

Lochalsh, Kyle of Lochalsh

EmBz Deposition Modelling Report

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QUALITY ASSURANCE

Mowi Scotland maintains a Quality Manual which defines the Quality and Environmental Policy of Mowi Scotland Farming Limited and includes an overview of its processes and acts as a signpost to key elements of its Quality Management System according to the requirements of BS EN ISO 9001, BS EN ISO 14001, GLOBALG.A.P. and British Retail Consortium Global Standard Food. Note the BRC standard is relevant to Blar Mhor processing plant only.

EXECUTIVE SUMMARY

Model simulations have been performed to assess the likely deposition of Emamectin Benzoate (EmBz) at the existing salmon farm site Lochalsh, Kyle of Lochalsh. The maximum standing biomass consent at Lochalsh is 2,500 T, no increase to this will be sought. This report explains the application of the NewDepomod model to describe the deposition of EmBz beneath the pens and in the surrounding environment. The modelling procedure followed as far as possible guidance presented by the Scottish Environment Protection Agency (SEPA) in January 2024 (SEPA, 2024). It is not the intention of Mowi Scotland to treat fish with EmBz directly at Lochalsh, but fish previously treated with EmBz may on occasion be moved to the site, and therefore this quantity is being sought for consent to allow for any residual discharge through fish waste at the site. Nevertheless, the model simulations were performed using the standard approach, including a discharge through waste feed, in order to establish a Maximum Environmental Quantity (MEQ) for consent.

Results indicated that in-feed medicine deposition at Lochalsh will be low, with a footprint area, where the deposition exceeding the critical deposition rate of 0.136 ug kg^{1}, was 0.1525 km^{2}.

These results indicate that the proposed EmBz quantity at Lochalsh will comfortably meet pertinent Environmental Quality Standards for salmon farm in-feed medicine waste.

Table 1. Site details & summary of results

Site Details	
Site Name:	Lochalsh
Site Location:	Kyle of Lochalsh
Peak Biomass (T):	2,500
Feed Load (T/year):	6,388
Pen Details	
Number of Pens:	10
Pen Dimensions:	120 m Circumference
Working Depth (m):	16
Configuration:	2 x 5, 65 m matrix
Medicine amount to be applied for	
Emamectin Benzoate MEQ (g)	31

1. INTRODUCTION

This report has been prepared by Mowi Scotland Ltd. to describe the deposition of EmBz from an existing marine salmon farm at Lochalsh, Kyle of Lochalsh (Figure 1). The site incorporates 10 x 120 m pens, with a working depth of 16 m. The report describes the application of the NewDepomod model to describe the deposition of waste EmBz beneath the pens and in the surrounding environment. The modelling procedure followed as far as possible guidance presented by the Scottish Environment Protection Agency (SEPA) in 2024 (SEPA, 2024).

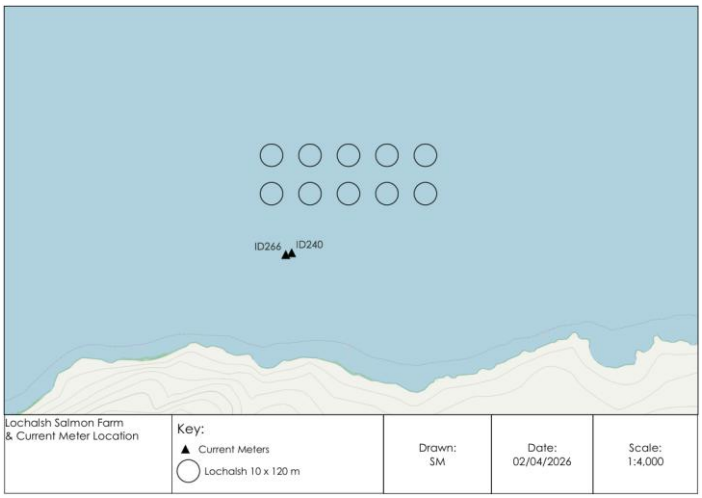


Figure 1. Pen locations (○) for the Lochalsh site and the current meter deployment locations (▲).

1.1 Site Details

The Lochalsh salmon farm site is situated off the Isle of Skye in Loch Alsh (Figure 1). The pen centre locations are given in Table 2; these locations were used in the computer modelling (Section 2). Details of the site and hydrographic summary are provided in Table 3. Hydrographic data were collected over two deployments in 2018 and 2019 (ID240 and ID266, Figure 1). The receiving water is defined as open water.

Table 2. Details of the 10 x120 m pen centre locations and net depths used in the modelling for Lochalsh.

Pen	Easting	Northing	Net Depth (m)
1	178235	825630	16
2	178300	825630	16
3	178365	825630	16
4	178430	825630	16
5	178495	825630	16
6	178235	825565	16
7	178300	825565	16
8	178365	825565	16
9	178430	825565	16
10	178495	825565	16

2. MODEL DETAILS

Simulations were performed utilising the NewDepomod model which focussed on localised deposition of EmBz from the pen locations. The model was configured with the standard default parameter values specified by SEPA and using measured flow data to force the model.

Table 3. Summary of the near-bed hydrographic data at Lochalsh.

Hydrographic Summary	ID240	ID266
Deployment Date	Aug – Nov 2018	Feb – Apr 2019
Easting	178269	178259
Northing	825465	825462
Mean Speed (m/s)	7.59	7.62
Residual Speed (m/s)	0.004	0.007
Residual Direction (°G)	250	273
Tidal Amplitude Parallel (m/s)	0.004	0.043
Tidal Amplitude Normal (m/s)	-0.001	0.031
Major Axis (°G)	260	260

2.1 In-feed Medicine

The NewDepomod model was run using an optimisation script to find the highest value of Emamectin Benzoate (EmBz) that can be used on site at Lochalsh while still meeting environmental quality standards. The model was run for 118 days, with hourly results over the final two days (days 116 – 118) saved to file. This approach followed that of the standard default modelling approach outlined in the SEPA Regulatory Modelling Guidance (SEPA 2024). The mean concentrations of EmBz were calculated from this output for comparison with the EQS value of 0.136 ug/kg (wet weight, equivalent to 0.272 ug/kg dry weight), which is the current position standard.

3. RESULTS

3.1 In-feed Medicine Deposition

The in-feed medicine model of NewDepomod was run for the Lochalsh farm using the SEPA standard default method, giving the footprint shown in Figure 2. The area of the modelled footprint, defined as the area where the deposition rate exceeds 0.136 ug/kg was 0.1525 km^2 which was well within 120% of the allowable mixing zone.

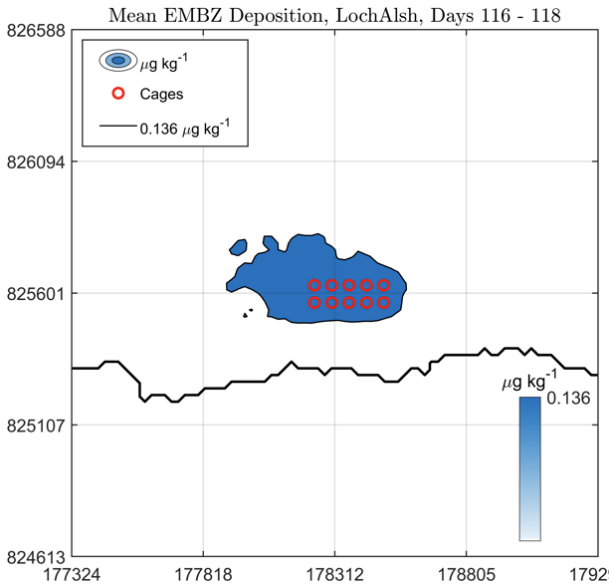


Figure 2. The modelled footprint for Lochalsh using the SEPA standard default method for the proposed EMBZ treatment amount of 43 g with 10 x 120 m pens (O).

4. SUMMARY AND CONCLUSIONS

The proposed EmBz consent at Lochalsh (Table 4), has been shown to meet pertinent Environmental Quality Standards. The SEPA standard default method, which is designed to provide a conservative prediction of in-feed medicine deposition, has shown that a modelled treatment amount of 43 g of EmBz will comfortably meet environmental quality standards. This corresponds to a consented Maximum Environmental Quantity of 31 g of EmBz (Table 4).

Table 4. Summary of Results

Site Details	
Site Name:	Lochalsh
Site Location:	Kyle of Lochalsh
Peak Biomass (T):	2,500
Feed Load (T/year):	6,388
Pen Details	
Number of Pens:	10
Pen Dimensions:	120 m Circumference
Working Depth (m):	16
Configuration:	2 x 5, 65 m matrix
Medicine amount to be applied for	
Emamectin Benzoate MEQ (g)	31

REFERENCES

Scottish Association of Marine Science (SAMS), 2021, NewDepomod https://www.sams.ac.uk/science/projects/depomod/

SEPA, 2024. NewDepomod Guidance for Aquaculture Applications. Scottish Environment Protection Agency, Air & Marine Modelling Unit, January 2024.