

DERWENT ESTUARY PROGRAM LTD SUBMISSION ON STORM BAY MARINE FARMING DEVELOPMENT PLANS/ENVIRONMENTAL IMPACT STATEMENTS:

Environmental Impact Statement to accompany Draft Amendment No 3 to the Storm Bay off Trumpeter Bay North Bruny Island, Marine Farming Development Plan, July 1998 (Huon Aquaculture)

Environmental Impact Statement to accompany Draft Amendment No 5 to the Tasman Peninsula and Norfolk Bay, Marine Farming Development Plan, November 2008 (Tassal)

Environmental Impact Statement for draft Storm Bay North Marine Farming Development Plan (Petuna)

17 January 2018

The Derwent Estuary Program (DEP) considers Storm Bay to be a single system, and thus addresses the potential cumulative impacts of all three proposals (HAC, Tassal and Petuna) in this combined submission, with a particular focus on the Derwent estuary.

The DPIPWE overview notes an aspirational target for salmon production in Storm Bay of 80,000 tpa, but that in light of robust scientific information, a combined limit of 40,000 tpa for the three proposals is currently under assessment. Further, that a staged 30,000 tpa limit will apply while monitoring and modelling systems are being established.

In addition to the comments provided below, the DEP requests a hearing to discuss these in more detail with the Marine Farming Planning Review Panel.

ABOUT THE DEP AND THE DERWENT ESTUARY

The DEP is a partnership between government, business, scientists and the community to restore and protect our waterway. Established in 1999, the partnership has been nationally recognised for excellence in reducing water pollution, protecting nature, monitoring river health and promoting greater use and enjoyment of the Derwent. In 2010, the DEP was awarded Australia's most valuable prize – the National RiverPrize.

Our major sponsors include: Brighton, Clarence, Derwent Valley, Glenorchy, Hobart and Kingborough councils, the Tasmanian Government, Nyrstar Hobart, Norske Skog Boyer, TasWater, TasPorts and Hydro Tasmania. Since March 2017, the DEP has been operating as a registered company, with an independent board.

The Derwent estuary lies at the heart of the Hobart metropolitan area and is home to 40% of Tasmania's population, as well as a major centre for commercial, industrial and tourism activities. The estuary has a long-standing history of heavy metal pollution – with some of the highest reported levels of zinc, mercury and lead in the world. In recent years, there has been significant investment to reduce metal inputs by both the zinc smelter and the state government, with considerable success. However, the legacy pollution in the estuary sediments will require careful management for many years to come.

More recently, the estuary has shown increasing signs of nutrient stress, including nuisance algal blooms, seagrass loss and persistent low oxygen levels in some areas. Previous research has shown a strong link between nutrient loading, low oxygen and release of heavy metals from sediments. Therefore, a key element of our long-term management strategy for the estuary is to manage and reduce nutrient loads, particularly during summer months, when the risks are highest. The marine waters of Storm Bay and the D'Entrecasteaux Channel drive the overall circulation of the estuary, and set the background nutrient levels for the system as a whole. Therefore, a significant change in nutrient inputs from Storm Bay could have far-reaching impacts on the Derwent estuary.

GENERAL COMMENTS

1. Need for a combined assessment

Given the size and scale of the proposed expansion, and the connectivity of Storm Bay, it is essential that these three proposals be planned, assessed and managed together, as a cumulative impact assessment. Development of an 'Area Management Agreement' is also recommended by the Aquaculture Stewardship Council as an important aspect for certification.

It is very difficult to understand the scale and timing of the three proposed developments when they are presented as separate proposals. Without this information, it is difficult to evaluate potential impacts. Therefore, the DEP has attempted to extract information on proposed biomass and nutrient loads from the three documents, as presented in the table below. Feedback on the accuracy of this combined table would be welcome, as comparative information was difficult to find.

Other information that should be compiled and assessed as part of a combined regional assessment includes the location of sensitive or threatened communities/species including seagrass meadows, giant kelp, spotted and red handfish, and other relevant communities and species.

2. Large scale, rapid development and the precautionary principle

The proposals indicate that an initial combined maximum biomass of 40,000 tpa is being considered for Storm Bay, with a staged approach (starting with 30,000 t as first stage). However, information is not presented in a consistent manner between the proposals. In particular, the HAC proposal presents a case for the 40,000 tpa scenario, while the Tassal and Petuna proposals provide information for the 30,000 tpa scenario.

In either case, this is a very large biomass in comparison with current salmon production across Tasmania as a whole (50,000 tpa), and as compared to production in individual systems (e.g. 12,000 to 14,000 tpa in Macquarie Harbour, >24,000 tpa in the Channel/Huon (based on 2010 figures; current data was not available); or by individual producers (HAC: 20,000 tpa; Tassal 25,000 tpa; Petuna: not available).

Estimated nutrient loads associated with these production levels are very large, as set out in the table figure below. An estimate of nutrient loads associated with the longer-term aspiration of 80,000 tpa is also presented.

Current and proposed production and Dissolved Nitrogen Outputs (DNO) to Storm Bay under different production scenarios (in tonnes/year):

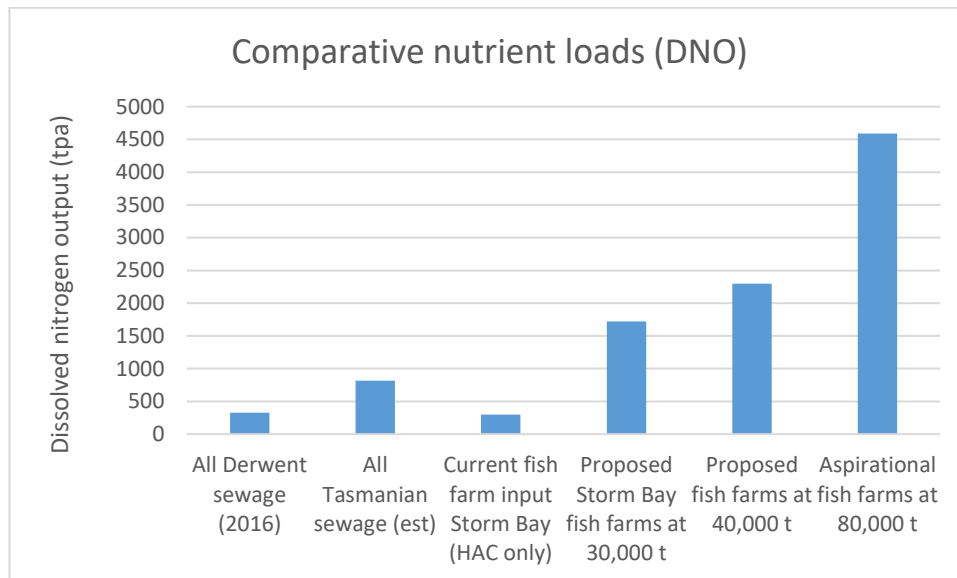
Source	Current production & load	Interim production - 30,000t 1722t TPDNO	Proposed production - 40,000t 2296t TPDNO	Aspirational production - 80,000 tpa 4592t TPDNO
Storm Bay off Trumpeter lease (HAC) ⁽¹⁾	6000t 300 – 400 t (based on Fig 4)	<i>15,000 t biomass</i> <i>861 t DNO</i> <i>by ???</i>	20,000 t biomass 1148 t DNO by May 2019	
West of Wedge lease (Tassal)	?? ⁽²⁾	9000 t biomass 514 t DNO (Staged over 3 years) <ul style="list-style-type: none"> • Yr 1: 150 • Yr 2: 300 • Yr 3: 400 	12,000 t biomass 689 t DNO	
Storm Bay North lease (Petuna) 35-39 m	0	6000t (@75%) 344t DNO (@75%) No info on staged approach	8000 t biomass 459 t DNO	

(1) HAC EIS proposes 20,000 t biomass, and notes the 30,000 t interim limit for Storm Bay as a whole, but does not provide DNO values at this level in the EIS. Values in italics are pro rata estimates based on 75% production. Of concern is the plan to stock

the Yellow Bluff site with smolts by April 2018, as this would lead to a very rapid increase in biomass and nutrient loads before monitoring & modelling systems are fully operational. See Fig 4, p17.

(2) Could not find Tassal current production at Nubeena in EIS

To provide some context, the DNO from all sewage discharged to the Derwent estuary is estimated at 327 tpa, and the sewage-derived DNO for the entire state would be under 1000 tpa (pro rata, assuming similar treatment levels). By comparison, the estimated DNO as set out in the three proposals at 40,000 t production is 1892 tpa (ie nearly six times the Derwent sewage load), and would be more than 14 times the Derwent sewage load at the 80,000 tpa production level.



The proposed rate of development is also very rapid, particularly for the Trumpeter Bay lease, which proposes to reach a DNO of 1147t by mid 2019 (Figure 4a, p 17).

‘Offshore’ is a relative term, and while the Storm Bay environment is relatively exposed, it is still considered to be a bay with variable degrees of exposure to prevailing winds and storms.. Given the scale and pace of the proposed expansion, and the proximity of several potentially sensitive receptors to nutrient loading – specifically the Derwent estuary and Frederick Henry Bay – it is recommended that a staged, precautionary approach be taken, based on good science, monitoring and reporting.

3. Need for good system understanding, including monitoring, modelling and process studies

Storm Bay is a unique system, with processes and patterns that are unlike other areas of Tasmania. This is an area of high variability, both within and between years, and has been identified as a climate change hotspot. Previous studies of Storm Bay have shown that nutrient processes and algal blooms are strongly influenced by wind and storm events (Harris et al, 1991). Assumptions based on steady state conditions are therefore risky, as are comparisons with other systems, and monitoring and modelling designs need to take this into account.

The nutrient assimilation capacity of Storm Bay is unknown, but likely is likely to vary seasonally, and from year to year. Furthermore, major southerly storm events could stir up nutrient-enriched bottom water and sediments with unanticipated consequences. Finally, the benthic system may not respond as anticipated as this system may not be adapted to high levels of nutrient and organic loading.

While there has been some baseline monitoring done for Storm Bay and some early stage modelling, these results are indicative and should be interpreted with caution. Furthermore, while there are a number of scientific investigations currently underway (e.g. FRDC), these have not yet been completed.

The intention to develop and implement a regional BEMP monitoring program, together with development of a BGC model (and associated process studies), would provide a good scientific basis for science-based management of aquaculture in Storm Bay. However, it is anticipated that this work will take a minimum of 2 to 3 years. We believe this work should commence, before significant expansion, and that future stages should be linked to completion of specific milestones.

4. Regular public reporting and access to data

Publications of annual environmental reports on the state of Storm Bay should be an integral part of this plan to ensure timely and transparent reporting on conditions and trends. It is essential that this include robust interpretation, and that funds be allocated to complete this (non-trivial) task. Monitoring data should also be made available via an on-line portal, as well as on request.

DETAILED COMMENTS

Issues of particular concern for the Derwent estuary

The Derwent has shown increasing signs of nutrient stress, including nuisance algal blooms, seagrass loss and persistent low oxygen levels in some areas. Previous research has shown a strong link between nutrient loading, low oxygen and release of heavy metals from sediments. Therefore, a key element of our long-term management strategy for the estuary is to manage and reduce nutrient loads, particularly during summer months, when the risks are highest. The marine waters of Storm Bay and the D'Entrecasteaux Channel drive the overall circulation of the estuary, and set the background nutrient levels for the system as a whole. Therefore, a significant change in nutrient inputs from Storm Bay could have far-reaching impacts on the Derwent estuary.

Of particular concern is the potential for increased nutrient levels in bottom water, which drives the overall circulation of the Derwent estuary and subsequent ecological response. This is not fully represented in the model, nor is the potential for large-scale resuspension following storm events. Ecological responses to eutrophication could present as changes in phytoplankton production (algal blooms and/or changes in community structure) and/or increased macroalgae production (attached or drift). Sensitive receptors could include:

- Ralps Bay (shallow, poorly flushed, may be susceptible to drift algae growth and accumulation)
- Spotted handfish in lower Derwent/Ralps Bay (spawning substrate susceptible to algal fouling)
- Derwent temperate reef communities (including EPBC-listed giant kelp communities), particularly those along the Kingborough shoreline
- Seagrass and macrophyte communities (susceptible to algal overgrowth, shading and loss)
- Heavy metal contaminated sediments – low oxygen levels can remobilize toxic metals (including mercury) with potential impacts on humans, fish, birds and other biota.

Comments on Nutrient Dispersion Modelling (Hadley et al, 2017) and proposed biogeochemical model

This report provides an interesting representation of predicted nutrient dispersion from the proposed developments at a combined biomass of 40,000 tpa, however, as stated on page 14 'this is early stage modelling is only indicative of the system conditions, and as such the results should be interpreted with the relevant degree of caution.' The DEP has a number of questions about the model, and would be concerned if it was used as a basis for decision-making without further validation, and indeed without the development of the full biogeochemical model. In particular:

- What hydrodynamic model underpins the dispersion model? If Herzfeld 2008, this is a relatively early-stage model (Stage 1 –INFORMD), and requires further development, particularly with respect to boundary conditions.
- The assumptions used in the model require further testing and validation, particularly the 4-day decay rate.
- Decay is not the same as removal – both ammonium and nitrate will stimulate phytoplankton and other algal growth, and the nutrients removed will return to the system when the algae breaks down (along with

oxygen depletion). This is what we are really interested in understanding, and a full biogeochemical model is needed to evaluate nutrient impacts more broadly.

- The assumptions used for dispersion at depth are hard to follow, and the dispersion model does not seem to include nitrogen release from sediments (e.g. breakdown of faecal matter and feed)
- It is unclear what period of data were used to generate the background percentiles – was this a single year or multiple years?
- The model seems to reflect steady-state conditions, but how would the system respond to a major storm event?

The biogeochemical model is an important tool to assess ecological responses to nutrient loading. The model should identify sensitive receptors and the conditions/times when these are most likely to be impacted – e.g. during summer months, following major storm events, during EAC dominated periods. Scenarios to be tested should include ‘worst case scenarios’. Growth and accumulation of drift algae may be an important symptom of eutrophication in shallow bays such as Ralphs Bay and Frederick Henry Bay, and should be also be included in model development. Given the time required to develop and test the model – including process studies – the BGC model should be funded and well underway before significant expansion

Comments on Indicative Storm Bay Environmental Monitoring Program (DPIPWE, 2017)

This report provides an overview of an indicative BEMP monitoring program for Storm Bay, to be implemented as part of an adaptive management regime. The Storm Bay BEMP would include a range of water quality, benthic and reef monitoring sites. The DEP is very supportive of broadscale monitoring and reporting, and would strongly encourage coordinated and integrated monitoring between the Derwent and Storm Bay systems. Our recommendations include the following:

- Deployment of sensors at key sites to better inform model development, and to assess storm-related effects (it will not be practical or safe to collect water samples during major southerlies!).
- Include resources needed for the preparation/publication of annual reports. While the Huon/Channel BEMP is cited as a model for Storm Bay, lack of timely and regular public reporting has been a real concern. To date, only one BEMP report has been publicly released (for the period from 2009 to 2013), and it is therefore not possible to assess the merits of this monitoring program, or the current state of the Huon/Channel system.

Other comments

- Frederick Henry Bay / Norfolk Bay: these are shallow, clear and biodiverse systems, which are highly valued by the recreational fishing community. These bays are poorly flushed, and could be seriously impacted if nutrients were to be entrained. Some areas also provide critical habitat for the endangered red handfish (sensitive to biofouling), and there may also be important seagrass meadows and giant kelp communities. Thus, this area should be assessed with particular care, including potential impacts of storm events.
- Implications for Harmful Algal Blooms (HABs) – the increasing prevalence of the EAC suggests that this development may essentially be adding nutrients to a warm water, nutrient poor system that has seen severe increase in HABs over the past few years. Could further addition of nutrients exacerbate this?
- Marine pests: could nutrient and organic enrichment of previously coarse, sandy sediments encourage settlement and migration of marine pests? For example, the invasive Japanese seaweed *Undaria pinnatifolia* has been shown to grow more prolifically in nutrient enriched conditions.
- Handfish – where are current handfish populations (spotted and red), and could nutrient enrichment/biofouling pose a risk to their breeding success?
- Seagrass: as noted, seagrass is adversely impacted by nutrient enrichment. Existing seagrass beds should be mapped, baseline surveys (condition & extent) carried out and regular monitoring be implemented as part of this development.
- The estimated nutrient loads for Storm Bay are based on Food Conversion Ratios and associated nutrient yields that were derived from studies that are now over 15 years old; these also assumed zero loss of feed

(Wild-Allen, 2005). Given recent advances in feeds, feeding technologies and new cage designs, a review of these conversion rates is recommended to ensure the models are based on correct load estimates.

RECOMMENDATIONS

1. Science-based management

Storm Bay should be managed as a single system, including integrated assessment and management of salmon production. It is important that potential impacts on adjacent nutrient-sensitive systems (Derwent and Frederick Henry Bay) also be fully assessed, and included in modelling and monitoring programs.

2. Staged and precautionary growth

Given the scale of the proposed expansion, a staged and precautionary approach is recommended based on good system understanding. This should include determination of the Bay's carrying capacity under a range of conditions, as well as an understanding of how the system responds to major storms.

A series of milestones and deliverables should be established that are clearly linked to each stage, and stocking levels should allow for the completion of each stage before the next production level is approved. It is particularly important that environmental triggers be established early on, and that there is clarity about the required management response, should the monitoring program demonstrate that these have been exceeded. A possible growth scenario could progress as follow:

Pre-expansion

- Commence BEMP and BGC model development; map location of / conduct baseline surveys of sensitive receptors (e.g. seagrass meadows, giant kelp, handfish populations)

Stage 1 (e.g. 10,000 tpa)

- Complete first BEMP report and stage 1 modelling

Stage 2 (e.g. 20,000 tpa)

- Complete second BEMP report and BGC modelling, including scenario-testing under worst case conditions

Stage 3 (e.g. 30,000 tpa)

- Consider further expansion based on successful completion/assessment of above.

3. Regular public reporting and access to data

Publications of annual environmental reports on the state of Storm Bay is requested to ensure timely and transparent reporting on conditions and trends. Monitoring data should also be made available both via an on-line portal, as well as on request.

4. DEP actively engaged

Given the potential sensitivity of the Derwent estuary to eutrophication, the size of the regional population, and the importance of the Derwent to tourism, we request that the DEP be actively engaged in the development and coordination of Storm Bay monitoring, modelling and process studies. We have over 20 years of water quality and other environmental data that could inform and value-add to these activities, and are widely respected by the regional and scientific community for our scientific understanding and expertise.

In particular, the DEP would welcome regular meetings and workshops with colleagues at EPA, DPIPW, IMAS, CSIRO and the marine farming companies to facilitate exchange of information, coordination of scientific investigations and constructive review and feedback on reports.