

## PINDIMAR ABALONE FARM- RESPONSE TO s75H(2) REVIEW ASSESSMENT (EP&A Act)

	Issue	Response
	Department Planning & Infrastructure	
1	Please submit a revised EA (via email or CD) to adequately address the matters outlined in Attachments 1 and 2. A late submission from the NSW Marine Park Authority will be forwarded to you as soon as possible.	A revised, final version of the EA (dated February 2014) has been prepared and submitted.
2	It is requested that when you lodge the revised EA, you include a cover letter which sets out in detail how each of the issues raised in Attachments 1 and 2 has been addressed and provides references to the sections of the document that have been updated, preferably with those sections highlighted.	This Table outlines how each issue raised has been addressed throughout the EA, including references to the relevant sections of the EA and its appendices. Further, all key changes to the EA document since the submission of the Draft version (including those made in response to the issues raised) have been 'tracked' in a separate version of the document, submitted to DP&I for ease of reference.
3	Submissions The statement that 'all submission will be treated as public documents' could be misleading to the reader and may deter those that prefer to ensure that their personal information is not provided to the proponent/or made publically available. The following is an extract from the Department's exhibition advertisement template, which you may reproduce in the EA <i>(see original letter)</i> .	The <i>Guidelines for Making a Submission</i> have been amended generally as recommended- see page xv of the EA.



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4	Plans and maps Regional and local context maps/aerial photographs- It is suggested that the maps (xxi and xxii) are replaced by the high quality aerial photographs in Appendix 22 (Visual Assessment) but updated and annotated with surrounding land use and geographical features including nearby sensitive receptors i.e. closest dwellings, key roads, wetlands, the township of Pindimar, creeks etc. See also EPA's comments. This will enable the community to more easily identify the location of the site in both a regional and local context.	Amended aerial images, incorporating the suggested changes, have been included i.e. <i>Location Plan-Aerial</i> , and <i>Subject Site &amp; Proposed Development- Local Context</i> . Refer to the <b>Executive Summary</b> and <b>Figures 2 and 10</b> .
5	<ul> <li><u>Plans of the proposed building works</u>- Provide a clear site layout plan, <u>simplifying</u> the architect's plans and annotating all of the main buildings and infrastructure, such as: <ul> <li>all cultivation, breeding &amp; water treatment buildings,</li> <li>boardwalk and marine pipe;</li> <li>tanks and storage;</li> <li>staff/office buildings,</li> <li>access roads, internal road network,</li> <li>landscaping.</li> </ul> </li> <li>This site layout plan should replace the existing development overview shown on page xxii.</li> </ul>	As requested an amended plan has been prepared incorporating the suggested values i.e. <i>Proposed Terrestrial Development- Overview</i> . Refer to the <b>Executive Summary</b> and <b>Figure 11</b> .



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6	Broodstock / genetics In the wild, Abalone is known to consist of various sub-populations. The Abalone fishing zones are not necessarily great proxies for the stock structure of the species in NSW. The report has not adequately considered the risks of translocation of Abalone stock <i>within</i> NSW. This is not to say that the risk is significant, but rather the report does not appear to have assessed the risk.	<ul> <li>Section 5.21.2 of the EA provides a detailed risk assessment of genetic material escaping from the farm and potentially interacting with local Abalone populations. Previous studies have indicated that the risk of a spawning event leading to larvae escaping, maturing and spawning again in the wild is less than '4 in a million'. This holds true regardless of the source-location of broodstock, either within or even outside NSW.</li> <li>With regard to disease risk, Section 5.3 of the EA and Appendix 5 (<i>Biosecurity &amp; Disease Management Plan</i>) addresses risks associated with disease within the farm. The risk management measures and protocols hold true for any disease risks associated with the farm, regardless of the source-location of broodstock.</li> <li>However, for the sake of clarity, a new section has been added to the EA (Section 5.25, Abalone Translocation) which addresses the key risks outlined in the National Translocation Guidelines in a consolidated manner.</li> </ul>
7	<ul> <li><u>Marine water quality impacts</u></li> <li>Updates to the EA are requested to ensure the reader can clearly understand marine water quality impacts without referring to appendices or making assumptions, including: <ol> <li>background water quality levels;</li> <li>the expected discharge water quality (i.e. nitrogen and total suspended solids), including the overall load and whether this is within guideline levels;</li> <li>the cumulative impact of the discharge 'load';</li> <li>a clearer explanation of the proposed mitigation measures and/or treatment measures should be provided.</li> </ol> </li> </ul>	<ul> <li>The marine water quality impacts section of the EA (Section 5.4) has been significantly amended as requested. In addition, the supporting report titled <i>Dilution &amp; Transport of Discharged Material from a Proposed Abalone Farm</i> at Appendix 19 has also been significantly amended (and consolidated into a single report from the previous two). These changes are expected to make water quality impacts clearer. In particular: <ol> <li>background water quality levels are discussed in Section 5.4.2 of the EA and in more detail at Appendix 19;</li> <li>the expected discharge water quality is also addressed, along with the expected nutrient loads and a comparison with ANZECC trigger values;</li> <li>the overall impact on background levels of nutrients within the Port is addressed; and the mitigation measures explanation has been revised.</li> </ol> </li> </ul>



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8	Section 5.4.3.2 is not clear: what are the figures on pages 127 & 128 saying about nitrogen levels relevant to the water quality guidelines? The statement that 'plumes are clearly diluted before reaching seagrass beds' has no basis or explanation.	A more detailed explanation of the purpose of the dispersion plumes is provided in <b>Section 5.4.2.1</b> of the EA. Amended <b>Figures 20</b> and <b>21</b> illustrate the expected averaged ammonia concentration in the vicinity of the outlet pipes, arising from the farm's discharge (i.e. not including variable background concentrations). In particular, the figures now also illustrate the ammonia concentration in the vicinity of <i>Posidonia australis</i> seagrass beds. A detailed explanation as to how the plumes are diluted before reaching the seagrass beds is provided.
9	A diagram showing the estimated discharge plume and the location of the marine park sanctuary zone and sea grass beds would be beneficial. This diagram needs a key whereby the concentrations in the plume can be determined by a reader.	These figures have been prepared- refer to amended Figures 20 and 21.
10	<u>Chemicals</u> Chemicals are listed, but other necessary detail has not been provided. As a minimum the classification of the chemical should be included in accordance with the DG code (if relevant).	<ul> <li>Additional information regarding anticipated chemical and pharmaceutical use within the farm is provided at Appendix 7 of the EA, including the Australian Dangerous Goods Code (ADGC) classes and Safety Phrases (where relevant).</li> <li>It is noted that the ADGC relates to the transport of substances by rail or road, and in the case of the farm, is only relevant during vehicular delivery of the chemicals.</li> <li>Appendix 7 provides general information about chemical management/ safety requirements, however relevant Material Safety Data Sheets (MSDS) will provide much more comprehensive information. All chemicals will be managed in accordance with their MSDS.</li> </ul>
11	<u>Marine Flora and Fauna</u> Marine fauna, including benthos and nekton, has only been described in general terms, thus from reading the EA it is difficult to ascertain which species occur in the vicinity of the project site and which species do not. The Department notes that the DPI required the EA to include baseline flora and fauna studies of the benthic environment (see	The 'Benthic Fauna' section of the <i>Aquatic Ecology Assessment</i> ( <b>Appendix 16</b> of the EA) has been significantly amended to more comprehensively address benthic fauna issues. Detailed sampling and analysis of benthic macroinvertebrate assemblages and populations was undertaken at the subject site and in 2 reference locations within the Port, over a range of habitat types. Analysis results indicated no significant differences at the scales examined for the total richness of taxa, but total abundance differed significantly among locations and habitats. Notably, <i>habitats in the vicinity of the proposed pipeline supported relatively low numbers of species and individuals of benthic organisms</i> (p31). This benthic survey provides baseline data that will form the basis of future assessments to monitor



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	Appendix 24). Some information has been included in Appendix 14, but this does not constitute a relevant baseline fauna study.	potential impacts of the pipeline on populations and benthic biodiversity. The Assessment concludes that <i>…it is expected that there would be no measurable changes to the structure and composition of the existing assemblage of benthic macroinvertebrates at the Pindimar location in relation to the reference locations</i> (p35).
		In addition, the 'Fish' section of the <i>Aquatic Ecology Assessment</i> has been amended to include further details of the fish species expected in close proximity to the site, based on previous surveys by others.
12	12 In addition, the Department notes that marine fauna is not placed in a context where a reader can draw a conclusion with respect to whether the area is unique. Further, it is not placed in context with habitat that occurs within the region.	As outlined at (11) above, the results of a benthic macroinvertebrate survey and analysis indicated that the subject site was not significantly different in species richness compared to other reference locations within the Port (with the exception of a 'relative paucity' of fauna).
		With regard to fish species, the <i>Aquatic Ecology Assessment</i> ( <b>Appendix 16</b> ) noted (with reference to previous surveys undertaken by others), all species caught within Pindimar Bay close to the subject site were typical of NSW estuaries and that the total of 60 species caught over all estuaries and the total number of species caught per estuary was very similar (43 for Pindimar Bay, 42 Wallis Lake, Myall River 40) (p36). Further, the assemblages of fish found in and around the Zostera capricorni seagrass and bare habitats at Pindimar are similar to other locations within Port Stephens (p38).
		Accordingly, with regard to marine fauna, the location of the proposed pipelines is considered to be fairly typical of other locations within Port Stephens and other estuaries around NSW, and cannot be considered particularly 'unique'.
13	The likelihood of fragmentation of <i>Posidonia</i> beds from disturbance requires consideration. See also comments from the EPA regarding nutrients.	The Aquatic Ecology Assessment ( <b>Appendix 16</b> ) has been amended to address the potential for fragmentation of <i>Posidonia</i> - see pages 24 and 25. Generally, the Assessment found that <i>loss and fragmentation of seagrass and effects on biota that use different resources within the seagrass meadow will be localised. It is recommended that an appropriately designed monitoring programme be implemented to test this prediction (p25).</i>
14	Additional and more appropriate analysis needs to be undertaken for plankton entrainment. This should include relevant invertebrates and marine fish – the two species quoted are freshwater species. This is not to say that the overall conclusions of	Section 5.9.2.5 of the EA has been significantly amended to more comprehensively address the potential for impingement/ entrainment impacts, including the provision of references to examples of additional marine species.



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the effectiveness of mitigation will change, but at present the information is far from compelling. The conclusion that by placing the intake pipe at a depth of approximately 15 to 20 metres avoids most marine species does not follow logically from the information presented in the report. It may be true but is largely unsubstantiated.	
15 The EA does not appear to consider any potential impacts from the proposed project on dolphins. Cetaceans are listed as migratory species under the EPBC Act. Considerations under the EPBC Act were discussed in section 5.8.2.4., but cetaceans do not appear to have been included. It is important for the EA to acknowledge that the bottlenose dolphin is an iconic species for Port Stephens. Issues associated with dolphins and the potential impacts on the significant dolphin tourism industry is a key issue of concern in the area. While the Department notes that the nature of the proposal is very different from previous aquaculture projects, the initial screening and scoping for the project should have identified dolphins as an issue to consider in appropriate detail. The Department notes that from consultation, DPI identified the need to consider commercial dolphin watching in the assessment.	<ul> <li>Page 41 of the Aquatic Ecology Assessment ('Dolphin Watching') (Appendix 16) now includes specific reference to the commercial dolphin watching industry within the Port. In addition, a more detailed assessment of potential impacts on dolphins is provided, including specific reference to the Indo-Pacific bottlenose species present within the Port. The Assessment concludes that the proposed farm is unlikely to interfere with the local dolphin population.</li> <li>Further, an additional section has been added to the EA (Section 5.19.4) which specifically considers potential impacts of the project on recreational/ commercial fishing and the dolphin watching industry.</li> </ul>



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16	Marine Parks The Department agrees that artificial structures (pipes) can enhance fisheries biodiversity through providing additional habitat for certain species of fish, but does not agree that this necessarily translates into a benefit for Marine Parks. The focus of Marine Parks is the maintenance and where relevant, the recovery of natural habitats. It is suggested that the EA remove any reference to these 'benefits' to the Marine Park.	References to potential habitat enhancement benefits in relation to marine parks have been deleted from the EA as suggested.
17	Section 5.9.2.7 appears to use the concept of "spillover" erroneously or at best ambiguously. In the context of Marine Park planning, spillover refers to the movement of adults, juveniles and propagules from a declared zone into other areas - primarily as a fisheries enhancement tool. It is a highly contentious topic in Marine Park planning. From what has been presented in Section 5.9.2.7., it is uncertain whether spillover is referring to fisheries enhancement or whether it is referring to dispersion of the discharge plume into the marine sanctuary zone. The first is not directly relevant to the project or its assessment and the second is an erroneous use of the term.	As the term 'spillover' has specific meaning within marine park planning jargon, all references to this term have been deleted from the EA.
18	Commercial fisheries Impacts on commercial and recreational	An additional section has been added to the EA, dealing specifically with the potential for impacts on recreational/ commercial fishing, as well as commercial dolphin watching- see <b>Section 5.19.4.</b>



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	fisheries (if any) are not adequately documented with the exception of some possible enhancement of recreational fishing due to the presence of the pipeline.	In summary, the farm is not considered likely to have any impacts on these activities.
19	Terrestrial flora and fauna No offset has been proposed for the clearing of 1 ha of vegetation including 65 trees and 0.14 ha of EEC. See submission from OEH. Further consideration should be given to avoiding and /or mitigating these impacts.	Despite the <i>Statement of Effect on Flora &amp; Fauna's</i> conclusions ( <b>Appendix 13</b> ) that the proposed clearing will not have a significant impact on local ecology, a 5.14 ha conservation area is now proposed in the northern portion of the site. This area encompasses 2 ephemeral drainage lines, associated riparian vegetation and an area of EEC, and equates to an offset ratio of around 2:1. Details are provided at <b>Section 5.8.2</b> of the EA. Officers from both the Office of Environment & Heritage (email- Paull, 24 July 2013) and Department of Planning & Infrastructure (email- Hamann, 25 July 2013) have provided support for the proposed conservation area. The legal mechanism through which the conservation area is to be managed will be determined with government stakeholders should the project gain approval. However OEH & DP&I have provided in-principle agreement that the imposition of a s88 covenant is most appropriate for the ongoing management of this area (email- Hamann & Bath, 17 October 2013).
20	Visual impact The photos provided in the visual assessment (Section 5.14) do not provide a clear indication of how the project will appear from Port Stephens or other land based view points. The Department considers that viewpoints 5-8 in Appendix 22 should replace Plates 34 and 35 in the main body of the EA.	As suggested, plates have been replaced with images from the <i>Visual Impact Assessment</i> . Refer to <b>Section 5.14</b> of the EA.
21	Figure 31 in the EA <i>does</i> provide a good representation of the scale of the development. As such please make this figure larger, and utilise it up-front in the EA i.e. Section 2 – Location and Context.	As <b>Section 2</b> of the EA deals with the <i>existing</i> context of the site, inclusion of an image of the proposed development in this section was not considered appropriate. However, <b>Figure 38</b> has been made larger as suggested, and the same image has been utilised within the <b>Executive Summary</b> to assist readers in interpreting the scale of the development.



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22	<u>Climate change</u> There is no assessment directly referring to climate change as per the DGR's. Section 5.16 refers to 'Flooding' in the context of climate change. Is temperature change (in water or air) likely to have an impact on the growth of Abalone?	The EA has been amended to specifically include a section on climate change impacts- see <b>Section 5.18</b> . This includes a discussion on expected temperature changes and their management.
23	Noise The back ground monitoring locations (Figure 28) are not shown in relation to the proposed project. This Figure should also demonstrate the closest dwellings, and the location of the 'nearest sensitive receptor' which is referred to in Table 32.	As requested, an amended figure has been provided, including the suggested values. Refer to Figure 35.
24	<u>Traffic</u> Access to the site is via 4 key roads (refer page 174), please include these roads on a map which also shows the project location and site access roads.	For ease of reference, the internal road network has been added to <b>Figure 13</b> , and the same figure is replicated in <b>Section 5.11</b> ( <b>Figure 34</b> ).
	NSW Rural Fire Service	
25	Matters which require further clarification: -The standard of public road access to the site from Cambage Street, including the provision of a turning area at the end of the public road.	As discussed with Mr. Creenhaune (RFS), the RFS was particularly seeking further information on turning areas for RFS vehicles at the western terminus of Challis Ave (at the site entrance). In order to address this issue, the <i>Bushfire Protection Assessment</i> (BPA- <b>Appendix 22</b> ) has been amended accordingly. New lockable gates will be installed on the internal access roads west of Pig Station Creek, allowing for a suitable turning area at the intersection of the existing access roads (within the subject site), while still maintaining site security. This proposed ('Y') 'turning head' is illustrated within Figure 14 of the amended BPA. The existing boundary gate will remain, however it will remain unlocked at all times to ensure free access by RFS vehicles.



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		In addition, further details on access standards for fire fighting operations have been included within the amended BPA, including illustration of proposed turning heads throughout the site at Figure 14.
		bushfire matters.
26	-Further detail of the turning area within the site near the sheds.	Confirmation is provided within <b>Appendix 22</b> that a suitable turning area for fire appliances is available at the intersection of roads to the north-west of proposed development. This area is illustrated as a proposed 'turning head' within Figure 14 of <b>Appendix 22</b> (i.e. to be constructed as a 'T' or 'Y' turning head, to provide a 6m radius to internal corners).
27	-The location of the fire fighting water supply tank should be moved closer to the main property access road (e.g. near the car park or office).	As discussed with Mr. Creenhaune (RFS), the position of the water supply tank is most appropriate in its current location as it can be relied upon to supply gravity fed water in all situations. However, as suggested, a 2 x 65mm- outlet Millcock Valve (hydrant) is proposed to be located adjacent to the bin storage area. This will provide connections to the static water supply in close proximity to farm buildings. Refer to Section 4.5 of <b>Appendix 22</b> .
28	Given the potential limitations that may exist for use of the broadwalk during a bushfire event, the EA should also include provision for a safe refuge within the development for staff and fire fighters that may become trapped on the site during a bushfire.	As suggested, the office complex will be designated as an on-site safe refuge area during a bushfire event. This location benefits from shielding by adjacent buildings, and will be identified via appropriate signage. Refer to Figure 15 and Section 4.6 of <b>Appendix 22</b> .
29	References in the BPA report to "safer place" on the foreshore to Port Stephens [off Cambage Avenue]' should not be construed as being a Neighbourhood Safer Place identified by the RFS.	Noted- no changes required.
	Office of Environment & Heritage	
30	Biodiversity The removal of 1.2 ha of remnant vegetation including 65 trees (13 significant habitat	Despite the <i>Statement of Effect on Flora &amp; Fauna's</i> conclusions ( <b>Appendix 13</b> ) that the proposed clearing will not have a significant impact on the local ecology, a 5.14 ha conservation area is now proposed in the northern portion of the site. This area encompasses 2 ephemeral drainage lines, associated riparian



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	trees) will require compensatory actions. This should include the provision of offset land, fauna habitat augmentation and vegetation management actions. It is noted that the last two have been included in the mitigation actions for the project, although there is no provision at this stage for securing an in- perpetuity conservation outcome. It is noted that the area of land within the subject site (51 ha) has the ability to provide such an in- perpetuity conservation outcome for this proposal.	vegetation and an area of EEC, and equates to an offset ratio of around 2:1. Details are provided at <b>Section 5.8.2</b> of the EA. Officers from both the Office of Environment & Heritage (email- Paull, 24 July 2013) and Department of Planning & Infrastructure (email- Hamann, 25 July 2013) have provided support for the proposed conservation area. The legal mechanism through which the conservation area is to be managed will be determined with government stakeholders should the project gain approval. However OEH & DP&I have provided in-principle agreement that the imposition of a s88 covenant is most appropriate for the management of this area (email- Hamann & Bath, 17 October 2013).
	NSW Environment Protection Authority	
31	A minor matter that should be addressed in the EA is the site location descriptions. In describing the location of the site the distances from other locations referred to appear to be based on estimated driving distances not direct line distances. For example the EA states that the site is located 78km north of Newcastle whereas direct line to the site is approx. 40km north-east of Newcastle. This needs to be clarified in the EA.	Noted- the location descriptions have been amended as suggested to reflect direct line distances. Refer to the <b>Executive Summary</b> and <b>Section 2.1</b> .
32	If the proposal proceeds to the public exhibition the EPA requests two hard copies of the EA.	Noted- it is requested that DP&I advises the proponent of the total number of hardcopies required to be produced for exhibition purposes.
33	Pollutant controls The EPA requires further details in relation to	As requested, the <i>Marine Water Quality Management System- Conceptual View</i> (Figure 21 in the EA) has been amended to show the conceptual location of these systems.



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	the pollutant controls to be utilised at the site. A schematic showing the location of all unit operations and descriptions of the pollutant removal mechanisms for any identified controls such as "filtration", "swirl separators" and "protein skimmers" are necessary.	M. Howat (EPA) advised via email on 16 June 2013 that the amended diagram appears to satisfy the EPA's requirements in relation to this query.
34	The project proposes the use of two 2ML capacity ponds proposed to handle 50 ML/day, which is equivalent to approx. 2 hours holding time for settlement. The EA does not appear to provide any data or justification to show whether this holding time is long enough for any materials/ substances that may be in the water column to settle. Justification is needed to support the assumption in the modelling that 62% of the total waste nitrogen will be removed by skimming and/ or settling. If pollutant matter is mostly fine particulates it is unlikely this material will settle in 2 hours resulting in higher nutrient loads being discharged back into Port Stephens than is currently predicted.	The proposed Settlement Ponds are intended to serve as 'polishing systems' or additional buffers to the other filtration/ treatment systems proposed within the farm (listed within <b>Section 5.4.3.1</b> of the EA). A discussion on the nutrient removal efficiency of these other systems is provided in response to (40) below in this Table. Generally, these other systems are expected to remove the vast majority (approximately 80%) of particulate material from the stream <u>before</u> water is discharged into the Settlement Ponds. Research by others (Mudrak 1981- <i>see Reference list at Section 9 of the EA</i> ) indicates that a properly designed sedimentation system for aquaculture farms should be able to remove 85 to 88% of solid wastes (Henderson and Bromage 1988) (although in order to be conservative, the Dilution Report at <b>Appendix 19</b> utilises a total figure of 80% removal efficiency for <i>all</i> farm treatment systems, including the filtration systems and settlement ponds- see p5). The farm's proposed Settlement Ponds have been properly designed in accordance with best practice protocols (for example those indicated by Huguenin, E & Colt, J 1989) and so are expected to achieve at least these rates of removal efficiency. As outlined in <b>Section 5.4.2.2</b> ( <i>Increased Turbidity</i> ) of the EA, based on previous research by Cripps & Bergheim (cited within Theiss et. al 2004), the proposed farm water should only require a residency time of around 2 hours. Accordingly, in a 'worst-case' scenario (e.g. if there is some kind of operational failure of all of the farm's filtration systems), the Settlement Ponds would still remove around 80% of particulate waste before discharge to the Port. In a normal operational scenario, the Ponds would serve to <u>enhance</u> the nutrient removal efficiency of the other treatment systems proposed (i.e. 80%+ efficiency). It is noted that many other Abalone farms around Australia do not utilise settlement systems in Point Boston and Smith Bay in SA), and rely only on coarse filtration methods. Accordingly, th



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		treatment system.
35	There is a risk that the settling ponds could act as a source of nitrogen. In order for the ponds to filter nitrogen they must either bury material in sediments, or remove nitrogen via denitrification. The common problem in these ponds is that denitrification becomes carbon saturated and ineffective. Also, the ponds become favoured habitat for water birds which constitute an added source of nutrients and pathogens. These issues must be addressed in the EA.	The majority of carbon within the water column would be filtered out through the use of swirl separators and other means before water reaches the Settlement Ponds- accordingly there will be negligible carbon added to the Settlement Ponds. Regardless, the ponds will be cleaned out at regular intervals, as outlined within <b>Section 3.7.7.7</b> of the EA ( <i>'Maintenance procedures</i> '). This cleaning process will ensure the ongoing effectiveness of the denitrification process however, as outlined in response (a) below in this Table ( <i>'Additional issues raised by the Environmental Protection Agency 20 November 2013</i> '), the farm <u>does not</u> place any reliance on this process as part of its water treatment train. It should be emphasised that the Settlement Ponds will act essentially as a 'polishing system' or additional buffer to the other water treatment methods proposed (as discussed in <b>Section 5.4.3</b> of the EA). Many Abalone farms around Australia do not include settlement pond systems as they are not considered necessary for the treatment of marine water.
		order to restrict waterbird access (see Section 3.7.7.7 of the EA- 'Maintenance Procedures').
36	The EPA is aware, based on other data / experience primarily obtained from sewerage treatment plant ponds, there is frequently a seasonal signal in performance, with high nitrated concentrations from late Autumn to Spring, however, this has not been taken into account in the modelling. Seasonal variation predictions should be incorporated into the performance predictions of the settling ponds. Maximum total nitrogen, ammonia- nitrogen, total phosphorous, and total suspended solids need to be detailed in the EA	While the proponent is not familiar with the workings of sewerage treatment plants (STPs), it is assumed that the seasonal variations in freshwater STPs may be due to seasonal variations in air temperature (due to the close interactions between sewage waste and the ambient air through the aerobic treatment process e.g. trickle filter systems). The proposed farm will not be using any similar aerobic treatment processes, and so will not be as influenced by the ambient air temperature. The water temperature within Abalone farms is similar to the temperature of the marine water from which it was sourced (before any required cooling applications). These temperatures have much less seasonal variation than might be expected in freshwater systems exposed to air, particularly at the depths from which marine water is proposed to be sourced (up to 20m). Data obtained by the applicant from other Abalone farms (e.g. in South Australia) indicate little presence or variation of Nitrate production, probably because Abalone only excrete Nitrogen as Ammonia and the surface area to volume ratios and low water residency time within the farm/ Ponds (compared to a STP) leaves little opportunity for bacteria to convert the Ammonia to Nitrate.



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		Note that the biomass of Abalone throughout the year (and the associated waste production load) is also likely to remain relatively constant, and will not change due to seasonal variations.
		Maximum expected Ammonia concentrations within the Port have been modelled and are discussed in the EA (see <b>Section 5.4.2.1</b> ) and in more detail at <b>Appendix 19.</b> Only Ammonia has been modelled as <i>relative to ANZECC trigger values, the Ammonia increment is by far larger than the increments of other nutrients so attention should be focussed on the dilution of Ammonia. In particular, if dilution is deemed sufficient for Ammonia then dilution will be sufficient for other nutrients (p8, <b>Appendix 19</b>). Nevertheless, anticipated nutrient loads and a discussion of expected concentration increases within the farm outlet pipe have been provided for Total Nitrogen (particulate-N + ammonia-N); Filterable Reactive Phosphorus (FRP) and Total Phosphorus (particulate-P + FRP).</i>
		A discussion of why maximum concentrations are not considered as valuable as averaged increments is provided on p22 of <b>Appendix 19</b> . Generally, averaged increments are most relevant for biological growth because such growth happens over time scales longer than the duration of eddies that come and go at different phases within the tidal period.
		Further discussion on the potential for impacts on seagrasses is provided at response (a) ('Additional issues raised by the Environmental Protection Agency 20 November 2013') below in this Table.
37	The EA needs to include information detailing how the solids and materials collected in the settling ponds will be removed and disposed. Also needed is information on the type/ classification of the waste and predicted volumes of material expected to be collected, and details on the transport and disposal options.	As requested, additional details on the expected pond cleaning processes have been provided within the EA- see Section 5.23.1.
38	The EA needs to be clear if it is proposed to operate the two settling ponds alternatively to allow cleaning/ maintenance works. If so, it is	As outlined in <b>Section 5.23.1</b> of the EA, the ponds are anticipated to be used alternatively during cleaning activities. However this is only likely to occur for short periods (typically 2-3 hours) on rare occasions (perhaps once or twice a year).
	likely that settling time would be reduced to 1 hour when all effluent is entering a single	As the marine water is expected to require a settling time of only 15 minutes within one pond to achieve around 80% settlement of particulates (see response [34] in this Table for further discussion), the use of 1



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	pond.	pond for short periods will have no impacts on water quality outcomes.
39	The EA needs to address impacts on the settling pond system from intense rainfall.	As outlined in <b>Section 5.23</b> of the EA, the ponds have been designed to allow for heavy rainfall events. Any rainwater that falls will generally sit on top of the marine water layer. The ponds will be continuously releasing water to the Port, anticipated to be via a standpipe outlet positioned approximately 30cm below the top of the pond walls. Even if the rainfall event was so intense that the water volume in the ponds temporarily increased (i.e. there was a back-up of water release via the standpipe) the additional 30cm of pond wall height above the outlet will comfortably allow for at least an additional 160,000L of water in each pond before the ponds are at risk of overflowing. Accordingly, the risk of marine water overflowing due to intense rainfall is considered to be low.
40	<u>Modelling and prediction verifications</u> The EPA has concerns about some of the input predictions and subsequent modelling calculations. These concerns are predominantly about lack of evidence/ basis/ justification for input parameters. For example it appears that the predicted amount of waste nitrogen (1.34 t/year) is based on a food conversion ratio of 1:3:1, however there is no justification or evidence provided for this conversion ratio. As noted above there seems to be clear justification for the nutrient removal efficiency of the pollution treatment mechanism, as optimistic assumptions for nutrient removal could lead to significant underprediction of nutrient levels in discharged waters.	The Dilution Report at <b>Appendix 19</b> has been amended significantly in order to provide more clarity with regard to input predictions and modelling calculations. For example, references to appropriate scientific studies are made which support the assumed food conversion rate. The proponent (Housefield) provided the following information in order to support the assumptions within the Dilution Report/ EA around the nutrient removal efficiency of the pollution treatment mechanisms. Note that much of this information is now replicated in <b>Section 5.4.3.1</b> of the EA: The proposed farm intends to use the most modern cost-effective solids management systems. These commonly comprise a series of stages or 'unit processes'. The farm will integrate a number of 'unit processes' so that solids are prepared by one unit process or management regime to be better handled at the next stage. Hence <i>solids controlled stages such as feed management, pre-treatment, primary separation, secondary solids handling and disposal will comprise an integrated solids management system (Cripps, S.J. Bergheim, A, 2000)</i>
		The 'unit processes' proposed to be used within the farm are discussed in more detail below:
		Feed management
		To achieve the above aims the Abalone feeding regime will be documented with comprehensive records of feeding and growth rates along with other variables such as temperature and waste production including nitrogen. Feeding schedules will initially closely follow those advised by the feed producers – such information is freely available (for example, at www.adamamos.com). However continuous attention will be paid to optimising consumption rates in order to achieve efficient feed conversion ratios, thus minimising the amounts of waste produced.



Issue	Response
	<u>Swirl separators</u> Swirl separators will be in place immediately downstream of the main production tanks. This will ensure that solids can be removed from the main water flow, gently and continuously. Thus larger solids will be removed before they have a chance to break up and release nutrients. The efficiency of these separators depends on design, flow rates and the settling velocity of the particulates. Pfeiffer, Osborn <i>et al</i> found in 2008 that swirl separators were at least 80% efficient at separating solids, while other research indicates that the efficiency of solids separation is within the range of 50-95%, dependant on swirl separator design (Cripps, S.J, Bergheim, A. 2000).
	<b>Protein skimmers</b> Foam fractionators (or 'protein skimmers') will also be employed. These systems remove suspended and dissolved solids from culture water. The system concentrates volatile solids, total Kjeldahl nitrogen and total suspended solids, organic acids and bacteria in the foam condensate. Foam fractionation removes particulates less than 30 microns, including bacterial particles (Cripps, S.J; Bergheim, A. 2000). Enrichment factors associated with these systems are 25 (e.g. from 10 to 251 mg/l) for total suspended solids and 44 (e.g. from 0.8 to 346mg/l) for nitrogen TKN (Weeks. N.C. et. al. 1992). Barrut, Blacheton <i>et al</i> found in 2013 that protein skimmers achieved a removal efficiency of around 80% for total suspended solids and their associated Nitrogen within the particle size range of their operating capabilities.
	Screen Filters Screen filters will be used before water release to the Settlement Ponds in accordance with the directives of the <i>Sustainable Aquaculture Strategy for Land-Based Aquaculture</i> . It is proposed that a self-cleaning filter similar to the 'Triangle Filter TF2400' will be used. During operation, screen filters should be more than 80% efficient at removing particles within the targeted filter particle size range.
	Settlement Ponds Settlement Ponds will be used to allow settlement of any remaining particulates i.e. a 'polishing' system to the above mechanisms. The settlement system should be able to remove approximately 80% of the remaining solid wastes that enter the Ponds (Colt, J & Huguenin, E 2002, Maguire, G. 1989). It is anticipated that the above systems will result in a nutrient removal efficiency of significantly greater than 80%. However utilising the precautionary 'worst-case' approach, a conservative figure of 80% has been utilised, as outlined within the Dilution Report (and as recommended by Maguire 1998).



	Issue	Response
41	EPA notes that the modelling only relates to	The proponent (Housefield) has provided the following additional information:
	ammonium and that a proportion of the nitrogen will be in forms such as nitrate and organic nitrogen. The modelling needs to examine total nitrogen and oxidised nitrogen	As outlined above in this Table, data from other Abalone farms (unpublished) indicate little presence or variation of Nitrate probably because Abalone excrete Nitrogen as Ammonia and the surface area to volume ratios and low residency time within the farm/ ponds leaves little opportunity for bacteria to convert the Ammonia to Nitrate.
	concentrations in the vicinity of the outrali and compare such levels to relevant guidance.	The oxidation of Ammonia to Nitrite, and finally the less toxic Nitrate, requires at least two groups of bacteria that are responsible for this conversion — Nitrosomonas (Ammonia) and Nitrobacter (Nitrite to Nitrate). For the bacteria to efficiently do this a substrate that has a high specific surface area (large surface area per unit volume) is required to provide an attachment site for the bacteria. Some common substrates include sand or gravel as used in STPs but the proposed Settlement Ponds will have very limited surface area on which to complete this process (compared to the volume of water i.e. limited to the walls and floors of the ponds) and therefore this oxidation process will be limited. As any sediment that builds up on the walls/ floors of the Ponds (i.e. sludge) will be anoxic (low Oxygen) much of the little Nitrate produced in the oxic layer will be denitrified to Nitrogen gas by anaerobic bacteria. The farm will not depend on this denitrification process as part of its marine water treatment regime, as at most 16% of the SS and their Nitrogen and Carbon load will be available for this process.
		The diagram below schematically indicates the nitrogen cycle expected to occur within the Settlement Ponds.
		Note that the Dilution Report states (p8)our calculations did not include an estimate of the oxidised Nitrogen (No <sub>X</sub> ) loads and concentration increments. It is not clear that there is a mechanism from which we could calculate any meaningful increase in No <sub>X</sub> from the proposed Abalone farm. Measurements from South Australia Abalone farms (Table 2) show that increments in No <sub>X</sub> are small compared to increments in Ammonia and Total Nitrogen.







	Issue	Response
42	Most modelling results are presented as annual averages, but significant impact can result from maximum values. APE requests predictions of maximum nutrient concentrations are provided near the outfall.	It is noted that the annual averages are the same as maximum values in this instance, as the farm's Abalone production rates (and consequently, the waste production rates) will remain constant once full farm production is reached. Regardless, the 'Dilution Report' at <b>Appendix 19</b> has been amended to include modelling of maximum instantaneous ammonia concentrations during a modelled period. This is to consider that <i>concentrations might be intermittently higher at this or that local position from time to time due to the spatio-temporal structure (Figure 4)</i> ( <b>in Appendix 19</b> ) <i>underpinning the averaged quantities plotted in Figure 8</i> ) are not statistically robust so we also plot contours of the mean plus 2 standard deviations in Fig 9Increments plotted in Figures 8 and 9 are not expected to be of great biological importance because they are short lived (time scales typically ~1 hour or less) and they are spatially localised(p22, <b>Appendix 19</b> ). Overlays of the maximum instantaneous ammonia concentrations during the Spring and Neap tides (Fig 8 in the Dilution Report) onto a Pos seagrass bed map (Pos shown in pink shading) are provided below-similar to the amended <b>Figures 20</b> and <b>21</b> in the EA. These demonstrate that the highest <i>maximum instantaneous</i> concentration of ammonia (derived from the farm) at the closest Pos bed will be 5 µg/L, as outlined within <b>Section 5.4.2.1</b> of the EA. Even combined with (higher-end) expected mean background levels, ammonia levels at the Pos beds are not typically expected to exceed more than 11 µg/L, which is well below the ANZECC trigger value of 15 µg/L, and of course only for short time periods. Nevertheless, the averaged concentrations which are shown within <b>Figures 20</b> and <b>21</b> of the EA are considered most relevant for biological growth because such may nover time scales longer than the duration of eddies that come and go at different phases within the tidal period.











	Issue	Response
	this section of Port Stephens are already higher than other nearby estuaries that also support <i>Posidonia</i> . Localised increased water column nutrients have been shown to result in adverse impacts on <i>Posidonia</i> . The modelling need to be conservative and estimate concentrations of ammonium and oxidised nitrogen near the outfall and the area of seagrass likely to be subjected to increased nutrient loads.	The proponent has not been provided with the referenced water quality sampling data, and only has access to the publicly available background ammonia concentrations detailed in the Dilution Report. Calculations based on the available concentrations indicate that the ammonia levels arising from the Port, even when combined with the 'higher-end' known mean background levels, will still be significantly lower than the ANZECC trigger values of 15 $\mu$ g/L. The proponent is not aware of any research or data that would indicate that exposure of Pos to ammonia levels <i>below</i> ANZECC water quality guidelines would have any detrimental impacts on seagrass growth. A more detailed discussion on the potential for impacts on seagrasses is provided at response (a) below in this Table ('Additional issues raised by the Environmental Protection Agency 20 November 2013').
44	Other Abalone farms are known to produce nutrient levels much higher than predicted in this EA and it may be prudent to extend the outfall so that plumes of nutrient rich water are unlikely to impinge on seagrass beds.	It is not clear what other farms are referenced, or how these other farms may relate to the current proposal. The proposed length of the outfall pipe was determined during previous consultation with the EPA in relation to the previously-approved (but subsequently withdrawn) DA for this project. While the previously proposed farm had a lower annual production rate and discharge volume, the current position is still considered most appropriate, as outlined below. Comprehensive and conservative calculations and modelling have been undertaken in relation to the farm as-proposed (within the Dilution Report), and results indicate there will <u>not</u> be a significant impact on the Port or seagrasses due to discharged nutrient levels. Accordingly, it is not considered appropriate to extend the outfall beyond the proposed location.
45	<u>Discharge pipeline installation options</u> The proposal involves the installation of separate inlet and discharge pipe systems. The pipelines are proposed at 500mm diameter, resulting in an expected discharge velocity of approximately 1.5m/s based on the proposed 50ML/day discharge rate. The EA states that the pipelines are to be elevated over seagrass areas and while the EPA supports mitigation measures proposed	Proposed methods to manage the risk of scouring are outlined in <b>Table 29</b> of the EA. A discussion on alternative pipeline placement methodologies is provided in <b>Section 3.6</b> of the EA ( <b>Table 3</b> ). Alternative techniques considered but disregarded include micro tunnelling, trenching through the seagrass beds and horizontal direct drilling.



	Issue	Response
	to reduce the potential impacts on local seagrass beds, raising the pipelines increases the risk of local scouring with flow perpendicular to the pipe. Additional scouring would also be predicted around the pipe support structures. In order to determine the best installation design/ methodology the EA should include an assessment of alternative options for the pipeline, such as the potential to 'direct drill' or bury the pipelines under the seagrass beds, and provide justification for the preferred option proposed.	
46	In addition to potential impacts on local flora and fauna, safety factors such as potential for marine vessel and anchor collision/ impacts and any other relevant factors should be included in this assessment.	The alternative pipeline installation techniques discussed in issue (45) above would result in the pipelines being positioned <u>below</u> the seabed. Accordingly, there would be a negligible risk of marine vessel or anchor collisions/ entanglement. However, the other risks and potential impacts of the methodologies were considered to outweigh any possible increased risk of entanglements associated with raised pipelines, as outlined within the EA. A detailed discussion of potential impacts of the pipelines on navigational safety is provided at <b>Section 5.19</b> of the EA. It notes that the area in the vicinity of the pipelines is generally only lightly trafficked by boats and is predominantly north of navigational beacons which direct traffic south away from the Pindimar area due to the pipelines. Accordingly, there is not considered to be a significant risk of anchor entanglements or boat collisions from the proposal.
47	Monitoring program While the EA and associated modelling states that potential impacts on nearby <i>Posidonia</i> will be low, the EPA has concerns about the proposed discharge of nutrients	No data was available to indicate how Pos at the Pindimar site was considered to be 'upstream' compared to other seagrasses, nor near its limit in terms of salinity or nutrient exposure. A review of the <i>Macrophytes of Port Stephens</i> map prepared by the Department of Industry and Investment in 2009 (Fig 7, available here <a href="http://www.ozcoasts.gov.au/geom_geol/nsw/DIIMappingNSWestuaries.pdf">http://www.ozcoasts.gov.au/geom_geol/nsw/DIIMappingNSWestuaries.pdf</a> ), indicates that other Pos populations are established 'upstream' from the Pindimar site, so the Pos populations in proximity to the site



## Issue

## Response

	which is predicted to migrate over <i>Posidonia</i> beds, given that <i>Posidonia</i> only survives in	should not be considered to be near their limits in this respect.
	high quality, near oceanic water, and that the <i>Posidonia</i> at the Pindimar site is located "upstream" compared to other seagrassess in	May 13) that we agree with your comments that there are sufficient populations further 'upstream' and that the Pindimar sites may not be at their limits. It is understood that the original query was based on data related to other NSW estuaries (Lake Macquarie and Wallis Lake).
	limit in terms of nutrient exposure and salinity.	Note that a detailed discussion on expected ammonia impacts on Pos is provided at responses (42), (43) above, and (a) (below- ' <i>Additional issues raised by the Environmental Protection Agency 20 November</i> 2013') in this Table. In summary- there are not likely to be any significant impacts on Pos populations as a
	further detail on the monitoring program discussed in the EA, to ensure that nitrogen loads and concentrations in the discharge are within stated limits. In addition to the monitoring detailed in Section 5.4.3.3 the monitoring program should include:	Nevertheless, a detailed monitoring program is proposed as part of the operation of the farm, as outlined in <b>Section 5.4.3.2</b> of the EA (in relation to water quality) and <b>Section 5.9.3</b> (in relation to seagrasses and other aquatic ecology matters). Further details of the proposed monitoring regime can be provided should the Project gain approval.
	<ul> <li>high frequency monitoring of nitrogen and phosphorus concentrations and flow volumes in discharge water until the performance of the treatment train is shown to be stable trending;</li> </ul>	
	<ul> <li>assessment of seagrass physiology (as an indicator of short term stress) relative to a nearby reference site; and</li> </ul>	
	<ul> <li>data to confirm settling pond behaviour in term of particulates and nutrient removal or production.</li> </ul>	
48	<u>Contingency measures</u> The EA should also include details of a	Should monitoring results indicate that water quality exceeds nominated trigger values; appropriate contingency measures will be implemented. A range of potential measures are presented in <b>Section 5.4.3.2</b>



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	contingency/ response action plan for unexpected increases in nitrogen concentrations around the seagrass in the vicinity of the discharge location.	<ul> <li>of the EA, including:</li> <li>Reduce feeding of Abalone to 'maintenance levels';</li> <li>Cease water discharge from the tank/ facility temporarily (i.e. switch to 'full water recirculation'); and</li> <li>Increase aeration of water.</li> <li>However, the most appropriate response should be determined on a case-by-case basis.</li> </ul>
	Marine Parks Authority	
49	Given the proximity of the outfall to the Piggy's Beach Sanctuary Zone, the MPA seeks more information on the quality of water likely to be discharged into the Port from the facility. Though some information is provided for nitrogen levels, a typical and/or anticipated analysis of discharge (as compared to intake) is not provided.	A detailed assessment of water quality issues is provided in the amended report titled <i>Dilution &amp; Transport</i> of <i>Discharged Material from a Proposed Abalone Farm</i> ( <b>Appendix 19</b> ). <b>Section 5.4.2</b> of the EA also provides a discussion on this issue.
50	It is not clear from Table 7 which chemicals and pharmaceuticals are proposed to be used in the water treatment, nor are volumes and frequency of use discussed. Terms such as "negligible" "rare" and "in extremely low volumes" require definition.	<ul> <li>Additional information regarding anticipated chemical and pharmaceutical use within the farm is provided at Appendix 7 of the EA. The chemicals likely to be used (from time to time) within the marine water stream are also identified within the Table at Appendix 7.</li> <li>Appendix 7 provides general information about chemical management/ safety requirements, however relevant Material Safety Data Sheets (MSDS) will provide much more comprehensive information. All chemicals will be managed in accordance with their MSDS.</li> </ul>
	Fisheries NSW	
51	Fisheries NSW advise the draft Environmental Assessment is adequate for exhibition. For further information please contact Scott Carter, Senior Conservation Manager (Port Stephens office) on 4916 3931, or at:	Noted.



	Issue	Response
	scott.carter@dpi.nsw.gov.au.	
	NSW Office of Water	
52	The NSW Office of Water advises that the following matters be addressed in the Environmental Assessment prior to being placed on public exhibition: (i) a description of the existing environment using adequate baseline data. The assessment does not provide baseline data on surface or groundwater sources at the project site.	Clarification was sought from the Office of Water (OoW) in relation to this query. An OoW officer advised via email (Macdonald, 28 May 13) that the primary concern is the ability to detect and respond to any potential incidents which may impact on water resources on the site. As such it is likely that our response following exhibition of the EA will include a request for baseline groundwater monitoring prior to commencement of operations to characterise the groundwater resource and ongoing monitoring during operation to enable detection of and response to any incidents. With regard to surface water issues, the email clarified that the buffer between the proposal and Pig Station Creek is likely to be sufficient to minimise potential impacts and so monitoring would not appear warranted in this case. Accordingly, while baseline groundwater monitoring may be requested by OoW before the project's commencement (despite there being a very low potential for the proposal to impact upon groundwater, as outlined in <b>Section 5.7</b> of the EA), no surface water monitoring will be required. Note that an amended <i>Stormwater Management Plan</i> was prepared for the proposal by SMEC (dated September 2013, attached at <b>Appendix 17</b> of the EA). The Plan provides a description of the existing environment, including a discussion of existing watercourses, climatic conditions and geotechnical conditions.
53	(ii) information regarding the quality and quantity of water required for the project. The assessment provides information regarding marine water required for the project, but does not provide quantification of other water supply requirements such as water for use in on-site amenities and water for wash-down requirements.	Clarification was sought from the Office of Water (OoW) in relation to this query. An OoW officer advised via email (Macdonald, 28 May 13) that upon further review of the EA, OoW did not require anything further in this regard, noting that no groundwater or surface water extraction for farm use is proposed.
54	(iii) information regarding the proposed stormwater management system during operations. The assessment does not provide information on the likely volumes of	Clarification was sought from the Office of Water (OoW) in relation to this query. An OoW officer confirmed via email (Macdonald, 28 May 13) that all that was required was calculations with regard to farm surface water runoff in relation to the stormwater management system proposed.



	Issue	Response
	water generated from project infrastructure and hardstand areas during rainfall events, or the capacity of the proposed stormwater	A detailed discussion of the proposed stormwater management strategy is included in the <i>Stormwater Management Plan</i> ( <b>Appendix 17</b> ), including water quality modelling to demonstrate the effectiveness of the strategy and to determine key design parameters of the proposed water quality controls.
	management system to deal with these volumes of water.	The OoW was provided with a copy of the Plan and confirmed via email (Macdonald, 17 Sept 13) that the Office of Water is satisfied that the Stormwater Management Plan satisfactorily addresses the stormwater issues raised in the adequacy review.
	Great Lakes Council	
55	No objection in principle to the DA. Council's final decision on use of Carruthers Street and Cambage Street will depend on assessment of the project documentation during the exhibition period.	Noted.
	Port Stephens Council	
56	The proposed development requires access to Port Stephens Waterways which are currently part of an environmental protection zone under Port Stephens Local Environmental Plan 2000.	Noted- the proposed development is permissible in this zone. Refer to <b>Section 4.3.2</b> of the EA.
57	Council is concerned that the development has significant potential for impacts to water quality and associated environmental and marine degradation from the discharge of nitrogen and acid sulphate soils.	A detailed assessment of and discussion on the farm's potential water quality impacts is provided at <b>Section 5.4</b> and <b>Appendix 19</b> (the 'Dilution Report') of the EA. A discussion on the potential for encountering Acid Sulphate Soils and their subsequent management is provided at <b>Section 5.5</b> of the EA. These assessments conclude that the proposal is not likely to have any significant impacts on water quality or the marine environment generally.
58	Assessment of the proposal should include	The potential for impacts on the commercial and recreational fishing industries is addressed in <b>Section</b>
	careful and comprehensive assessment of these environmental impacts, and ensure	<b>5.19.4</b> of the EA. Potential impacts on the oyster industry are addressed further in <b>Sections 5.9.2.8</b> ( <i>Oyster Farms</i> ), <b>5.19.3</b> ( <i>Oyster Industry Impacts</i> ) and <b>4.2.3.4</b> ( <i>SEPP 62</i> ).
	that the commercial operation of the proposed Abalone farm does not negatively	The assessments concluded that there are not likely to be any significant impacts on the viability of any



Issue		Response
	impact upon the existing viability of the oyster, prawn, and fishing industries currently operating within the area.	fishing industries within the Port.
59	It is considered that the proposed wastewater management system is appropriate, however it is noted that Great Lakes Council will be responsible for the legislative aspects covering the installation and operation of the wastewater system.	Noted.
60	It is recommended that any approval require ongoing environmental monitoring and critical review by a third party (at the developers expense) to ensure there is no unacceptable environmental impacts. Alternatively, any approval could require an annual contribution (indexed) from the developer to GLC and PSC sufficient to enable the undertaking of a critical review of the annual report, site inspection and any necessary compliance action via appropriate Development consent conditions.	It is anticipated that the EPA, as part of its licensing conditions, will impose a strict monitoring and review regime in relation to water quality and other issues. Liaison by the proponent with DP&I and EPA officers suggests that further review of sampling data/ reports by other government agencies/ Councils is not likely to be necessary.
	Additional issues raised by the Environmental Protection Agency 20 November 2013	
a	Residence times and potential ammonium impacts The submission claims that a residence time of 15 minutes is sufficient to achieve 80% removal of particulates. While this settling	It is not clear from the EPA's query how the ammonia discharge plume could have the potential to <i>chronically impinge on the Posidonia adjacent to the discharge location.</i> The EPA indicated in its letter that it would not be providing any further comments/ clarification on the EA until the public exhibition period. As detailed in <b>Section 5.4.2.1</b> of the EA ( <i>Expected Nutrient Concentration Impacts</i> ), immediately upon discharge from the outlets, the ammonia from the farm will be diluted through mixing with the waters of the



Issue	Response
efficiency seems high, the EPA is prepared to accept that it may be possible to remove a significant portion of the particulates, however this leaves the dissolved loads untouched. The EPA's concerns relate to the potential discharges of ammonium on the Posidonia and possible associated impacts (e.g. impacts on epiphyte growth). The submission, and in particular the Dilution Report, details that the discharge plume is not predicted to impinge on the wider bay. However the EPA considers that the discharge plume has the potential to chronically impinge on the Posidonia adjacent to the discharge location, and as such impacts associated with this community could be expected.	<ul> <li>Port. The results of modelling indicate the following:</li> <li>the highest <i>averaged</i> concentration of ammonia (from the farm) at the closest Pos bed will be 0.5 μg/L (Spring &amp; Neap tides); and</li> <li>the highest <i>maximum instantaneous</i> concentration of ammonia (from the farm) at the closest Pos bed will be 5 μg/L (see response [42] above in this Table for graphics of the modelled ammonia plume).</li> <li>The mean background concentration of ammonia in the Port has previously been identified at around 4.3 μg/L (± 2.3: refer to Table 19 in the EA).</li> <li>Accordingly, even assuming a worst-case instantaneous scenario, based on the modelling and background (mean) water quality data, the water surrounding the Pos bed nearest to the outlets might reach a maximum ammonia concentration of around 11 μg/L. This is well below the ANZECC trigger value of 15 μg/L. As noted in the Dilution Report <i>catchment discharge results in far greater peak values which persist for much longer periods and extend over much greater areas</i> (p22).</li> <li>Further, the <i>highest maximum instantaneous concentrations</i> mentioned are only likely to occur occasionally as a result of tidal eddies that come and go through the tidal cycle. For this reason, the concentration at the Pos beds is likely to reach a maximum of around 7 μg/L (including mean background levels) for the majority of the time. Again, this is well below ANZECC trigger guidelines.</li> </ul>
The submission also predicts that the plume will not impact on the Posidonia for periods long enough to be biologically relevant. Given that it has been identified that the discharge will be constant, the EPA considers that there is potential for the Posidonia community to be exposed to constantly elevated ammonium concentrations.	The proponent is not aware of any research or data that would indicate that exposure of Posidonia to ammonia levels <i>below</i> ANZECC water quality guidelines would have any detrimental impacts on growth. As the water quality associated with the Pos beds is expected to remain well below ANZECC trigger guidelines, there are unlikely to be any associated 'impacts' on the Posidonia community.
Removal of biomass The EPA previously identified concerns in relation to the predicted removal of biomass	As outlined in <b>Section 5.4.3.1</b> of the EA, the farm proposes to remove nutrients from water via filtering (including swirl separators and protein skimmers) and settlement. Biological treatment of the water via naturally establishing marine organisms is also mentioned. This is mentioned predominantly because

b



prior to discharge. Based on the information provided, the submission does not appear to address the need for the removal of biomass in order to maintain maximum removal efficiency. The EPA considers that once the system eaches carrying capacity (e.g. polychaetes each maximum density) it will cease to be a net sink of nitrogen. Should the proponent be advocating biological removal the EA needs o demonstrate what biota are involved; what hey will be removing; what conditions and esidence times are required for optimal performance; and how will the material be emoved as it accumulates. The EPA recommends a comprehensive nonitoring program of system performance o ensure the treatment train is operated at conditions that maximise nutrient removal perfort to discharge.	marine organisms have been known to and are expected to colonise the Settlement Ponds naturally, and will play a small role in further removing nutrients from the water column. Section 2.2 of the Dilution Report provides calculations of the nutrient loads (and therefore the concentrations) to be discharged from the farm. These calculations assume that <i>80% of particulate waste will be separated/ filtered</i> before discharge. However, the calculations on which the modelling and results are based do not assume <u>any</u> removal of dissolved nutrients from the water column, via biological treatment or otherwise (even though protein skimmers will remove some dissolved nutrients- see <b>Section 5.4.3.1</b> ). Even on this conservative basis, the nutrient levels of the Port (as influenced by the farm) will still remain well below ANZECC guidelines levels (as explained in response [a] above). Accordingly, while biological treatment is mentioned, the farm's water treatment system does not place <u>any</u> reliance on this control. For this reason, no information is provided with regard to expected species composition, residence times etc. Regardless, excess biomass will be removed from the Ponds on an as-needed basis, as part of the general farm maintenance regime. Nevertheless, a comprehensive water quality monitoring regime is proposed, as outlined in <b>Table 22</b> of the EA. Should any significant discharge exceedences be identified, the most appropriate contingency measure will be implemented as outlined in <b>Section 5.4.3.2</b> .
Review of effluent quality The EPA requests that the proponent provide eview of effluent quality associated with Abalone farms to display the potential variation in effluent quality from this activity. The Dilution Report includes a number of eferences, however does not adequately show how the examples provided relate to he current proposal. Given the potential constitution of the Posidonia and its	The Dilution Report provides a significant amount of detail on <i>the predicted and achievable effluent quality from the project</i> . This detail is based on sound scientific principles and modelling, and is considered to most accurately predict the expected discharge quality and potential impacts from this particular farm. There are not expected to be any significant impacts on Posidonia as a result of the farm's water discharge, as outlined in response (b) above. The availability of comprehensive data in relation to existing Abalone farms is very limited, due to reasons of commercial confidentiality. Brief comparative data on 3 existing Abalone farms within South Australia was presented in Section 6.1 of the Dilution Report (based on available information) along with the reference for the source document (available here for ease of reference
	rior to discharge. Based on the information rovided, the submission does not appear to ddress the need for the removal of biomass a order to maintain maximum removal fficiency. The EPA considers that once the system eaches carrying capacity (e.g. polychaetes each maximum density) it will cease to be a et sink of nitrogen. Should the proponent be dvocating biological removal the EA needs of demonstrate what biota are involved; what hey will be removing; what conditions and esidence times are required for optimal erformance; and how will the material be emoved as it accumulates. The EPA recommends a comprehensive nonitoring program of system performance of ensure the treatment train is operated at onditions that maximise nutrient removal rior to discharge.



	Issue	Response
ii t F	importance to the regions aquatic ecosystem, the EPA requests that further details be provided on the predicted and achievable effluent quality from the project.	<u>Planning and Mgmt, Env Audit of Marine Aquacultre Dev in SA.pdf</u> ). While this data is presented to give an idea of the results from other farms, there are significant differences between the mentioned farms and the proposed farm, including the following:
e		<ul> <li>the SA farms discharge seawater <i>above</i> the high tide mark (whereas the proposed farm will discharge into deep waters, where it will be more swiftly diluted);</li> </ul>
		<ul> <li>the SA farms involve a different species of Abalone (Greenlip) and different feeding regimes;</li> </ul>
		<ul> <li>the SA farms' discharge habitats differ to the farm site (e.g. rocky reefs);</li> </ul>
		<ul> <li>the SA farms' annual discharge volumes are very different to the proposed farm (i.e. from 1.6 GL to 36 GL);</li> </ul>
		<ul> <li>most of the SA farms do not make any use of settlement ponds;</li> </ul>
		<ul> <li>there is great variation in the number of outfall pipes in the SA farms (from 1-6); and</li> </ul>
		<ul> <li>the total Abalone biomass or production rates from the SA farms are not known/ available due to confidentiality reasons.</li> </ul>
		Accordingly, there are expected to be significant differences in results between the SA farms and the proposed farm.
		Regardless, the referenced source document noted for the SA farms that overall, we found only a small detectable increase in dissolved inorganic and organic nitrogen levels in the subtidal waters adjacent to farms at the Smith Bay and Point Boston regions, and virtually no detectable increase adjacent to the farm in Streaky Bay. It is apparent that the nitrogen, which is mostly in the bio-available forms of ammonia and oxidised nitrogen, is rapidly assimilated and/or dispersed (p138). While nutrients are produced in the farms and discharged to the marine environment, the total annual loads of dissolved nitrogen are relatively low in comparison to some wastewater treatment plant outfalls with similar annual discharge volumesthis possibly helps to explain the apparently low level of subtidal impact adjacent to the farms(p140). Notably, the report found thatif seagrass loss had occurred adjacent to the farm sites, then the cover of bare sand might be higher there. However, none of the data suggest that losses of Amphibolis or Posidonia have occurred (p143).
		The SA farms are considered likely to have more significant impacts on water quality than the proposed farm, due to their difference in size, water discharge volume and lack of settlement ponds (if nothing else),



Issue	Response
	and yet were still not found to be having a significant impact on the surrounding water quality. Regardless, the modelling data presented in the Dilution Report is considered to be a far more relevant and reliable predictor of impacts associated with the currently proposed farm than reliance on data from other farms.