollution.
- Solids should not be discharged to the Port
- Consider adopting an Integrated Multi-Trophic Systems Aquaculture (IMTA)

Response

The water treatment process has been amended to incorporate a three stage algae bio-filter, and now represents industry best practice and achieves water quality consistent with ANZECC guidelines. The water treatment methods are shown in **Figure 1** and described in **Table 2** below.

Figure 1: Water Treatment Process

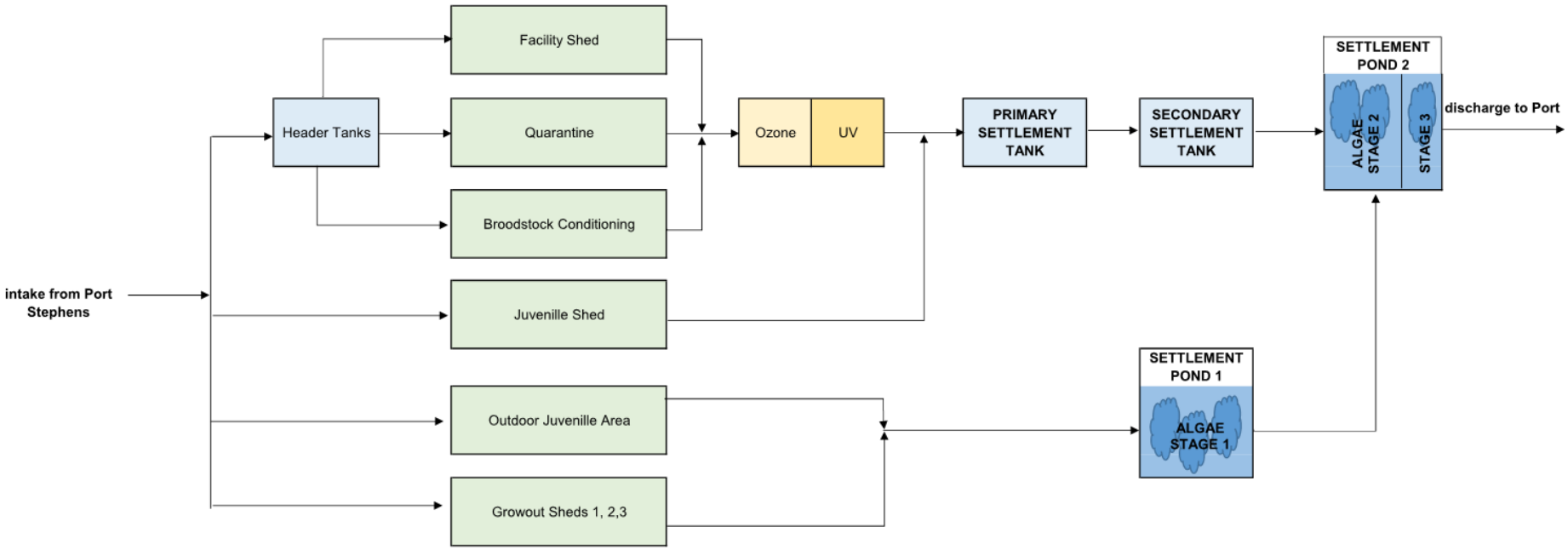


Table 2: Water Treatment Methods

	Water Treatment Technology	Water Treatment Process
Facility Shed	Coarse Screen Filter	Incoming water will pass through a nylon bag filter where larger solids are collected. Bags are removed and solids emptied for disposal and off-site disposal.
	Foam Fractionator	These systems remove suspended and dissolved solids from the water. Foam fractionators concentrate volatile solids, nitrogen, suspended solids, organic acids and bacteria in the foam condensate (Weeks, NC et. al. 1992). Foam fractionation removes particulates less than 30 microns in size (Cripps, S.J, Bergheim, A., 2000). The foam collects at the surface and overtops the fractionator and collects in a weir. The foam is drained and combined with the solids collected from the other systems.
	Bio-filter	Media of large surface area is provided within the tanks to allow bacteria such as nitrobacta and nitrosomas species to colonise and convert ammonia in the water to its less toxic form of nitrate.
Quarantine	Coarse Screen Filter	As above ôCoarse Screen Filterô
	UV Steriliser	Water entering the quarantine tanks will be sterilised by exposure to UV radiation. Water will pass through a cylinder containing a UV globe at a flow rate of 2 - 4 L/minute.
Broodstock Conditioning	Coarse Screen Filter	As above in ôFacility Shedô
	UV Steriliser	
	Foam Fractionator	
	Bio-filter	
Ozone	Ozone contactor	Aeration that has been through an ozoneater is applied to the water.
UV	UV Steriliser	As above ôUV Steriliserô
Growout Sheds (Raceways)	Swirl Separators	Remove waste food, excreta, suspended solids, mucus and other suspended organic materials from the recirculating water stream. Two swirl separators will be installed at the end of each raceway run. The efficiency of these separators depends on design, flow rates and the settling velocity of the particulates

	Water Treatment Technology	Water Treatment Process
		and for solids separation it is within the range of 50-95% (Bergheim, A.; Cripps, S.J., 2002).
	Protein Skimmers (foam fractionator)	As above ôFoam Fractionatorô Four protein skimmers will service each raceway run.
	Ozone (when required)	Ozone may be added to the protein skimmers to reduce populations of bacteria or any other propagules that may be present in a situation requiring full recirculation.
Primary and Secondary Settlement Tanks	Coarse Screen Filter	Coarse Screen Filter will be used to treat the effluent water prior to it entering the settlement ponds in accordance with the Draft Hunter and Central Coast Sustainable Aquaculture Strategy for Land-Based Aquaculture (DPI, 2005). It is proposed that a self-cleaning filter similar to the Triangle Filter TF2400 will be used. Negligible solids are expected since the abalone in the facility shed will be in fasting state.
Settlement Ponds 1 and 2 (containing algae)	Settlement	Water is treated by physical settlement of remaining particulates. Any solids will settle as the water flow rate decreases as it travels through the larger pond area. The settlement system will remove approximately 80% of solid wastes (Huguenin, E & Colt, J 1989, Maguire, G. 1989).
	Three Stage Algae Bio-filter	Algae will be placed in both Settlement Ponds 1 and 2. Settlement Pond 2 is divided into two portions, providing the three algae stages. Each pond will have: • 8mm diameter ropes will be strung across the narrowest width of each of the settlement ponds • Ropes will be suspended approximately 10cm below the pond water level. Sinking ropes will avoid any bird roosting issues. • Ropes will be placed approximately every 800mm across the ponds. • Ropes will be attached to reels at either end and secured on the banks of the ponds. • Suspended from each rope by ôshark hooksôare 1.5m lengths of rope on which the algae will be attached and grow.

	Water Treatment Technology	Water Treatment Process
		• The endemic algae (ulva sp) will be thread through each rope (see **Figures 2 and 3** below). Algae will be bunched and ropes staggered to direct water flow to maximise exposure to algae. • Algae will be left to grow in the ponds for 2 weeks and sequentially harvested using the reels. Algae reach their optimum protein level after 2 weeks of growth, at which time their ammonia absorption uptake rate begins to decrease (Carl, de Nys et al. 2014). • Ropes containing the 2 week old algae will then be laid directly at the base of the raceways for Abalone up to 6 months prior to harvest to consume. • The Abalone will feed directly from the ropes. • Once the majority of algae has been eaten, the ropes will be removed from the raceways and returned to the settlement ponds. Remaining algae portions will regrow and new algae will colonise on the ropes. • Algae will be reseeded if and when necessary in accordance with the procedures outlined in Carl de Nys et. al. (2014).

Figure 2: Example of rope cultivation of algae and an enlarged image showing the plant held within the twists of the long line rope. Source: Elsevier (2005) ñAlgal Culturing Techniquesò

Figure 3: Example of Ulva sp. growing on ropes in a settlement pond.

Dr Sanderson has confirmed that the swirl separators will efficiently remove solid waste, as the water will be extracted from the bottom of the raceways, where concentrations are high. Abalone food is designed to sit on the bottom of the raceway without being washed away and not float like many fish foods are designed to do. Uneaten food would mostly be in the form of large particles and not fine particulates.

Dilution as a proven scientific form of pollution mitigation. Concentration matters for a wide range of physical, chemical, biological and ecological processes. What is beneficial (for whatever/whoever) at one concentration can be disastrous at a different concentration. Dr Sanderson recommends the volume pumped should not be diminished unless the mass of discharged nutrient can be diminished to an even greater extent.

Commercial implementation of Integrated Multi-Trophic Systems Aquaculture (IMTA) would be extending the state-of-the-art with regards to commercial abalone farming in Australia, and particularly so in New South Wales. While there is every prospect that IMTA can be achieved - given analyses for South Africa (Nobre, Robertson-Andersson et al. 2010) and previous work (Neori, Shpigel et al. 2000), there will be a learning curve for commercially implementing the state-of-the-art in this fashion for operation in NSW, Australia.

Dr Sanderson notes the proposed multi-trophic approach also has the potential to facilitate further recirculation and enable a reduced volume of water to be pumped daily from Port

Stephens. Such things should be implemented in a staged fashion, with increased recirculation tested only after IMTA has been successfully demonstrated and reduced pumping from Port Stephens implemented only after it can be demonstrated that this can be done without increasing concentration of nutrients in the discharged effluent.

The settlement ponds will also now incorporate an **algae bio-filter**. Extensive research report consistent performance of algae in reducing ammonia and phosphorous concentrations in effluent water by approximately 60% (Neori, LC Ragg et al. 1998; Hernández, Martínez-Aragón et al. 2002; Neori, Shpigel et al. 2000 and Kirkendale, Robertson-Andersson et al. 2010). Further, this research confirms *Ulva* efficiently removed up to 85% of the ammonium from fish pond wastewater in darkness or light independently of temperature fluctuations (Vandermeulen and Gordin 1990).

Further research (Neori, Msuya et al. 2003) indicates reduction of Total Ammonia Nitrogen (TAN) of 85-90% (i.e. up to 2.9 grams Nitrogen per m^2 per day) can be achieved by increasing the per square metre exchange rate with the introduction of a **three stage algae bio-filter**

Algae Bio-filter

The addition of an algae bio-filter to a treatment process is expected to reduce the concentration of ammonia by approximately 60% (Neori, LC Ragg et al. 1998, Hernández, Martínez-Aragón et al. 2002 and Neori, Shpigel et al. 2000) and a similar rate for phosphorus (Martínez-Aragón, Hernández et al. 2002).

Applying this reduction by simply adding algae on ropes to the settlement ponds would reduce the concentration increment of soluble ammonia to 31.2 micrograms per litre (or 0.57 tonnes per year) and phosphorus to 12 micrograms per litre (or 0.22 tonnes per year). This in turn reduces the size of the mixing zone as recommended in the ANZEEC (2000) guidelines.

Algae bio-filter processes have been developed in various places throughout the world (Al-Hafedh, Alam et al. 2014) and applied at a commercial level in South Africa (Bolton, Robertson-Andersson et al. 2008). Recent Australian research (Carl, 2014; Kirkdendale, 2010) has shown local algae species (Ulva sp.) can be cultured in the ponds onto a medium (rope) that may be then deployed in the proposed raceways without the bulk of the algae floating to the outlet and being washed away.

Ulva has long been considered a good species for seaweed bio-filtration, especially of aquaculture effluent, as it rapidly absorbs and metabolises nitrogen, grows fast unattached or attached, is highly resistant to epiphytism (growth on by another living organism), has a market demand for food (human and other animals) and is present around the world (Mata et al. 2010).

Ulva sp. at a density of 1-2 kg per m^2 of pond surface area has been shown to provide the optimum water exchange rate (Kirkendale, Robertson-Andersson et al. 2010), achieving the 60% reduction in nutrient concentration. Based on the settlement ponds' combined surface area of 1,064 m^2 (only utilising the area where there is a depth of 2 metres to accommodate the hanging ropes), the initial supply of Ulva sp. will be approximately 2 tonne. The initial Ulva sp. installed on the ropes will be sourced from either local Port Stephens wild populations adjacent to the site (under licence if required) or as provided from existing research stock.

Multiple species of green and red algae dominated by Ulva sp. will be used to ensure maximum retention of all variants of Nitrogen, as recommended in the report from Bracken and Stachowicz:

> "*In diverse seaweed assemblages, uptake of either nitrate or ammonium alone was equal to the average of the component monocultures. However, when nitrate and ammonium were available simultaneously, uptake by diverse assemblages was 22% greater than the monoculture average because different species were complementary in their use of different nitrogen forms. [The] results suggest that when individual species have dominant effects on particular ecosystem processes (i.e., the sampling effect), multivariate complementarity can arise if different species dominate different processes*" (Bracken and Stachowicz 2006).

Three stage algae bio-filter

The proposed three stage seaweed bio-filter is based on the research findings that indicate the performance of seaweed ponds depends on the flux of Total Ammonia Nitrogen (TAN) through them. Therefore the effluent with reduced TAN concentration could provide the seaweed with high TAN flux if the water flow increased proportionally.

When concentrations of TAN in discharge water decrease, it is harder for algae to uptake TAN. This can be offset by increasing the water exchange rate i.e. increasing the flow rate of water through the ponds and achieved by sequentially decreasing the size of ponds. Decreasing the size of the ponds by dividing 'Settlement Pond 2' into two portions (one two

thirds and the other one third of the original) by installing a fixed water barrier will increase removal rates to 85-90% of TAN.

The diminished inflow TAN concentrations in algae stages 2 and 3 in ôSettlement Pond 2ô are compensated for by increased water exchange rates inversely proportional to their size (i.e. TAN concentrations decrease at each successive pond, but the efficiency increases by increasing the exchange rate). As water velocity increases, the turbulence exposes greater surface area of water to the algae to improve exchange rates (Neori, Msuya et al. 2003).

The performance of this type of bio-filter has been evaluated under several TAN loads, with a high per square metre exchange rate achieving 85-90% TAN removal (i.e. up to 2.9 grams Nitrogen per m^2 per day). Performance of each seaweed bio-filter correlated not with TAN concentration, but with per square metre TAN loads. Research evidence indicates that the three stage design provides significant functional and economic improvements in seaweed bio-filtration (Neori, Msuya et al. 2003).

Even better results have been achieved in some studies with *Ulva lactuca* ñefficient in capturing and removing all of the inorganic nutrients originating from the abalone cultivation ... equivalent to a 100% removal of the NH4, NO3, and PO4é ò(Macchiavello et al.; 2014).

Therefore, the calculated discharge concentrations of Ammonia are reduced by a conservative 85% to 11.7 micrograms per litre (or 0.22 tonnes per year) (refer **Table 3** overleaf).

As can be seen in **Figure 1** above, some of the out flow doesn't need to go through both ôSettlement Pondsô, only Settlement Pond 2 (with algae stages 2 and 3), as this effluent has already been through a much more rigorous filtration system in house, their flow and nutrient content is already so low.

It is likely the decreased nitrogen and phosphorous concentrations achieved by the use of the algal system will allow increased recirculation of water to the Abalone, thereby reducing the overall facility discharge volumes. The existing design of the inlet and outlet pipes through the pump house allow for this. Existing research on recirculation in Abalone farms has been conducted in South Africa and New Zealand. Research will be conducted onsite to assess the suitable capacity for recirculation for this local Abalone species.

Table 3: Revised Discharge Nutrient Concentrations

Nutrient	Original Proposal Discharge		Revised Proposal Discharge[a] (with three stage seaweed biofilter)		ANZECC Criteria[d] (µg/L)	
	Load (tonnes /year)	Concentration (µg/L)	Load (tonnes /year)	Concentration (µg/L)	Marine Ecosystems	Recreational Purposes
Ammonia	1.43	78	0.22	**12**	15	10
Total Nitrogen	2.07	113	0.31	17	300	-
Filterable Reactive Phosphorus	0.46	25	0.18[b]	10[b]	15	-
Total Phosphorus	0.55	30	0.22[b]	12[b]	50	-
Total Suspended Solids	3.3	180	3.3	180 (0.18mg/L)	<10mg/L[c]	1,000,000

[a] 85% removal rate (Neori, Msuya et al. 2003)
[b] 60% removal rate (Martinez-Aragon et al 2002) applied since the three stage system has not quantified the further reductions achieved in phosphorus concentrations.
[c] ANZECC (2000) Table 4.4.2 Physico-chemical stressor guidelines for the protection of aquaculture species
[d] ANZECC (2000) Australian and New Zealand guidelines for fresh and marine water quality. Volume 1, The guidelines.

All discharge concentrations are below the ANZECC marine and recreational water quality criteria with the exception of Ammonia, exceeding recreational criteria by 2µg/L. It is noted that ANZECC criteria trigger values are conservative assessment values and not a ópass/failôcompliance criteria. Where an indicator is below the threshold value, the risk to the protection of the environmental value is low. Where an indicator is higher than the threshold value there may be a risk that the environmental value will not be protected. This may ótriggerôfurther consideration of the local conditions and ambient levels to determine whether the trigger value is too conservative for local conditions (DEC; 2006). In this instance, there are no likely impacts on neighbours, fishers or swimmers from the discharge of suitably treated marine water back into the Port due to the low nutrient concentrations rapidly dispersing beyond the mixing zone. The localised area of elevated nutrient concentrations is not likely to affect recreational use of the Port, since the small mixing zone is located away from usual swimming locations (450m from the shore). Navigational signs to be installed above and around the pipes, will also direct water craft away from the discharge areas.

Particulates

Raceway swirl separator system retains 80% of solids. Settlement ponds achieve a further 80% retention of the 20% that is received, thereby reducing the amount of total suspended solids discharged to approximately 3.3 tonnes per year. At a concentration of 0.18mg/L, significantly less than the ANZECC criteria of 10mg/L.

4.1.2 EFFLUENT DISPERSION

Issue

Raised by: The Greens, community x 72

- Poor circulation in estuary makes it an inappropriate location for proposal.
- Concern that effluent discharge is continuous as opposed to irregular

Response

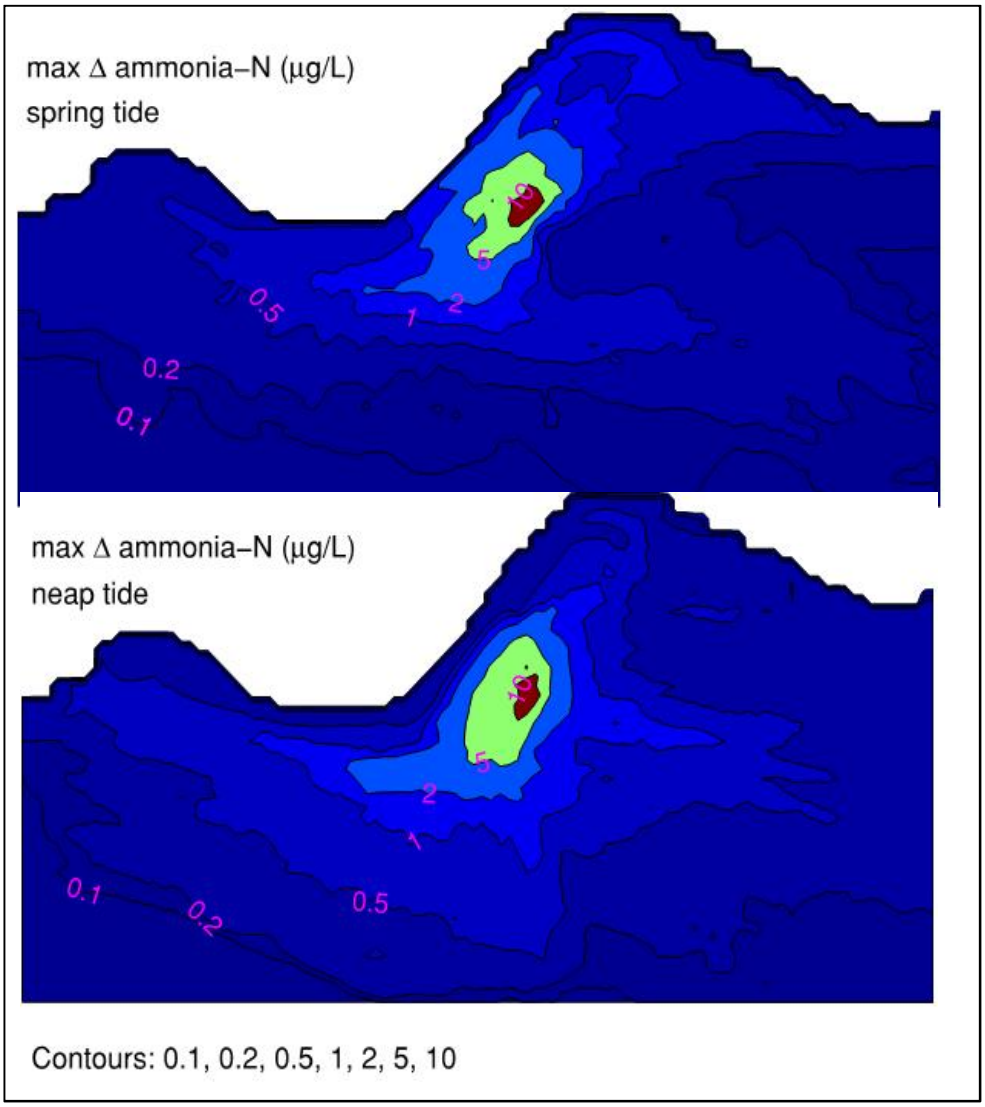
Detailed modelling undertaken by renowned geoscientist Dr Brian Sanderson in **Appendix 19** of the **EA** confirms that discharged nutrients will be *"rapidly diluted by tidal currents near the outlet location"*. The report provides extensive citations of local studies to inform the model.

Dr Sanderson is experienced and respected (his CV is provided in **Appendix 5**), and was engaged to develop the estuary models for the NSW Office of Environment and Heritage (OEH) ï the *"Coastal Eutrophication Risk Assessment Tool"* (CERAT). CERAT uses models to estimate nutrient and sediment loads from coastal catchments in New South Wales, and assess potential impacts of the loads on the ecological condition of the receiving estuary.

The assessment considered the proposed discharge nutrient levels to be minimal in this environment. Now, with the addition of the three stage algae biofilter, the discharge concentrations will be a further 85% less than originally assessed.

Dr Sanderson has remodelled the nutrient dilution contours (see **Figure 4**) and confirmed the only location where the average ammonia-N concentration (average with respect to time and depth of the water column) exceeds 10µg/L is approximately 25m x 25m. Averaging N concentration only over time, the time-averaged ammonia-N concentrations above 10µg/L are confined close to the discharge point and close to the discharge depth.

Figure 4: Maximum Average Concentration of Ammonia-N



The small area exceeding the ANZECC recreational criteria (10µg/L) is unlikely to affect any recreational users since the exceedance is limited to close to the discharge point and discharge depth. Given the pipes and discharge points will be marked with navigational buoys, it is unlikely any recreational uses will occur within the small exceedance area.

Dr Sanderson has reviewed the public submissions regarding dispersion, and provided the following response:

Dr Fyfe raises a concern that the effluent discharge is "continuous as opposed to irregular and temporal like high-nutrient runoff events." Natural runoff events are (arguably) more discontinuous with respect to time but their impact is over a bigger spatial area, that is, they are more continuous with respect to space. One must point out that while the pipe flow is

continuous, the strong and variable tidal currents ensure that the concentrations are NOT continuous at locations a short distance away from the point of discharge. Given the rapid dilution, only a very local area is affected and it is affected in a discontinuous way with respect to both space and time. Further, given that the discharge is at depth, uptake by fixed organisms will be minimal near the discharge point, although there would be uptake by planktonic organisms that are subsequently dispersed in much the same way that the nutrient would be otherwise dispersed. On the other hand, I wonder if septic tanks continuously seep into the intertidal zone which provides habitat for fixed organisms to grow (and senesce) and therefore acts to sequestor material and increase nutrient concentrations in a way that is more continuous with respect to both space and time.

4.1.3 IMPACTS ON SEAGRASSES

Issue
Raised by: community x 23

- Effluent discharge will have a negative impact on seagrasses.

Response
Effluent nutrient and sediment concentrations achieve the conservative ANZECC criteria for aquatic environments and are therefore considered unlikely to negatively affect nearby seagrasses. As discussed in **Section 4.1.2** above and in **Appendix 19** of the **EA**, discharge water will be rapidly dispersed, avoiding any accumulation effects on seagrasses.

The Seagrass monitoring program proposed by BioAnalysis (2014) in **Appendix 16 of the EA** will be refined in consultation with OEH and DPI.

4.1.4 MONITORING

Issue
Raised by: community x 13

- Water quality should be monitored by an independent body at the proponent's expense.
- Monitoring and controls must be 24 hours a day, 7 days a week even when the site is not being staffed.

Response
Water quality will be monitored daily to ensure the levels remain safe for Abalone, marine life and human users.

Discharge levels will be governed by an Environment Protection Licence (EPL) issued by the EPA. The EPL will require regular reporting and publishing of monitoring results.

Proposed trigger levels for monitoring discharges is provided in **Table 4** below. These are based on ANZECC criteria, receiving water conditions and comparable EPLs for other NSW aquaculture facilities.

Table 4: Adopted Monitoring Criteria

Pollutant	Frequency	Adopted Trigger Value (mg/L)
Nitrogen (total)	Monthly	10
Phosphorous (total)	Monthly	1
Biochemical Oxygen Demand (BOD)	Monthly	20
Total Suspended Solids (TSS)	Monthly	200
Dissolved Oxygen (DO)	Monthly	>4
pH	Monthly	6.5-8.5

Three water-based monitoring locations are proposed, each within 10 metres of the Posidonia seagrass bed.

Samples will be collected from the surface water via boat in accordance with NSW EPA *"Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales"* (DEC, 2004). Water samples would be sent to an independent NATA accredited laboratory to be tested.

In addition to EPL monitoring, additional water quality parameters will be tested on a weekly basis for quality control purposes. **Table 5** below describes the acceptable range and the ameliorative measures to be implemented in response to non-compliance.

Field test probe (water quality meter) would be used to measure:

- Temperature
- Oxygen
- Salinity
- pH

Chemical test kit (saltwater compatible) would be used to measure:

- Ammonia

- Nitrite
- Nitrate

Table 5: Weekly onsite water quality monitoring

Parameter	Acceptable Range[1]	Ameliorative Response
Temperature	10°-27°	High Temp Reduce feed to reduce excretion and reduce potential for bacteria build-up. Low Temp Reduce feed in response to reduced feeding demand.
Salinity	25-40 ppt (g/kg)	High Salinity Add fresh water. Low Salinity Recirculate water within farm.
Oxygen	95%-110% saturation	Higher Check pumps at intake pipes to identify where air is being inspirated. Lower Reduce feeding to base metabolic rate. Check solids separates are emptied (decomposing sediment consumes oxygen).
pH	7.5-8.5	High Direct addition of carbon dioxide (bottled soda water) to tank water. Low Add sodium carbonate to inlet pipes at each raceway run.
Ammonia	<0.05mg/L	High Reduce feeding rate until stabilised.

[1] ñManual for Intensive Hatchery Production of Abaloneò Department of Primary Industries (2007)

4.1.5 IMPACT ON OYSTER, PRAWN AND FISHING INDUSTRY

Issue

Raised by: community x 77

- Operational oyster lease is present directly in front of Cambage Street homes, approximately 500m from the proposal.

Response

Independent assessment of the impact on oyster, prawn and fishing industry was conducted by Umwelt (2014) (refer **Appendix 1**) and concluded no likely impact:

> *"Nutrients in farm water will be almost immediately diluted to well below background levels and ANZECC trigger levels once released from the farm. No impacts on nearby seagrass beds, oyster farming areas or other ecological or aesthetic values are anticipated."*

4.1.6 IMPACT ON MARINE ECOLOGY

Issue

Raised by: The Greens, community x 62

- Impacts on dugong, dolphin, crabs, turtles, sharks, stingrays, fish, prawns and black swans.
- Nutrient load will affect aquatic ecology.

Response

Independent assessment of the impact on marine ecology was conducted by Umwelt (2014) (refer **Appendix 1**) and concluded no likely impact:

ñThe Aquatic Ecological Assessment (BioAnalysis 2013) included assessments of impacts to a variety of aquatic communities including likely protected threatened species, populations, ecological communities and habitats adjacent to the site. The report assesses the impacts of the Project on the variety of aquatic habitats present within the study area including seagrasses, benthic communities, mangroves, near shore environments. The report contends that the impact of the Project on these communities will be minimal and therefore the impact of the Project on the broader aquatic environment is considered to be minimal.

The Aquatic Ecological Assessment assessed the impact of the Project on the population of dolphins known to utilise the habitats of Port Stephens. The report states:

> *Dolphins utilise most of the habitat types within the port including seagrass meadows. Dolphins will not be impacted by the proposal as the pipelines are either buried in the intertidal sediments or near the bottom (i.e. the pipe will be elevated 50cm above the seabed) in the seagrass or bare subtidal habitats and there will be no chance of dolphins being injured or snared by the pipes. In addition, Sanderson (2013) predicted that effects on the quality of water pumped through the aquaria and then discharged back into the estuary will be minimal. An assessment of effects on populations of Bottlenose dolphins and dolphins listed under the EPBC Act 1999 that have the potential to live within the Port Stephens*

estuary, has been undertaken within the section 'Threatened Species Assessment'.

The EPBC Act threatened species assessment in relation to dolphin species concluded that the Project will not have a significant impact (BioAnalysis 2013).

The threatened species assessment prepared as part of the Aquatic Ecological Assessment considered the impacts of the Project on the dugong, threatened marine turtles, sharks, whales and fish and concluded that the Project is not likely to result in a significant impact. This conclusion was based on the minimal area if direct impact associated with the emplacement of the discharge and intake pipes and the prediction that nutrients in farm water will be almost immediately diluted to well below background levels and ANZECC trigger levels once released from the farm.

4.1.7 IMPACT ON OTHER WATER USERS

Issue

Raised by: Community x 41

- Pollution will affect local recreational fishing and swimming.
- Possible human health risk from pollution.

Response

There are no likely impacts on neighbours, fishers or swimmers from the discharge of suitably treated marine water back into the Port due to the low nutrient concentrations rapidly dispersing beyond the mixing zone. The localised area of elevated nutrient concentrations is not likely to affect recreational use of the Port, since the small mixing zone is located away from usual swimming locations (450m from the shore). Navigational signs to be installed above and around the pipes, will also direct water craft away from the discharge areas.

4.1.8 TOURISM

Issue

Raised by: Community x 95

- The proposal represents heavy industry that is not conducive to the tourist image of Port Stephens.
- Recreational swimming and water sports will be affected by the water pollution.

- Dolphin/whale/turtle watching, diving, fishing, sailing etc. depend on the pristine nature of the Port being maintained.

Response

The proposed development is a relatively small land-based aquaculture activity, which is classified as a type of agriculture (and not industry) for the purposes of NSW land use planning.

It is acknowledged that Port Stephens is a coastal tourist destination and that a pristine coastline and water based activities are key attractors for visitors. The North Coast of NSW Destination Management Planning Process from June 2013 also identified that specialist food producers and fresh produce are local tourism assets (pp 13, 14).

In order to protect the coastline and water-based activities in the Pindimar locality, the proposed development (buildings, pumphouse, settlement ponds) will be screened by vegetation and surrounding topography and will not be readily visible from the water. The intake and outlet pipes will only be visible during extreme low tide periods (6 times/ year) and will be suitably identified with safety buoys to allow continued recreational use of the waters and shoreline.

Suitable water treatment measures and regular monitoring are proposed to ensure there will be no impact on recreational swimming or water sports, and no impact on marine life from the intake and discharge of water from Port Stephens. The Aquatic Ecology Assessment (**Appendix 16** of the EA) concludes that water discharges will not affect the Portõs water quality

The development will therefore not detract from the tourism image of the area, but may instead provide a source of fresh, specialist food to local cafes and restaurants that may be an additional tourist attractor to the Port Stephens/Great Lakes area.

4.1.9 CHEMICAL USE

Issue

Raised by: Community x 15

- Risk of overflow and accidental spill impacts on groundwater are a concern.
- Potential for flooding to discharge chemicals and contaminants into the Port.

- Calcium hypochlorite, ôVirkonô, ôTrushwashô and ôNapisanô are not included in **Appendix 7** to the EA

Response

Calcium hypochlorite, ôVirkonô, ôTrushwashôand ôNapisanôare all bactericides commonly known as ôbleachô Sodium percarbonate is listed in **Appendix 7** of the EA, and ôTrushwashô and ôNapisanôare commercial names for this chemical. ôVirkonôis a brand of Calcium hypochlorite. Whilst all forms of bleach, Calcium hypochlorite is a chlorine based version of bleach, and will be added to the table in **Appendix 7**.

Chemicals used on the proposed farm are predominately household strength. The volume of chemicals stored is not considered hazardous under *State Environmental Planning Policy 33 (Hazardous and Offensive Development)* and is not considered a risk to the groundwater or the Port.

4.2 Biodiversity

4.2.1 BIODIVERSITY OFFSETS

Issue

Raised by: community x 1

- Offsets should be provided for the aquatic impact area.

Response

Independent assessment of the proposed biodiversity offset was conducted by Umwelt (2014) (refer **Appendix 1**) and concluded that:

> *"The proposed offset strategy provides a high quality, appropriately located conservation area to compensate for the residual impacts of the Project on biodiversity, that meets the NSW offset principles for major projects policy"*
>
> *"It is not proposed to place the proposed pipeline route underground and adverse impacts to Coastal Saltmarsh EEC are not predicted as a result of the Project. The impact of the Project on Coastal Saltmarsh EEC is limited to the construction of pylon locations for the emergency egress across Pig Station Creek as discussed in Section 1.2 in the Wildthing (2013) report. Additional offsets for Coastal Saltmarsh EEC are therefore not required"*
>
> *"The Aquatic Ecological Assessment (BioAnalysis 2013) concludes that the construction and ongoing operation of the Abalone Farm will result in minimal impacts to aquatic species and habitats adjacent to the site or in the estuary in general. There are predicted to be short-term disturbance to mangroves and intertidal sandflats as a result of trenching however these habitats will recover quickly. There will be direct impact to approximately 40m^2 of Posidonia australis seagrass as a result of laying inlet and outlet pipelines into the estuary. This will not have any significant impact on the viability of the local population of Posidonia australis within the Port Stephens estuary or result in a net loss of Posidonia australis seagrasses within the coastal and estuarine waters of NSW".*

4.2.2 VEGETATION IMPACTS

Issue

Raised by: community x 19

- Minimise vegetation clearing
- Vegetated buffer between the farm and the foreshore
- Mangroves should not be cleared.
- Impacts on SEPP14 wetlands

Response

Independent assessment of the impact of the proposal on vegetation was conducted by Umwelt (2014) (refer **Appendix 1**) and concluded ñthe proposed offset strategy provides a high quality, appropriately located conservation area to compensate for the residual impacts of the Project on biodiversity, that meets the NSW offset principles for major projects policyò(Umwelt, 2014:7).

A vegetated buffer from the farm to the foreshore will be retained. Vegetation clearing will be restricted to the development footprint as shown in the EA. Ongoing vegetation management will be addressed in a Vegetation Management Plan to be prepared prior to construction.

Section 5.9.2.1 of the EA details the minor impact the pipeline trenching will have on mangroves. No mangroves will be removed. Several branches will be removed from one mangrove without a demonstrable impact on the plant. The Aquatic Ecological Assessment (**Appendix 16 of EA**) found that ñthe risk to the mangrove habitaté as a result of any construction or operation of the farm is considered to be low or negligibleò(p22).

The proposed evacuation egress is located outside the boundary of the SEPP14 wetlands and will not result in any significant impact.

4.2.3 IMPACT OF PIPELINES

Issue

Raised by: community x 19

- Two intake pipes will suck in and destroy juvenile marine life.
- Plankton will get sucked into the pipes, affecting the food chain.
- Pipefish and seahorse impact is not acceptable.
- Micro tunnelling would be better option to protect the seagrasses.
- Placement of pipes will disturb mangrove vegetation
- Will recreational fisherman still be able to access the shoreline?

- What impact will occur on recreational boats from the submerged objects?

Response

INTAKE INTO PIPES

The proposed pipe inlets will be located at a depth and environment where many species of marine organisms will not be present (i.e. no seahorses or pipefish) or occur in only relatively low numbers (i.e. majority of plankton are within the top 3m, and only 25% or less are likely to be present at pipe inlet depth of approximately 18m).

The velocity of the intake water is so low (lower than tidal currents) that most marine organisms can swim faster than the intake water. This means they can move safely away from the inlet. The pipes will provide additional habitat for pipefish and seahorses.

Plankton may be drawn into the pipes, but evidence from other water extraction facilities in NSW indicates that there is little effect on the regional scale.

It is therefore highly unlikely that there will be a significant effect on marine organisms from the pipe inlets.

Details on the impacts of the pipe intake on organisms are set out in **Section 5.9.2.5** of the **EA**.

FISHING ACCESS

The pipelines will be buried for their land-based extent and emerge at the Indian Spring Low Tide mark, and continue under the water suspended over the seabed. The pipes will be covered by water during typical tide cycles and will be visible during brief 1 hour periods of neap low tide 12 times per year (6 times per year in daylight hours). Even when exposed, the 63cm diameter pipes will not demonstrably restrict access to the shoreline for recreational fishing.

Recreational boating will be maintained at the site. The seabed drops rapidly from the shoreline so the pipes are sufficiently deep (6-18m) to not impede boating use of the area. Navigational buoys/markers will be installed as directed by NSW Roads and Maritime Services to identify the location of the submerged pipes.

MANGROVES

Section 5.9.2.1 of the EA details the minor impact the pipeline trenching will have on mangroves. No mangroves will be removed. Several branches will be removed from one mangrove without a demonstrable impact on the plant.

The Aquatic Ecology Assessment (AEA) (**Appendix 16** of the EA) proposed to minimise impacts on mangroves via careful trench excavation (to avoid root system disturbance) and the transplantation of small seedlings in nearby locations (considered to have a high success rate). A mangrove monitoring regime is also proposed in order to assess the impacts of the construction works on the habitat, including the success of seedling transplantation.

Overall, the AEA found that ñthe risk to the mangrove habitaté as a result of any construction or operation of the farm is considered to be low or negligibleò(p22)

SEAGRASSES

ñThe Aquatic Ecological Assessment (BioAnalysis 2013) concludes that the construction and ongoing operation of the Abalone Farm will result in minimal impacts to aquatic species and habitats adjacent to the site or in the estuary in general. There are predicted to be short-term disturbance to mangroves and intertidal sandflats as a result of trenching however these habitats will recover quickly. There will be direct impact to approximately 40m^2 of *Posidonia australis* seagrass as a result of laying inlet and outlet pipelines into the estuary. This will not have any significant impact on the viability of the local population of *Posidonia australis* within the Port Stephens estuary or result in a net loss of *Posidonia australis* seagrasses within the coastal and estuarine waters of NSW. There will be minimal impacts to aquatic ecology as a result of the construction of an access boardwalk across Pig Station Creekò(Umwelt 2014).

MICRO TUNNELLING (PIPE JACKING)

Micro tunnelling was addressed as an alternative option in **Section 3.6** of the EA. It involves pushing a small tunnelling machine between 2 excavated pits (the launching pit and the receival pit). Pipes are placed into the launching pit behind the tunnelling machine and both are then pushed forward by a set of hydraulic jacks. Additional sections of pipe are progressively added until the tunnel machine reaches the receival pit. While there is the potential to reduce disturbance to seagrass beds utilising this technique, there are also significant risks and constraints, including:

- The complexity and impacts of sealing the launch pit, and boring through soft sand material;
- The potential for lubricant dispersal into the Port from the soft ground bores;
- The risk of leaking at the point of connection of the tunnelled section of pipe to the pipe above substrate;
- The environmental and safety risks associated with the need for a coffer dam (dry enclosure), estimated to be at a depth of over 5 metres;
- The difficulty of applying ballast to the pipes (to prevent their gradual movement up through saturated sediment) using this technique; and
- Unanticipated risks (as use of such a technique in a similar situation has not been known to occur).

Accordingly, this option was considered likely to involve more significant risks of impacts on the Port than the proposed methodology, and was disregarded.

4.2.4 FAUNA IMPACTS

Issue

Raised by: community x 15

- Impacts on koalas and glossy black cockatoos.

Response

Although Koalas were not recorded during the targeted surveys, the sighting of the female koala with a joey near the Project Area and the recent and historical records of koalas within and surrounding the Project Area implies (according to the definition in the SEPP) that the Project Area does represent ñCore Koala Habitatò However, SEPP44 does not apply pursuant to cl.6(b) of the SEPP, since the project is not subject to a development application under Part 4 of the EP&A Act. Regardless, Koala habitat will be included in the site Vegetation Management Plan to be prepared in consultation with Council and OEH prior to construction.

Wildthing (2013) identified potentially suitable foraging habitat in the form of *Allocasuarina torulosa* (Forest Oak), *Allocasuarina littorlais* (Black sheoak) and to a lesser extent *Casuarina glauca* (Swamp Oak) within the Project Area. Suitable large nesting hollows were also observed. Targets surveys for the species did not identify secondary indications of the species through the presence of chewed cones of *Allocasuarina spp.* Beneath potential feed trees. Umwelt (2014) (**Appendix 1**) prepared a 7 Part Test in accordance

with Section 5A of the EP&A Act and concluded the Project is unlikely to result in a significant impact on the glossy black cockatoo. Further, approximately 4.92 hectares of suitable foraging habitat is provided in the proposed biodiversity offset area.

4.2.5 ABALONE BROODSTOCK

Issue

Raised by: community x 7

- Wild stock have disease that will be brought into the farm

Response

Abalone brought onto the farm as broodstock will be sourced from NSW populations where no AVG disease is known to occur. No stock will be sourced from interstate. Rigorous quarantine screening will take place to assess the health of each abalone and to minimise the risk of introducing disease.

4.3 Disease

4.3.1 HIGH TEMPERATURE

Issue

Raised by: The Greens, community x 30

- Temperature will increase mortality rate and disease
- Water discharge to the Port will be cooler

Response

The farm will aim for typical operating water temperatures between 17 and 25 degrees Celsius, with an optimal temperature of 20 degrees. The ambient surface water temperature in the Port near the subject site (i.e. at Soldiers Point) has been recorded as ranging between 9 and 29 degrees Celsius (between 2004- 2012), with an overall average of 20 degrees (source- unpublished data provided by Port Stephens Council). The average temperature of water at greater depths within the Port was not available at the time of writing, but is expected to be lower than the near shore shallow surface water temperature.

The current sea surface temperatures from Nelson Bay (near the proposed site) to Coffs Harbour (south of the northern most extent of the proposed Abalone species according to the Australian Museum) vary from 22.9 to approximately 25.9 degrees Celsius. The sea temperatures in Port Stephens is within this range (Heasman 2006).

Examples of lower critical temperature of 26.9 degrees Celsius are from Tasmanian research where abalone are acclimatised to water temperatures between 17.1 and 10.7 degrees Celsius (BOM website). Given that Abalone stock for this project will be sourced locally, they will be acclimatised to local sea temperatures and therefore could expect that the maximum and optimum temperatures are higher.

Sea Temperature Rise

CSIRO research indicates that sea surface temperature is unlikely to raise by more than 1 degree Celcius by 2030. An overall hotter climate may have a subsequent impact on the ambient temperature of marine water stored and circulated within the proposed farm. In order to manage water temperature, the following measures may need to be implemented and/or undertaken with more frequency:

- Air cooling in Grow-out Sheds (preferably via retro-fitted solar-powered air conditioners);

- The wetting of shed roofs with rainwater to cool buildings (note- the farmôs tanks are anticipated to be full for much of the year;
- The (temporary) recirculation of cooler water within tanks/ raceways; and

Artificial water cooling via ówater chillersôassociated with Abalone tanks and raceways.

4.3.2 VARIABLE SALINITY

Issue

Raised by: community x 11

- The Port experiences variable salinity that will affect the efficiency of the operational controls and increase the risk of disease.

Response

Salinity levels in the Port occur as a part of existing natural processes, especially following severe rainwater storms. **Section 5.4.1** of the EA describes the existing marine water quality and the salinity levels in the Port. While a freshwater halocline (layer) of poorly mixed fresh water can develop on the surface waters of the Port after severe storms, the water quality below 8m depth is generally unaffected and remains óoceanicô in quality (Housefield, G. 2013 pers. comm. 10 February).

Fresh and salty water stratification can develop in the Lower Myall River following large rainfall events (PWD 1978), but this isnôt affecting other physical characteristics such as temperatures (i.e. temperatures measured during a dry weather period on 17th December 1997 showed no vertical stratification in the water column, although there was significant variation along the river (MHL 1999)).

All evidence points to fresh water mixing being limited to surface waters, and since the intake pipes will extract water at depths well below the surface layers, significant variation to the salinity levels of water used within the farm is not expected.

Regardless of the concern about variable salinity, the water treatment technologies rely predominately on physical processes (swirl separators, sedimentation ponds, etc.) that are not affected by salinity changes. The ozone, UV and biological treatment processes for disease control are also not compromised by salinity changes.

There is also no evidence to indicate that the natural changes in salinity levels in the Port (i.e. following severe rainstorms) are affecting the wild populations of abalone. It is therefore highly unlikely that there would be any effects on the farmed abalone.

4.3.3 RISK TO WILD ABALONE POPULATIONS

Issue

Raised by: community x 76

- Recirculation of water after disease identification may be too late to protect wild populations
- Testing and monitoring regime should mitigate likelihood of discharge of contaminated and potentially infected water into Port Stephens.
- Risk scenarios should consider the Victorian Supreme Courtôs decision in *Regent Holdings Pty Ltd v State of Victoria* - 7 November 2013.
- Local environmental conditions will increase stress and the likelihood of disease.

Response

Daily monitoring of abalone health and water quality parameters will ensure rapid response to any contamination or disease. Clean water and healthy abalone are critical to the economic viability of the farm and are closely scrutinised. A qualified and experienced marine aquaculture biologist will monitor the health of all abalone as described in the detailed *Biosecurity and Disease Management Plan* (**Appendix 5** of the EA).

The site provides around a 10km buffer to the nearest wild abalone population. The distance, Port flushing rate and rapid response affords a significant dilution factor to further minimise the risk to wild populations.

The AVG outbreak in Victoria (Victorian Supreme Courtôs decision in *Regent Holdings Pty Ltd v State of Victoria* - 7 November 2013) was attributed to several poor practice factors:

1. Wild stock brought to the farm were not tested for AVG prior to translocation
2. No quarantine protocols of new stock
3. Uncontrolled and un-monitored movement of stock between farms
4. Hybridizing of black lipped/green lipped species (potentially creating a new species of the herpes virus)
5. Inadequate biosecurity protocols (including disposal of live abalone, shell and offal)
6. No internal biosecurity control measures in place to respond to an outbreak

Victorian Department of Primary Industries (DPI) investigated the high rate of mortalities across several farms and confirmed the deaths were the result of AVG. Whilst investigations were underway, DPI allowed virus infected water to continue to be discharged from the farm directly onto a wild abalone habitat, spreading the disease. The lessons learnt from this situation will be applied.

The Pindimar Abalone Farm will operate under strict biosecurity protocols to prevent and manage infection outbreak including:

1. 8 week quarantine period for all new stock
2. Sourcing of brood stock from NSW habitats, with no history of AVG
3. Operational disinfection/hygiene protocols for equipment and staff
4. Daily monitoring and recording of disease indicators
5. Separation from wild Abalone communities
6. Biosecurity response measures to control, contain and treat any identified occurrence of disease (including containing wastewater and holding water onsite)
7. Reporting of any unexplained mortality to NSW DPI.

Section 5.4.1 of the EA describes the good quality of the Port water. ñThe DECCW (2010) study showed that Pindimar Bay and the Lower Myall River do not have poor water quality. Indeed the water quality is typical of estuarine environments, while the ecological health is considered very good, and comparable to other nearby estuarine locations in Port Stephensò (BMT WMB; 2011). Therefore water quality is considered suitable and will not increase abalone stress and the likelihood of disease

4.3.4 MANAGEMENT MEASURES

Issue

Raised by: community x 20

- What are the contingency plans in the event of mass abalone mortality?
- What happens to abalone mortalities?
- Inspection rate of 150 individuals or 2% is not sufficient. 100% inspection should be required.
- Offsite inspection and quarantine should occur.
- Laboratory should be NATA accredited.
- No contaminated material/equipment should be allowed to leave the site.
- Why not breed a different species that does not pose a disease risk?
- Who ensures disease management measures are met?

Response

The contingency plans in the event of mass abalone mortality are described in the *Biosecurity and Disease Management Plan* **Appendix 5** of the EA. This plan is based on current best practice process and protocols prepared by:

- Commonwealth Department of Agriculture

- Australian Aquatic Veterinary Emergency Plan (AQUAVETPLAN)
- NSW Department of Primary Industries
- Department of Primary Industries and Regions South Australia (PIRSA)
- World Organisation for Animal Health

This plan will be refined in consultation with DPI prior to construction.

Management of abalone mortalities is discussed in **Section 3.7.7.8 of the EA** and describes the following:

> *Any Abalone stock mortalities will be assessed for disease in accordance with the Biosecurity & Disease Management Plan. If safe to do so, stock will then be disposed of at the Bedminster Advanced Resource Recovery Facility (ARRF) at Raymond Terrace, along with other solid waste. Note that stock will be kept chilled or frozen until garbage collection days, to minimise odour production.*
>
> *Should any stock be deemed unfit for disposal to the ARRF, appropriate disposal methods will be determined in accordance with the protocols within the Biosecurity & Disease Management Plan (see* ***Appendix 5 of the EA****).*

The proposed inspection rate (150 individuals or 2%) is based on the latest best practice standards for attached exotic marine species, which was established by the Department of Primary Industries and Regions South Australia (PIRSA) in *Policy Guidelines Biosecurity Standards (abalone aquaculture)*. Disease prevention and detection measures will be refined in consultation with DPI and may include measure such as testing broodstock using the PCR test.

Disease prevention commences off-site, with the sourcing of farm breeding stock from only NSW populations (where AVG is not known to occur), with no translocation of specimens from interstate.

The disease risk to wild abalone populations was assessed as *ónegligible - an acceptable risk'* (**Appendix 5** of the EA). Quarantine procedures will isolate new stock for a minimum of 8 weeks, to allow any endemic disease or infection to be identified before the abalone join the existing farm population. Detailed quarantine protocols will be implemented, including the comprehensive disinfection of all quarantine water with ozone and UV treatment after use. Strict hygiene, monitoring, control and record keeping standards will prevent the spread of any disease. Added safety is provided by the 10km buffer distance to the nearest wild abalone population, significantly reducing the likelihood of disease transmission to these populations.

Monthly water samples (as required by the impending EPL) would be sent to a NATA accredited laboratory.

No contaminated material/equipment will leave the site. Only small amounts of solid waste material are expected to be produced within the farm, and are likely to comprise the following:

- **Solid marine waste** - resulting from the marine water treatment processes (e.g. recoverable sediment, waste Abalone food, abalone excrement etc.);
- **Vegetative waste -** resulting from cleaning of tanks and ponds (e.g. excess algal growth);
- **General waste** - arising from the general operation of the farm (e.g. office waste, empty feed packaging, disposable gloves, suits etc.).

All non-recyclable solid wastes will be collected and stored on-site within appropriate garbage receptacles until pick-up by a licensed waste removal contractor. Receptacles containing organic waste (e.g. excess algae) will be fitted with tightly sealing lids to minimise the escape of odours during storage. Disposal of waste is anticipated to occur at the Bedminster Advanced Resource Recovery Facility (ARRF) at Raymond Terrace.

It is noted that the salinity of most of the anticipated waste products (e.g. marine water sediment) precludes the potential for any direct on-farm land application and beneficial re-use.

The onsite biologist is responsible for ensuring the disease management measures are met. Effective disease prevention, identification and management is integral to the production of healthy, saleable abalone and the success of the farm. All mortality and/or disease occurrences are notified to NSW Department of Primary Industries (Fisheries), who would likely investigate should frequent mortalities or disease be occurring.

The abalone species for harvest does not pose a greater disease risk than any other species.

4.4 Amenity

4.4.1 LOCAL AMENITY

Issue

Raised by: community x 92

- Peaceful, tranquil village
- Natural unspoilt setting
- Not suitable for industrial development
- Not want to be commercialised
- Low traffic, quiet community
- Safe community
- Site is not appropriate
- Bin structures and pumphouse should be relocated to achieve a 50m setback to all property boundaries

Response

CHARACTER OF THE AREA

The benefits of the location will not be diminished by the proposal. The proposed development will be visibly and audibly screened to maintain the existing quiet, residential character of the Pindimar village. The proposal will not be obvious to nearby residents or visitors and will not result in any demonstrable impact on local amenity. As requested by GLC, the bin structures and pumphouse will be relocated to achieve a 50m separation from property boundaries.

Water quality of the Port will be closely monitored to ensure marine health and recreational access are maintained.

SUITABILITY FOR AQUACULTURE

Significant research has been invested into the identification of appropriate aquaculture sites around NSW in recent years. In particular, two Government studies identified the subject site as potentially suitable for the Project, as follows:

- The *NSW Land Based Aquaculture Strategy* (NSW Government 2009) maps the subject site as being ópotentially suitable for aquacultureô subject to detailed assessment (i.e. this EA). This suitability was determined based on site variables such as elevation, avoidance of conservation exclusion zones and spatial salinity.

- A site assessment survey, undertaken by NSW Fisheries (Glendenning & Read 2003), identified the subject site's potential for aquaculture, despite its location outside the scope of the study area (i.e. coastal estuaries within 2km of the coast). It noted that the site *has a number of attributes suited to aquaculture development, such as available flat land in close proximity to the water, access to power and sealed road access* (p89).

The subject site was identified as appropriate through a rigorous site selection process. In particular, it was found to meet the site selection criteria outlined within the Project Profile Analysis (prepared by the NSW Government as part of its *Land Based Aquaculture Strategy*). The key reasons for the site's appropriateness are summarised below:

- Its zoning, which permits the development of aquaculture with consent / approval;
- Its separation from nearby sensitive landuses. For example, at least 200m of heavily vegetated bushland separates the site boundary from the nearest dwelling-house. This assists in avoiding land use conflicts;
- Its access to an abundant supply of good quality, well-flushed marine water;
- The appropriateness of the climate for the farming of Blacklip Abalone. For example, the temperature regime is highly suited to the year-round nursery production of Abalone (Heasman & Saava 2007);
- The large size of the site which allows for acoustic separation from nearby landuses;
- Its visual isolation (i.e. the proposed farm area is not visible from public areas), due to the site's large size and the presence of extensive mature forest along all boundaries;
- Its proximity to essential infrastructure, including electricity, telecommunications and an established road network;
- Its proximity to the arterial road network and subsequent access to regional and export markets (i.e. approximately 2.5 hours driving time to Sydney);
- The suitable topographical slope, allowing for the natural cascade of waters within the farm (reducing the need for artificial pumping);
- Its proximity to nearby industrial / commercial services and resources to support construction and operation, such as the Tea Gardens industrial estate;

- Its proximity to residential areas as a source of labour (e.g. Pindimar, Tea Gardens);
- Its proximity to technical expertise, researchers and regulatory authorities (e.g. Port Stephens Fisheries Institute at Taylorôs Beach);
- The availability of land above flood planning levels, including increased flooding impacts arising from climate change;
- Its location outside of conservation exclusion zones; and
- Its capacity to accommodate development without significant impacts to Aboriginal heritage values, or threatened flora or fauna species.

The site allows the development to occur without any significant impact on local amenity or the environment.

4.4.2 TRAFFIC

Issue

Raised by: community x 61

- Cambage Street is local traffic only, currently safe with resident traffic only
- Elderly and children use the street for walking, riding and socialising
- Cambage Street, Como Avenue and Challis Ave all need upgrading to accommodate the proposed traffic.
- Access should be via the existing site access at 180 Clarke Street.
- Daily traffic volumes represent a doubling or tripling of the existing traffic volumes which is not a low impact.
- Traffic assessment does not adequately investigate, assess and record the actual traffic volumes.
- Traffic assessment does not account for heavy vehicles used during construction.
- Traffic assessment does not adequately account for worker trips, heavy vehicles, service vehicles (sewage, biomass, garbage) and educational/research personnel during construction and operation.

Response

The existing traffic on Cambage Street is assumed to be limited to the existing 35 dwellings (approximately). Therefore, based on RMS standard traffic generation rates for dwellings houses of 9 trips per dwelling (RTA, 2002), it can be assumed that daily traffic on the street

would be approximately 315 trips per day. The farm is estimated to generate around 20 x two-way vehicle movements per day during the construction period, and around 12 x two-way movements during the operational period based on the following assumptions:

- eight (8) staff vehicles;
- one (1) Abalone transport;
- one (1) general delivery;
- one (1) garbage collection; and
- one (1) visitor.

This will include a small rigid truck, utility vehicle and trailer, and garbage collection trucks during operation.

The proposal represents a 7.6% increase on the existing traffic volumes during the operational period. This traffic generation is considered to be low and unlikely to affect the amenity, safety or functionality of the local road network. The nature of vehicles using the road during operations is consistent with domestic traffic (i.e. no heavy vehicles) and of volumes comparable with generation expected from three residential dwellings (RTA, 2002).

Construction traffic is also a minor increase on existing traffic volumes (12.7%) and equipment (small earthmoving vehicles, delivery vehicles) and time periods (2 ï 3 months) is not considered to be significantly different to the construction traffic for a residential dwelling, pool or shed in the Pindimar area.

The roads provide safe passage for the existing domestic traffic and this development will not create significant increase in traffic volumes, safety risk or pavement damage. Normal conditions of consent would require an inspection of the roads before and after construction to identify any necessary repairs.

Upgrades to Como Street and Challis Avenue will be undertaken in response to submissions received from RFS and GLC as described in **Table 6** and **Figure 5** below.

Table 6: Road Upgrades

Work	Standard to be provided
Construction upgrading of Como St. including ancillary drainage, from the intersection of Cambage St. to the intersection of Challis Ave.	Widen Como St. to Class 4e standard - 5m gravel width, 200mm thick with a 5m wide two coat bitumen seal from the Cambage St.

	intersection to the rear boundary of No. 13 Cambage St.
Construction upgrading of Challis Ave. including ancillary drainage, from the intersection of Como St. to the property boundary.	Widen Challis Ave. to a Class 4e standard - 5m gravel width, 200mm thick and include a passing bay in accordance with the requirements of the NSW Rural Fire Service.
Construction of an emergency pedestrian egress boardwalk over Pig Station Creek.	Construct a timber boardwalk 2m wide.

Figure 5: Proposed road upgrades

An alternative access to the site was considered via the existing access at 180 Clarke Street, however this would require extensive vegetation clearing and earthworks on the site. The environmental impact of the required clearing is considered more significant than the minor increase in traffic on the nearby residential streets.

4.4.3 ODOUR

Issue

Raised by: community x 10

- Inadequate assessment of odours.

- Air quality effects of exhaust.

Response

Abalone do not produce any odours. They have a digestive system different from other molluscs, utilising absorption in preference to chemical digestion. Abalone excrement is also enclosed in a protein sheath. Excrement is plant-like, being a straight reduction of nitrogen and phosphorous that wasnôt digested and indigestible fibre. There is no bacteria in the excrement. Therefore, there is no odour associated with Abalone excrement (pers comms. Patrick Hone).

Sediment collected by the filters will be removed weekly and placed in sealed plastic bags (reused feed bags) then into the proposed 1.5m^3 waste bin. The sediment will not be exposed for sufficient time to allow decomposition and odour generation.

Decomposition of the minor sediment accumulated in the settlement tanks, will not generate odour due to the minor quantity and high exchange rate of water within the settlement tanks.

The limited and minor nature of any odour generated by this development is demonstrably less than other ôextensive agricultureô operations (such as cattle or goat grazing) that are permissible on the site without development consent.

There is no significant vehicle exhaust arising from this proposal.

4.4.4 VIBRATION

Issue

Raised by: community x 1

- Vibration impacts on nearby houses during construction and ongoing.

Response

The construction required for the farm is consistent with that used for domestic house construction. No pile driving or percussive equipment will be used.

The distance to the nearest residence provides sufficient dissipation to prevent detection of any vibration impacts.

4.4.5 NOISE

Issue

Raised by: community x 56

- Noise from power generator
- Noise from traffic
- The low density population of the village does not represent a ósuburban environmentô
- Industrial/rural baseline noise standards are not appropriate for this tiny, tranquil holiday village.
- Background noise monitors used do not accurately characterise the ambient background noise.
- No assessment of cumulative noise of all equipment operating together.
- Noise monitors should be placed at the proposed source of noise and at the nearest dwelling houses of Cambage Street and on the waterfront for those homes facing Cambage Street.
- Vegetation will not effectively reduce the noise from the pump system.
- Noise will travel across the water to South Pindimar Village especially at dusk, night and dawn.
- Noise impact on nearby vacant rural lots should be considered as these may become residential in the future.
- Noise will be evident 24 hours a day, 7 days a week with no respite.

Response

Section 5.12 of the EA outlines the proposed mitigation measures in relation to noise, and concludes that the noise impacts associated with the construction and operation of the Abalone farm would satisfy the objectives and standards of the relevant State noise regulations, and would not produce any noise that would unreasonably interfere with the amenity of the surrounding quiet area.

NOISE FROM EQUIPMENT AND ACTIVITIES

The acoustic assessment assumed that all equipment was being used during the proposed hours of operation, and that there was a ñpeak hourò traffic condition. The equipment includes water pumps, electricity generator, air conditioner and a delivery truck (see Heggies 2003, pg 5).

Road traffic noise was considered (see Advitech 2011, pg 5) and the relevant policy for road noise sets a higher threshold for noise than the amenity threshold. This means that the development has to meet the quieter requirement, which is the amenity level.

IMPACT ON AMENITY

Ambient (background) noise was measured in the Pindimar area. The noise logger was placed in a location that the acoustic consultant considered *to be representative of typical noise impacts in this receiving environment* (Advitech report, 2011, pg 7- **Appendix 21** to EA). The measurement confirmed that the Pindimar area is a rural receiver, being *an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic* (Advitech report, 2011, pg 9). This is the quietest type of residential receiver for amenity assessment (NSW Industrial Noise Policy, 2000, pg 16). This applies to all houses surrounding the site, and the assessment noise impact is taken at the potentially worst affected residence.

The acoustic consultants then applied the State's noise policy to determine the noise level that would be intrusive (i.e. noise that would be unacceptable over short time periods), and a noise level that would affect the amenity of the area. Details of the noise levels that are adopted are in Table 32 of the EA.

The predicted noise from the operation of the development will not exceed the noise levels set for intrusive or amenity impacts. Wind and temperature inversions were considered, but there was no evidence from the metrological records to show that these weather conditions would affect the site and the noise levels (Advitech, 2011, pg. 11).

4.4.6 LIGHT POLLUTION

Issue

Raised by: community x 8

- Affecting nearby residents
- Affecting the vivid night sky

Response

Minimal outdoor site lighting is proposed around farm facilities, predominantly limited to solar powered path-lighting. The facility will not operate at night so will not require extensive lighting.

External lights on the buildings will be selected and located to direct light towards the ground and minimise light spill.

Given the separation distance and vegetative screening from nearby residents and water, lighting is not expected to be visible beyond the site.

4.4.7 PROPERTY VALUES

Issue

Raised by: community x 5

- How will the proposal affect property values?
- How will land rates be affected?

Response

Property values fluctuate due a range of external factors including Australian dollar value, Reserve Bank home loan rates, market supply and demand, changing population demographics, employment opportunities, infrastructure upgrades etc. Local real estate values benefit from the natural beauty, coastal location, residential character and isolation. Conversely the isolation from employment, distance to services and limited infrastructure restricts property values.

The benefits of the location will not be diminished by the proposal. The proposed development will be visibly and audibly screened to maintain the existing residential character. Water quality of the Port will be closely monitored to ensure marine health and recreational access are maintained.

The proposal will not result in demonstrable off-site impacts that would alter the existing amenity.

The employment and economic benefits the project offers the local community could potentially improve the property values, providing a viable lifestyle for a younger demographic. Local economic benefit would also be gained by academics visiting the site for research opportunities. Staff and visitors would likely utilise local food and retail outlets for regular supplies and consumables.

Land rates are determined based on the activity on the site (urban, rural, industrial, intensive agriculture) as well as the property value. The landowner of the farm is likely to experience a change in their land rates because of change in farming, but this will not change the rating category for adjoining land.

Therefore the proposal is not expected to negatively affect property values or land rates.

4.4.8 UTILITIES

Issue

Raised by: community x 12

- Power supply will not cope with the proposal
- Electricity for pumping water and managing water temperature would exceed local capacity.
- What happens to the environmental control measures during a blackout, especially during extended periods?

Response

The local electricity provider for the area (ôEssential Energyõ) confirmed the existing 11kV network has ample capacity for the existing and proposed demand (pers comms 26.4.14). Three transformers are currently located close to the site. The capacity of these transformers to service the development will be formally assessed following lodgement of an áapplication for connectionõ. The proponent may need to install a new onsite transformer to service the development.

Essential Energy were not aware of any supply interruptions occurring in the area and advised any local outages are likely the result of isolated transformer overload and can be readily addressed by Essential Energy. There are no demand or excess load problems with the network.

A back-up diesel generator capable of continuous operation would be present onsite and utilised in the event of a black out.

4.4.9 WASTE

Issue

Raised by: community x 2

- What happens to the waste biomass?
- What chemicals does the biomass contain?
- What is the frequency of cleaning and disposal of waste?
- How will the removed sediment be treated?
- Sludge must be managed to not affect the marine park
- Particulate waste should not be dumped in the Port.

Response

Sediment waste comprises Abalone excrement (see ***Section 5.4.3 Odour*** above) and uneaten feed scraps.

Abalone will be fed every second afternoon. The feed used is powder, crumb or biscuit depending on the animalôs age, and will be supplemented by the algae grown in the Settlement Ponds. The manufactured food has been especially developed for abalone, using vegetable products and milk proteins.

After feeding, the amount of uneaten food resting on the bottom on the raceways is visually assessed and standpipes are removed. Feeding rates initially applied will be as per product specifications which is likely to be 1.3kg of feed per 1kg of abalone per raceway. If food remains uneaten, the amount of feed will be reduced and adjusted in response to feeding rates to minimise the amount of waste. Saltwater is used to flush the remaining feed and excrement in each raceway to the filters and separators. Frequent flushing (i.e. every second day), provides insufficient time for decomposition of waste and generation of odour.

Raceway filter bags will be collected weekly and their contents placed into used feed bags which are then placed in a 1.5m^3 bin for collection and transported to the ôNewline Waste Facilityô in Raymond Terrace (Bedimister Composting Technology). This facility has confirmed acceptance of this organic waste.

Raceway swirl separator system retains 80% of solids. Settlement tanks achieve a further 80% retention of the 20% that is received. Sediment within settlement tanks will further decompose over time, therefore is unlikely to accumulate sufficiently to require removal. Sediment accumulation will be monitored daily and cleaned if required. **Table 7** below shows the solids budget for the cultivation process.

Unlike freshwater aquaculture by-products, the sediment is buffered by saltwater and therefore does not require drying and liming to adjust pH prior to disposal.

Table 7: Solids Budget

	Rate	Amount of solids (per year)
Maximum Abalone biomass	67.3 tonnes per year [c]	-
Feed input [a]	Feed Conversion Ratio (FCR) 1.5:1	100.95 tonne
Dry feed component	8% moisture	92.87 tonne dry feed
Abalone consumption	11.16%	10.36 tonne consumed 82.51 tonnes of solid remaining in the effluent in the raceways
Swirl separators and protein skimmers	80% removal of solids	66.01 tonne removed (approx. 1.3 tonnes per week) 16.5 tonne remaining in the effluent leaving the raceways
Settlement Ponds	80% removal of solids	13.2 tonne removed (approx. 0.25 tonnes per week) 3.3 tonne remaining in the effluent leaving the settlement ponds
	Total Solids for Disposal [b]	**79.21 tonnes**
	Total Solids in Discharge Effluent	**3.3 tonnes** **(9 kilograms per day suspended in 50 megalitres of water = 0.18mg/L)**

[a] Maguire and Hone (1998) Nitrogen budgets for land-based abalone farms ï a discussion document. Proceedings of the 5th Annual Abalone Aquaculture Workshop.
[b] worse case ignoring breakdown on the pond floor and assimilation by algae.
[c] abalone biomass exceeds the annual production/export amount with the inclusion of the larvae and juvenile stock.

Algae as a food source

Abalone feed will be supplemented by the algae grown in the settlement ponds. Ropes containing 2 week old algae will be removed from settlement ponds and laid directly in the raceways for Abalone to feed on, for up to 6 months prior to Abalone harvest. Once the majority of algae has been eaten, the ropes will be removed from the raceways and returned to the settlement ponds where the algae will be managed sequentially through the 3 pond sections till sufficiently regrown to be used in feeding again.

Ulva-fed abalone can concentrate large amounts of dimethyl sulphonio-proprionate (DMSP) in their tissues (Smit et al. 2007). This can affect saleability of the abalone with the potential for DMSP to create sub-premium odour when heated during canning or other heat based processes that the product may be subject to once it has left the farm. Taste tests have, however, suggested that smaller amounts of DMSP may enhance the taste of wild

and cultured abalone (Robertson-Andersson 2007). A return to a commercial diet for the last 6 months of Abalone growth and together with ULVA for the very last week will depurate the DMSP (Smit et al. 2007) to a level where it enhances taste.

Aside from the environmental benefit of reduced Nitrogen and Phosphorous (due to the uptake by algae and the reduced load of manufactured food) and the lowered food cost over the abaloneôs lifetime the efficiency of the farm will be enhanced, this process will also lead to a more natural coloured shell as the artificial diets tend to make the shell go a green colour.

4.4.10 VISUAL

Issue

Raised by: community x 36

- Visual impact of heavy trucks, machinery etc. has not been considered.
- Visual impacts for Bundabah and North Arm Cove residents.
- Visual impact of the pipes will affect water users

Response

The buildings will be screened from view by dense vegetation and topography, not visible from the nearest residents or from the water.

The pipelines will be buried for their land based extent and emerge at the Indian Spring Low Tide mark, and continues under the water suspended over the seagrass and then resting on the seabed. The pipes will be covered by water during typical tide cycles and will only be visible during brief 1 hour periods of extreme low tide approximately 6 times per year during daylight hours.

Vehicles required to access the site during operations will not appear substantially different from domestic vehicles and will not have a demonstrable visual impact. Approximately 20 vehicles per day will access the site during each stage of construction. Constructed over three discrete stages over a three year period, each construction period will be approximately 3 months duration and provide substantial respite periods between stages. No vehicles will queue or park on public streets.

Therefore the proposal is considered to have intermittent and minor impact on visual amenity.

4.4.11 DUST

Issue

Raised by: community x 2

- Dust created during construction will affect nearby residents.

Response

Dust generated during construction will be minimised through standard construction measures including:

- Minimising the time bare ground is exposed
- Watering of soil during extended dry periods and high winds
- Minimising the area of land exposed at any one time.
- Install erosion and sediment control devices.

The area required for clearing is separated from the nearest dwelling-house by over 200m of heavily vegetated bushland that would act as a screen to minimise airborne dust leaving the site.

4.5 Aboriginal heritage

4.5.1 IMPACT ON ABORIGINAL HERITAGE

Issue

Raised by: community x 2

- Minimise impact on middens

Response

The proposed pipeline alignment was amended in response to the Aboriginal Heritage Assessment findings. The extent of the midden was ground-truthed and defined onsite by a qualified Aboriginal archaeologist in consultation with the Local Aboriginal Land Council. The preferred pipeline route was ground-truthed using a hand-held GPS and the proposed alignment amended to avoid impact (shown on page 51 of **Appendix 15** of the EA and Page 197 of the EA).

Aboriginal stakeholders have provided written support for the assessment report, the recommended alignment and proposed mitigation measures (**Appendix 15** of the EA).

The project archaeologist has advised that the Aboriginal stakeholders would not support any disturbance to the midden area for investigative purposes.

An Aboriginal Heritage Management Plan will be prepared post-consent in consultation with Aboriginal stakeholders to further detail measures for the protection and management of the midden during construction and operation of the proposal.

Subsequent correspondence received from OEH (email from Nicole Davies dated 16/6/14) amends their advice, instead requiring:

> *"prior to the establishment of the Management Plan for the midden area, it is strongly recommended by OEH and supported by the Land Council that the midden be substantially fenced off, preferably under the supervision of the [Land Council], to ensure the extent of the midden is secure. If the proponent is willing to undertake these works, OEH would be satisfied that Aboriginal cultural heritage within the development has been appropriately managed."*

4.6 Other

4.6.1 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

Issue

Raised by: community x 1

- A CEMP is required to control construction impacts such as acid sulphate soil, erosion etc.

Response

It is usual practice for a CEMP to be prepared after approval is granted and not to accompany the EA. A CEMP will be prepared prior to construction to manage all environmental aspects of construction including erosion and sediment control, access, noise, waste, acid sulphate soils, vegetation protection, dewatering.

4.6.2 ACID SULPHATE SOILS (ASS)

Issue

Raised by: community x 7

- ASS may impact water quality when exposed during construction.

Response

An acid sulphate soil management plan, to be prepared in accordance with accepted guidelines, will be included in the CEMP. A range of techniques are available to address the exposure of ASS during construction. No significant impacts are expected.

4.6.3 BUSHFIRE

Issue

Raised by: community x 2

- Development in a bushfire prone area and a long distance from emergency services

Response

The Rural Fire Service (RFS) have reviewed the Bushfire Assessment Report (**Appendix 22** of the EA) and advised they have no objection to the proposal. The RFS have provided conditions of approval relating to asset protection zones, access, water and utilities, design

and construction and emergency management consistent with the Bushfire Protection Assessment provided in the EA, which are accepted by the proponent.

4.6.4 COMMERCIAL VIABILITY OF THE PROJECT

Issue

Raised by: community x 54

- Who will fund removal of farm infrastructure if the project goes bankrupt?
- A bond should be required to clean up the destruction when the business fails.
- Maximum production rate should be enforced.
- Financial assurance should be provided to manage any future environmental incident.
- Water temperatures are too high for abalone
- Depressed Abalone market will lead to compromised biosecurity measures.

Response

Section 3.7.7.10 of the EA details the site decommissioning and rehabilitation should the farm cease operation at any time after its construction. The farm infrastructure and remaining live stock would be of value to other aquaculture operators.

This proposal is of no greater risk than any other development and is in-fact further incentivised to adhere to environmental and quality commitments, not only to comply with licences and approvals, but to improve the quality and financial return of its product.

4.6.5 AMBIGUITY AND RISK

Issue

Raised by: community x 26

- Terms used in the EA are vague and contradictory - ôminimalôand ôunlikelyô
- No 100% guarantee of no impact. No risks should be taken.
- Misleading information

Response

The nature of environmental assessment is that there is never 100% certainty of impact. Environmental legislation is based on the notion of ôsignificantô effect and ôlikelihoodô of ôpotentialô impact. All development is assumed a level of impact, the assessment is to quantify as accurately as possible, on a precautionary worst case scenario, the potential

impacts and determine the suitability of the project on a balance of positive and negative impacts as per Section 79C of the *EP&A Act 1979*.

4.6.6 ESTABLISH A PRECEDENT

Issue

Raised by: community x 13

- If consent allows treated effluent to be discharged to Port Stephens, it sets a precedent that will then be followed by many.
- Sets a precedent for industrial development in the area

Response

The NSW planning system requires every development application to be assessed individually on its merits in accordance with the EP&A Act. Each development must satisfy the Section 79C factors of consideration to the satisfaction of the determining authority. The presence of this development would be a contributing factor to the cumulative impact assessment of any subsequent development application.

This proposal provides a high level of sensitivity to surrounding residences, existing amenity and the natural environment setting a high standard of development.

4.6.7 NOT MAJOR PROJECT – LIMITED VALUE

Issue

Raised by: community x 26

- Not an essential food to Australians
- Profit likely go overseas at the risk of our environment.
- Short term gain from employment should be weighed against the long term degradation to the water.
- Foreign ownership
- Social impact outweighs gain

Response

The economic benefits of the project will be enjoyed by the local community, with local employment and spending on local supplies (for equipment, technical support, trade backup etc.). The proponents are an Australian company. The Technical Director is also a local Port Stephens resident.

The project will provide additional benefit to a broader audience through research links to Newcastle University, NSW Fisheries and broader aquaculture research collaborations.

The project additionally supports the federal governments ôfood bowl for Asiaô plan to diversity Australiaôs export industry. It also fills demand gaps in the declining wild abalone harvesting and improves the sustainability of the wild abalone population here and abroad.

5 CONCLUDING COMMENTS

The Proposal as described in the EA and in this Response to Submissions Report, is considered a low impact development that will not have a demonstrable impact on visual amenity, noise, dust, odour, traffic, heritage, waste, recreational water use, marine and terrestrial ecology, or water quality. The Proposal has been designed to operate with the best practice technologies to minimise environmental impacts and optimise quality abalone production.

Mitigation measures include:

- Vegetated buffers to residents and the shoreline,
- Deep water discharges,
- Quarantine procedures,
- Biodiversity offset,
- Nest box replacement,
- Protection of Aboriginal heritage,
- Partially buried water pump,
- Partial burial of pipes,
- Water quality monitoring, and
- Elevation of pipes from the seabed.

The following additional measures have been incorporated in response to issues raised:

- Three stage algae biofilter,
- Inclusion of Koala habitat in the site Vegetation Management Plan
- Seagrass monitoring,
- Fencing of identified Aboriginal midden,
- Refinement of the *Biodiversity and Disease Management Plan* in consultation with DPI;
- Installation of onsite aerated wastewater treatment system (AWTS); and
- Upgrades to existing access roads.

A revised Statement of Commitments outlining these matters is enclosed as **Appendix 4**.

Therefore the Proposal is considered suitable and appropriate for approval.

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APPENDIX 1

RESPONSE TO SUBMISSIONS BIODIVERSITY (Umwelt 2014)

APPENDIX 2

ONSITE EFFLUENT DISPOSAL ASSESSMENT (Douglas Partners 2014)

APPENDIX 3

RESPONSE TO AGENCIES RECOMMENDED CONDITIONS OF APPROVAL

APPENDIX 4

REVISED STATEMENT OF COMMITMENTS

APPENDIX 5

DR SANDERSON CV