



Huon Aquaculture – Dissolved Oxygen Consumption Report, Macquarie Harbour

15 March 2024

1. Introduction

This Dissolved Oxygen Consumption Report has been prepared by Huon Aquaculture Company Pty Ltd (Huon) to meet the requirements outlined within the following environmental licences:

- Environmental Licence No. 9894/3 at Marine Farming Lease No. 216 (North East Pelias Cove)
- Environmental Licence No. 9895/3 at Marine Farming Lease No. 220 (North East Double Cove)
- Environmental Licence No. 9896/3 at Marine Farming Lease No. 267 (East of Butt of Liberty)

The following reports have been prepared in line with guidance provided by Darryl Cook in the letter dated 12 January 2024. Specifically, the calculations were based on a mass balance approach regarding the fate of carbon (C) and nitrogen (N) using the Wang *et al.* (2012) methodology.

2. Method

The methods used conform with the letter issued on the 12 January 2024 as detailed below.

Principles of calculation

The total dissolved oxygen demand has been determined for a 12-month period, and seasonal periods within it as specified in the licence condition, on the basis of feed input / biomass grown during the corresponding periods.

Calculations are based on a mass balance approach regarding the fate of carbon (C) and nitrogen (N). According to research by Wang *et al.* (2012), up to 70% of the total C and 62 % of the total N contained in feed are released to the receiving environment.

Calculations consist of, and clearly identify, the following elements:

1. The carbon components contributing to DO demand:

- a) Respiratory demand based on the Respiratory Quotient (RC);
- b) Demand associated with the release of dissolved organic carbon (DOC) to the environment;
- c) Demand associated with the release of particulate organic carbon (POC) to the environment.

2. The nitrogen components contributing to DO demand:

- a) Demand associated with the release of Dissolved Inorganic Nitrogen (DIN), (such as Total Ammonia Nitrogen and urea), from finfish pens to the environment;
- b) Demand associated with the release of dissolved organic nitrogen (DON) to the environment;
- c) Demand associated with the release of particulate organic nitrogen (PON) to the environment.

3. The overall dissolved oxygen consumption:

Amounts of N and C released to the receiving environment over a time period of approximately 12 months, and the resulting carbon and nitrogen components, are considered.

The following assumptions from Wang *et al.* (2012) were used for calculations:

Carbon calculation:

Respired (%)	0.48
DOC (%)	0.03
POC (%)	0.19
Fish Gain	0.3
Respiratory Quotient (RC)	1

Nitrogen calculation:

DIN (%)	0.45
DON (%)	0.02
POC (%)	0.15
Fish Gain	0.38

There are several differences between the Wang *et al.* (2012) and (2013) papers that have been referenced in the methods. Huon's suggestion is to use the Wang *et al.* (2013) assumptions as they are more up to date. Huon would also like Wang *et al.* (2013) to be considered, even though it is a Norwegian based study, given that that:

- Salmon feeds produced in Tasmania are primarily formulated in Norway;
- Any novel ingredients used in Tasmania are tested in Norway; and
- Generally, high energy feeds were developed in Norway prior to companies using them in Tasmania.

3. Results and discussion

The following tables and graphs are generated using actual feed data from 1 December 2022 to 30 November 2023 and calculated using Wang *et al.* (2012).

Table 1: Nitrogen and carbon dissolved oxygen demand calculated results using actual feed data (1 December 2022 to 30 November 2023) in tonnes per month

	Oxygen Demand from DIN	Oxygen Demand from DON	Oxygen Demand from PON	Oxygen demand from DOC	Oxygen demand from POC	Total Respired from Carbon
Dec-22	38.22	1.91	13.00	10.94	69.27	175.00
Jan-23	7.61	0.38	2.59	2.08	13.19	33.32
Feb-23	19.02	0.95	6.47	5.19	32.87	83.04
Mar-23	24.77	1.24	8.42	7.04	44.59	112.66
Apr-23	30.69	1.53	10.44	8.91	56.42	142.53
May-23	41.33	2.07	14.05	12.03	76.18	192.46
Jun-23	23.73	1.19	8.07	6.95	43.99	111.12
Jul-23	34.17	1.71	11.62	10.01	63.39	160.15
Aug-23	35.68	1.78	12.13	10.61	67.17	169.70
Sep-23	42.66	2.13	14.50	12.81	81.15	205.00
Oct-23	59.38	2.97	20.19	17.68	111.99	282.92
Nov-23	55.87	2.79	19.00	16.49	104.44	263.86

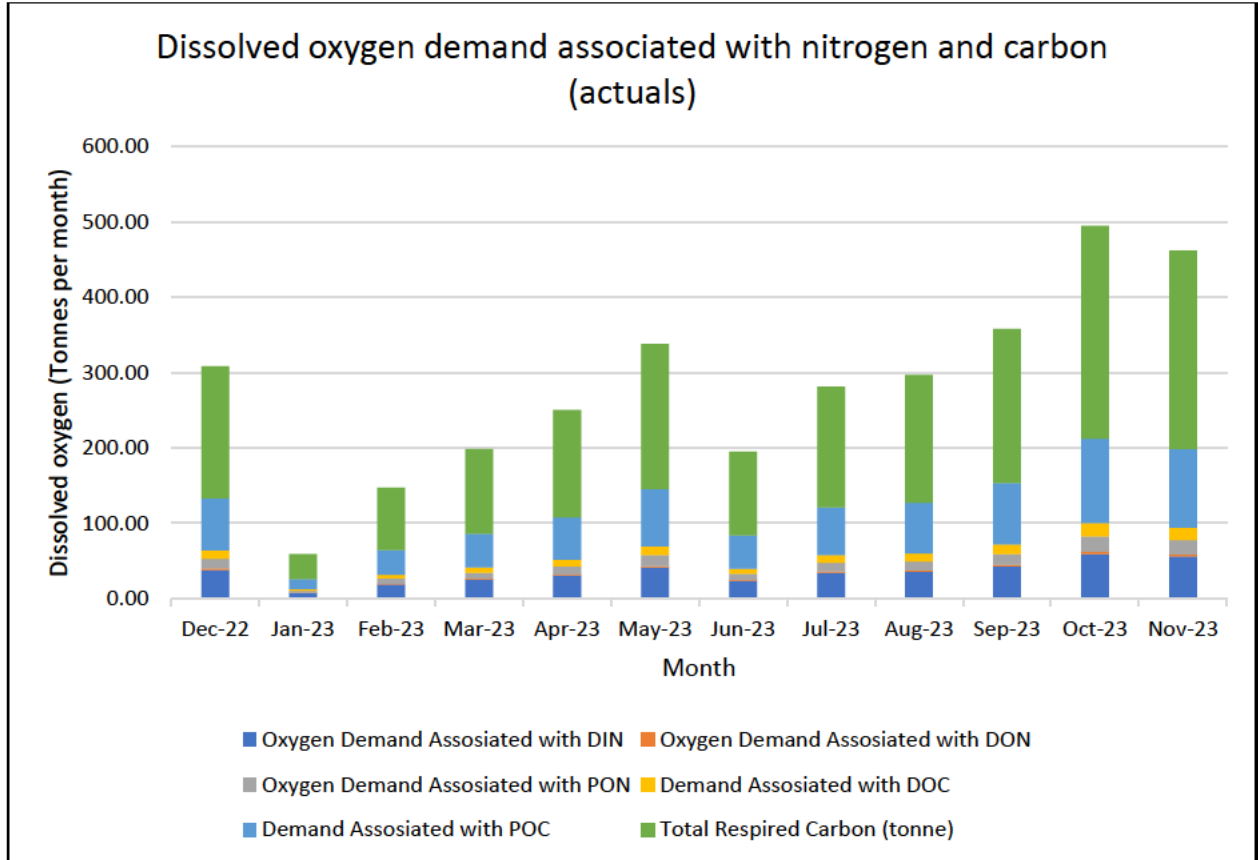
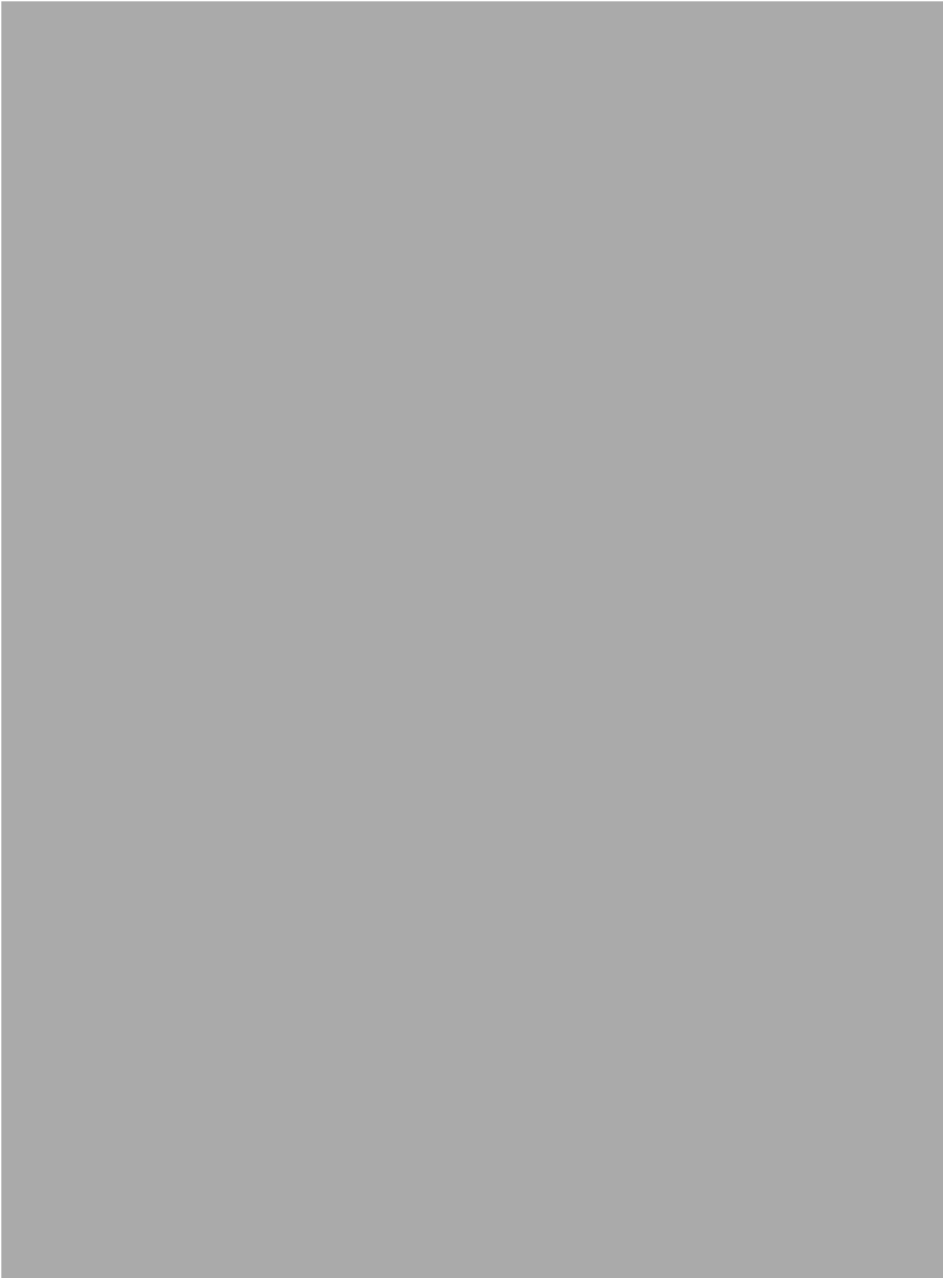


Figure 1: Dissolved oxygen demand associated with nitrogen and carbon (using actual feed amounts) including fish respiration resulting from Huon’s marine farming activities at MF216, MF220 and MF267.



4. Future Reporting

This report is an updated version of the original report submitted on the 31st of January 2024, following feedback from the EPA. As Huon continues to work through these new reporting requirements, we appreciate any further feedback from the EPA on future reporting requirements. By 1 January 2025, or a date otherwise advised by the Director in writing, Huon will submit a report containing revised dissolved oxygen consumption calculations for the 12-month period from 1 December 2023 to 30 November 2024, based on actual feed and dissolved nitrogen outputs.

Although Huon considers the approach by Wang *et al.* (2012) as an appropriate basis for calculations for oxygen demand, we recommend that the EPA consider the approach by Wang *et al.* (2013) for future calculations.