Macleans Nose, CAR/L/1002965/V7

Waste Solids Deposition Modelling Report

Mowi Scotland Ltd.

May 2022

[redacted]

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EXECUTIVE SUMMARY

Model simulations have been performed to assess the likely deposition of waste solids and in-feed medicine at a salmon farm site at Macleans Nose in the Sound of Mull. This report describes the application of the NewDepomod model to predict the deposition of waste solids and in-feed medicine 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 July 2019 (SEPA, 2019) and January 2022 (SEPA, 2022).

NewDepomod was used in both the SEPA standard default method and through calibration against data collected from seabed compliance surveys. The standard default method, which is deliberately conservative, predicted that the footprint area and deposition intensity for the proposed biomass would slightly exceed the permitted Environmental Quality Standards. However, the calibrated model predicted a footprint area similar to the measured footprint from the compliance survey of April 2020, which was about 39% of the allowable mixing zone (Table 1). The predicted mean intensity of deposition was 4,218 g m^{-2}, which was 13% greater than the modelled deposition intensity for the currently consented 3000 tonnes biomass, within the allowable 15% increase.

These results indicate that the proposed biomass at Macleans Nose will comfortably meet the mixing zone Environmental Quality Standard for salmon farm waste solids and meets the criteria for an allowable increase in deposition intensity.

Table 1. Site details and summary of results

Site Details	
Site Name:	Macleans Nose
Site Location:	Sound of Mull
Peak Biomass (T):	3,350
Feed Load (T/year):	8,559
Pen Details	
Number of Pens:	16
Pen Dimensions:	120m Circumference
Working Depth (m):	16
Configuration:	2x3 + 2x5, 75m matrix
NewDepomod Results	
Allowable Mixing Zone (m^2):	243,165
Maximum Deposition (g m^{-2}):	10,064
Modelled Footprint Area (m^2):	95,625
Mean Footprint Deposition (g m^{-2}):	4,218

1 INTRODUCTION

This report has been prepared by Mowi Scotland Ltd. to describe the deposition of waste solids from a marine salmon farm at **Macleans Nose** in the Sound of Mull (Figure 1 and Figure 2). It describes the application of the NewDepomod model to predict the deposition of waste solids and in-feed medicine 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 July 2019 (SEPA, 2019) and January 2022 (SEPA, 2022).

Figure 1. Location of the Macleans Nose site in the Sound of Mull.

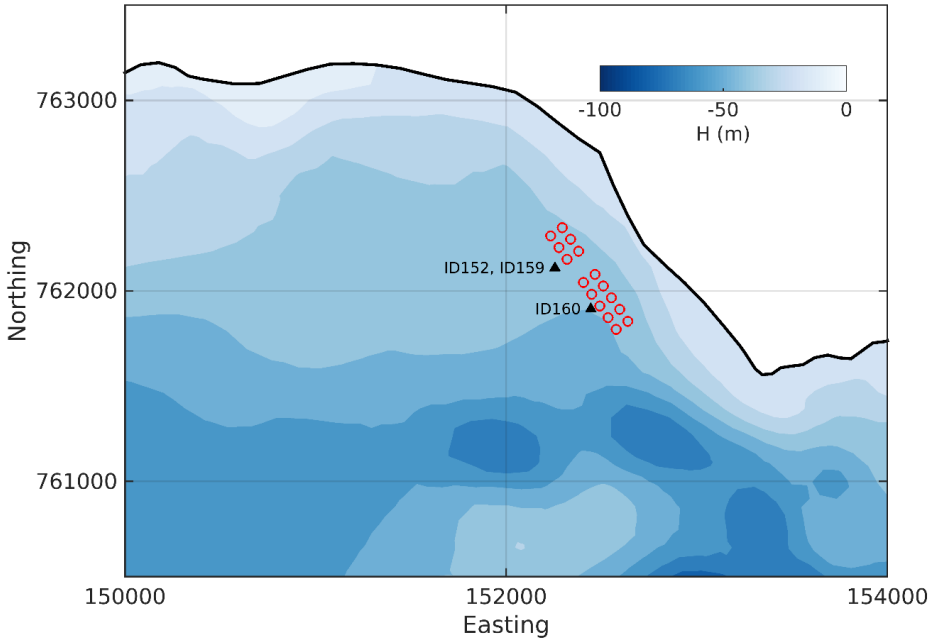

Figure 2. Pen locations (o) at the Macleans Nose salmon farm. ADCP deployment locations are also marked with black triangles. The shading represents the water depth (H, m).

Table 2. Summary of hydrographic data from near-bed currents during March – May 2017 (ID152) and May – July 2017 (ID160).

Hydrographic Summary	ID152	ID160
Start Date	22 March 2017	05 May 2017
End Date	04 May 2017	03 July 2017
Easting	152255	152443
Northing	762121	761905
Mean Speed (m/s)	0.053	0.050
Residual Speed (m/s)	0.007	0.004
Residual Direction (°G)	29	200
Tidal Amplitude Parallel (m/s)	0.072	0.077
Tidal Amplitude Normal (m/s)	0.047	0.026
Major Axis (°G)	330	185

1.1 Site Details

The site is situated off the southern shore of the Ardnamurchan peninsula, in the Sound of Mull just to the west of the entrance to Loch Sunart (Figure 1 and Figure 2). Details of the site and hydrographic summary are provided in Table 1 and Table 2. The receiving water is defined as open water. The pen centre locations are given in Table 3. These locations were used in the computer modelling (Section 2). The site is moderately exposed to waves, particularly from the west, with a wave exposure index of 3.17; wave action is thought to significantly enhance waste dispersion from the site.

Table 3. Details of the individual pen centre locations and net depths used in the modelling for Macleans Nose.

Cage	Easting	Northing	Net Depth (m)
1	152307	762173	16
2	152366	762218	16
3	152262	762232	16
4	152320	762277	16
5	152216	762290	16
6	152275	762336	16
7	152580	761822	16
8	152639	761867	16
9	152535	761881	16
10	152593	761926	16
11	152489	761939	16
12	152548	761985	16
13	152444	761998	16
14	152502	762043	16
15	152398	762056	16
16	152457	762102	16

The most recent fully-analysed benthic monitoring survey at the Macleans Nose site was conducted in April 2020. It has been classified as 'Satisfactory' by SEPA, confirming compliance with both pen edge and mixing zone environmental standards. Figure 3 shows the colour-coded IQI values at the sample stations, with red indicating an IQI of less than 0.64, taken to be the boundary between good and moderate status. The calculated ellipse area was 90,758 m^2, well within (37% of) the allowable mixing zone of 243,165 m^2.

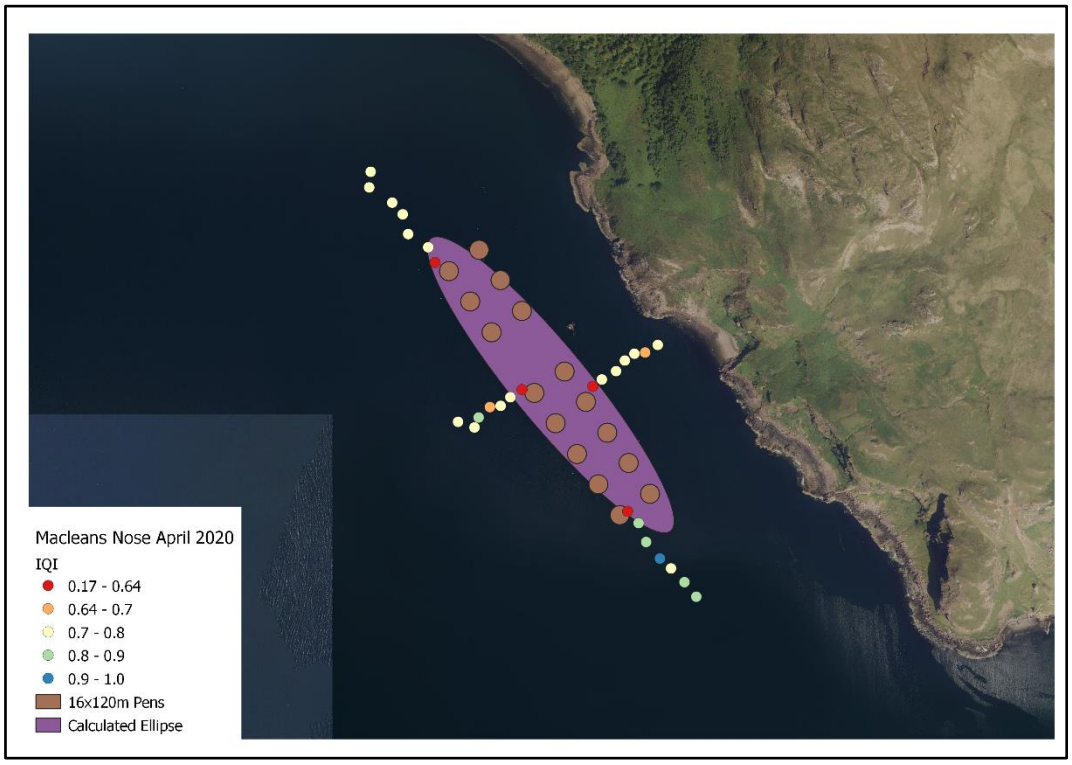

Figure 3. Sampled Infaunal Quality Index (IQI) at 28 stations at the Macleans Nose site in April 2020. IQI values are colour coded. The boundary between good and moderate seabed health lies at IQI = 0.64. The estimated area with IQI less than 0.64 is indicated by the ellipse.

During the COVID pandemic of 2020 – 2021, a temporary maximum biomass of 3300 tonnes, was granted. During the cycle, the maximum biomass attained was about 3200 tonnes. Following that cycle, a survey was conducted in January 2022 and the pen edge samples have been analysed. The results are shown in Table 4. The results demonstrated satisfactory pen edge samples achieved after a maximum on-site biomass of 3200 tonnes.

Table 4. Pen edge sample results from the seabed survey at Macleans Nose in January 2022.

Station	**T1 0m**		**T2 0m**		**T3 0m**		**T4 0m**	
No. poly species	3	2	2	2	2	3	3	3
No. poly/m^2	1380	1720	17810	38400	11620	2460	20690	9800

2 MODEL DETAILS

The deposition modelling was performed using the NewDepomod model (SAMS, 2021). The model was calibrated against the seabed survey from April 2020 (Figure 3) to relate the modelled solids deposition (in g m^{-2}) to the resulting measured Infaunal Quality Index (IQI). Once calibrated the model was used to determine a sustainable biomass at the site: one that met the mixing zone criteria and was unlikely to lead to excessive deposition at the pen edges.

2.1 NewDepomod Standard Default Method

NewDepomod is a bespoke modelling software designed to simulate the dispersion of particulate wastes from salmon farms. The model (SAMS, 2021) has been developed by the Scottish Association for Marine Science (SAMS) and is supplied under licence. The version used for the modelling described here was:

library version:
numerics version: Final 1.20211021113834.1634811708
datatypes version: Final 1.20211021113826.1634811708
util version: v1.4.0-rc02-(SEPA)

A regular model grid was prepared. The grid covered a 2km x 2km area, with a 25m grid spacing in both directions. The grid size was 80 x 80 cells. The water depth was 40.63 m. The flowmetry file combined the data from ID152 and ID160; after merging, the length of the combined record (initially 102 days in total) was truncated to 90 days to ensure a round number of spring-neap cycles was used in the flowmetry.

This configuration of the model produces a conservative estimate of the benthic footprint, with a deposition rate of 250 g m^{-2} equating approximately to an Infaunal Quality Index (IQI) of 0.64 (the boundary between moderate and good status). Work by SEPA has shown that footprints predicted by this “standard default” configuration broadly match the footprint area derived from seabed samples, although there is a great deal of variability from site to site.

Following the standard default approach, NewDepomod was used to simulate one year of deposition at the maximum farm biomass. Results were analysed over the final 90 days of the simulation, with the mean deposition rate across the model domain being calculated and the footprint area being delimited by the 250 g m^{-2} contour (SEPA, 2022). The results are presented in Section 3.1.

2.2 Calibrated NewDepomod Method

The calibrated deposition modelling approach applied NewDepomod with realistic bathymetry and flow fields taken from a calibrated hydrodynamic model. NewDepomod was calibrated against the 2020 seabed survey data, producing a parameter set that predicted seabed impacts at the Macleans Nose site with an acceptable level of accuracy. The calibration and validation process are described in more detail in the following sections. For the hydrodynamics, the RiCOM model (River and Coastal Ocean Model) was used, and three current datasets (ID152, ID159 and ID160) were used to calibrate and validate the model; the hydrodynamic modelling is described in a separate report submitted with this application.

2.2.1 NewDepomod Model Domain, Mesh and Bathymetry

When using NewDepomod with flow fields from hydrodynamic models, an unstructured mesh must be used. For the present application, the mesh covered an area of 2 km x 2 km around the site (Figure 4). The mesh consisted of 2798 nodes and 5356 elements; the mean element area was 562 m^2. The regional bathymetry was taken from the UK Hydrographic Office (UKHO) data portal (https://datahub.admiralty.co.uk/portal/apps/sites/#/marine-data-portal).

2.2.2 NewDepomod Calibration

NewDepomod was calibrated against benthic survey data from April 2020 (Figure 3). The calibration process simulated the November 2018 – April 2020 production cycle, and established a relationship between the modelled deposition (in g m^{-2}) and measured IQI at all the sample locations (Figure 3). The simulation ran from the date of stocking to the date of the seabed surveys (525 days in total). The mean modelled deposition over the final 90 days of the simulation (i.e. days 435 – 525) was used to compare to the IQI data. By comparing the modelled deposition to the 28 values of IQI from the 2020 survey, a relationship between deposition and IQI was established, allowing the modelled deposition to be converted to an IQI score. In the present application, a logistic function was used to relate the modelled deposition to the observed IQI. From the modelled and observed IQI values, a root-mean-square error for the model results was calculated.

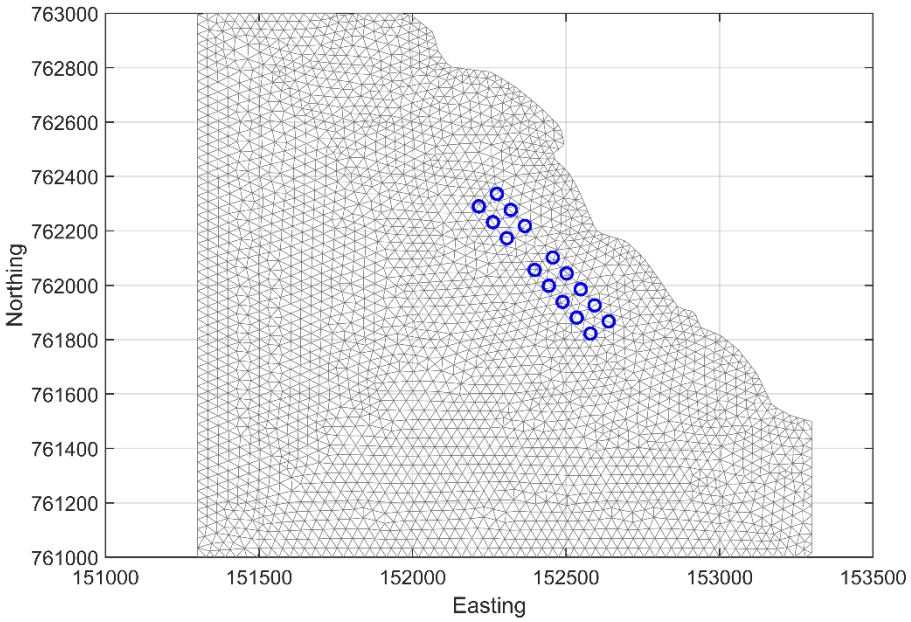

Figure 4. NewDepomod mesh used in the calibrated modelling of deposition from Macleans Nose. The pen locations are indicated (O).

An acceptable relationship between modelled deposition and IQI was stipulated as occurring when the root-mean-square error (RMSE) of less than 0.1, which is 10% of the range of IQI values. Given that we are comparing a physical process (particulate deposition) with a biological response (IQI), some variability in the response is inevitable and an RMSE target of 0.1 seems challenging but reasonable and achievable.

The calibration process involved numerous simulations of the model with different parameter sets, seeking the parameter values that achieved the best comparison (smallest RMSE) with the IQI data. Over the course of the calibration process, the following NewDepomod parameters were varied over realistic ranges of values:

- Coefficients of horizontal and vertical diffusion (K_H, K_V)
- Seabed roughness, z_0
- The critical erosion stress threshold (tauECritMin)
- The mass of sediment per bed layer per grid cell (dLayerMass)
- The release height of resuspended particles (H_R)
- The half-lives of bed expansion and contraction

A logistic function ($y = y_0[1+e^{-\lambda(x-x_0)}]^{-1}$) was fitted to the modelled deposition, allowing the modelled deposition to be converted to predicted IQI. Once a satisfactory relationship between the 90-day mean modelled deposition and IQI was established, the same parameter set was used to establish a relationship between deposition using waste solids derived from a year-long simulation at maximum consented biomass (3000 tonnes) and the IQI; this allows more realistic prediction of future deposition from the proposed biomass. The simulations performed are described in Table 5.

Table 5. Details of the model simulations. The primary calibration used waste solids calculated from actual feed input and was used to establish a model parameter set. The other model runs used fixed waste solids inputs appropriate for the modelled biomass and year-long simulations.

Run	Purpose	Start Date	End Date	Duration (days)	Consented Biomass (T)	Inputs
1	Calibration 1	05 Nov 2018	13 Apr 2020	525	3000	Actual
2	Calibration 2*	14 Apr 2019*	13 Apr 2020	365	3000	Fixed
3	Validation	1	365	365	3200	Fixed
4	Forecast	1	365	365	2500	Fixed

* Secondary calibration against fixed rate waste solids inputs for the consented biomass. The start date is nominal.

Note that the start date for the secondary calibration (Run 2) is nominal. The model results are compared to the IQI data from April 2020, and the simulation with fixed inputs lasts one year (365 days), giving a nominal start date of 14th April 2019.

2.2.3 NewDepomod Inputs

Inputs appropriate for the 2018 – 2020 production cycle, including pen locations, daily feed input and hydrodynamic flow fields, were used in the primary calibration simulation. The pen locations are shown in Figure 4. Pen centre coordinates used in the simulations are provided in Table 3.

Waste feed was estimated at 3% of the recorded daily feed input, and was distributed evenly between all 16 pens. Daily faeces input was calculated following SEPA (2019). The time series of inputs for the two calibration simulations are shown in Figure 5.

The fixed inputs are based on a feed load of 7 kg per consented tonne per day. The inputs for 3000 tonnes of fish were used in the secondary calibration (Run 2) and also in the standard default simulation (§2.1). The fixed feeding rate has a mean value that is over double the mean value of the actual feed rate, leading to more than double the daily waste inputs. This higher intensity of inputs has a significant effect on the critical deposition thresholds determined later (§3.2.1 and §3.2.2).

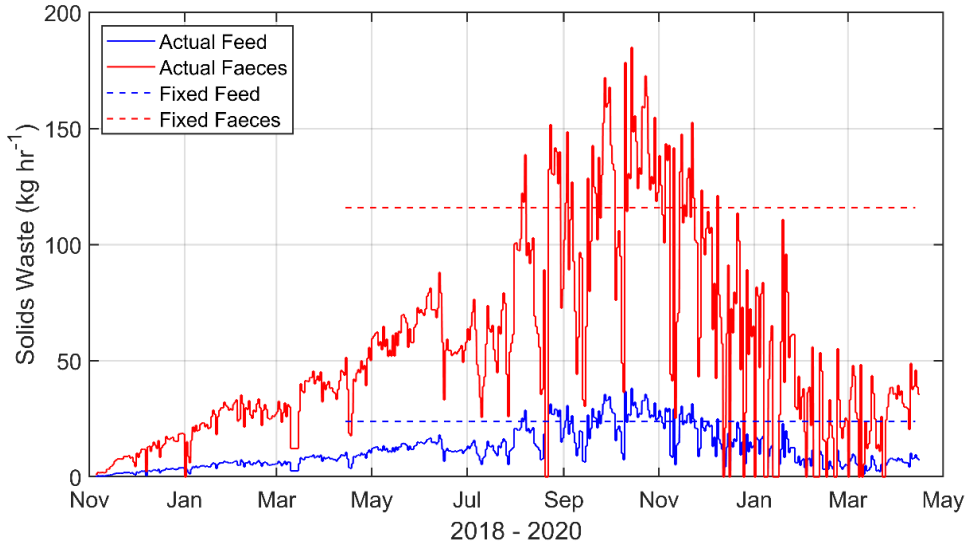

Figure 5. Waste solids inputs (feed and faeces) used in the two calibration simulations. The "Actual" inputs are derived from recorded feed inputs over the 2018 – 2020 production cycle. The "Fixed" inputs correspond to a consented biomass of 3000 tonnes and a feed rate of 7 kg per tonne of consented biomass per day.

2.2.4 Hydrodynamic Model Calibration

The RiCOM model has previously been calibrated against sea level and current meter data from the north of Scotland (Gillibrand et al. 2016). For the current study, the model was further calibrated and validated against hydrographic data collected in the region of the farm site in 2017. Acoustic Doppler Current Profilers (ADCPs) were deployed at two locations (Figure 2) from March – May 2017 and May – July 2017. Of the four datasets collected, three were used in the model calibration and validation (ID152, ID159, ID160). The fourth dataset (ID153) was subject to interference and was not used. The data are described in the relevant hydrographic reports.

The following main simulations were performed, corresponding with the dates of the ADCP deployments:

1. 22nd March 2017 – 4th May 2017 (ADCP deployment ID152)
2. 22nd March 2017 – 4th May 2017 (ADCP deployment ID159)
3. 5th May 2021 – 8th July 2017 (ADCP deployment ID160)

The calibration process and results are described fully in the accompanying hydrodynamic modelling report (Mowi, 2022).

3 RESULTS

3.1 NewDepomod Standard Default Method

The modelled footprint for the Macleans Nose farm using the SEPA standard default method is shown for the current consented biomass (Figure 6). The area of the footprint, as defined by the deposition rate of 250 g m^{-2}, was 246,250 m^2 (Table 6). While slightly larger than the allowable mixing zone of 243,165 m^2, the seabed survey of April 2020 demonstrated that the actual footprint area was only 90,758 m^2. The mean intensity of deposition in the footprint area was 4,141.4 g m^{-2}. The wave exposure index at the site is 3.17, giving a deposition intensity limit of 4,000 g m^{-2}. Again the seabed survey data from April 2020 resulted in a comfortable pass for pen edge samples, demonstrating that the site can sustain at least the current consented biomass.

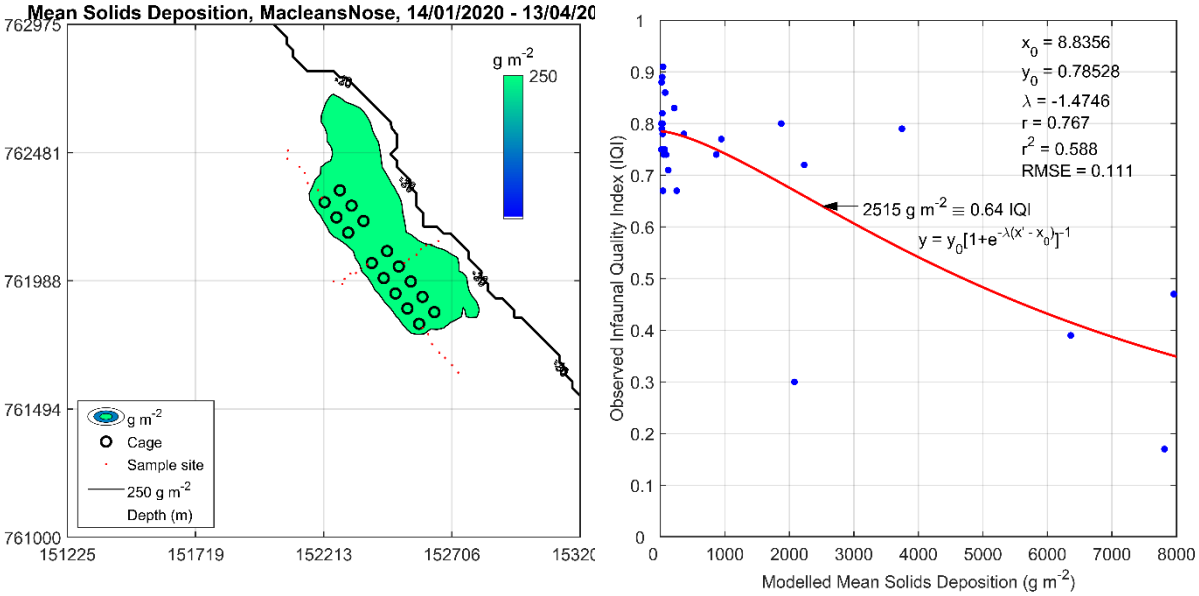

Figure 6. The modelled footprint for Macleans Nose for the current consented biomass of 3000 tonnes, using the SEPA standard default method (left). The pens (**O**) and locations of the samples from the April 2020 seabed survey (●) are shown. The comparison between observed IQI and modelled deposition at the sample locations is shown on the right.

Table 6. The modelled footprint areas and mean footprint depositions for Macleans Nose for the current consented and proposed biomasses, using the SEPA standard default method.

	Consented	Proposed
Maximum Biomass (T)	3,000	3,350
Feed Load (T/year)	7,665	8,559
Solid Waste Release Rate (kg/day)	7	7
Allowable Mixing Zone (m^2)	243,165	243,165
Modelled Footprint (m^2)	246,250	256,250
Area increase (%)	-	4.1
Mean Footprint Deposition (g m^{-2})	4,141.4	4,466.0
Mean deposition increase (%)	-	7.8
Wave Exposure Index	3.17	3.17

The modelled deposition footprint for the proposed biomass of 3350 tonnes is shown in Figure 7. The footprint area is slightly (2.5%) larger than that for the current biomass at 256,250 m^2 (Table 6). The mean deposition over the footprint was modelled at 4,466 g m^{-2}, an increase of 7.8% on the current biomass. This increase is within the allowable limits for deposition intensity for a site with a compliant history of benthic surveys.

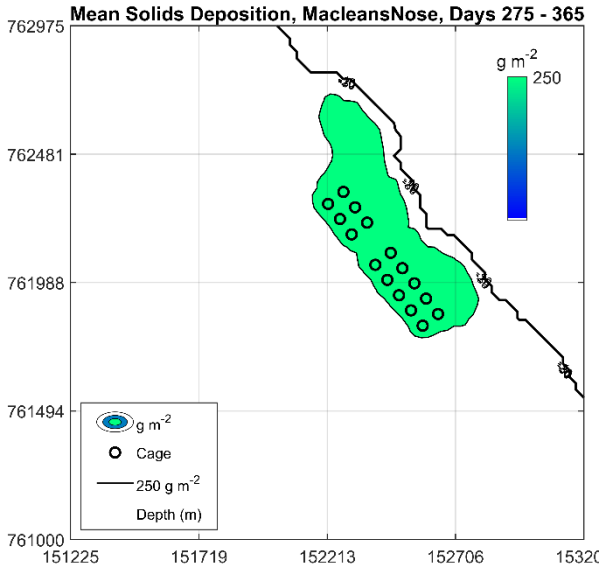

Figure 7. The modelled footprint for Macleans Nose for the proposed biomass of 3350 tonnes, using the SEPA standard default method.

These results indicate that the proposed biomass increase will meet pertinent Environmental Quality Standards for salmon farm waste solids. Further, more detailed and calibrated, modelling is described in the next section.

3.2 Calibrated NewDepomod Method

3.2.1 Calibration Simulation

The calibration process produced the NewDepomod parameter set summarised in Table 7. Only the parameter values that differ from the SEPA standard default method values are shown. The main difference between the SEPA standard default method and the calibrated method is that the former does not consolidate wastes into a compacted bed sediment layer (the consolidation, or contraction, time scale is infinite), whereas the calibrated approach does allow (up to 9) consolidated bed layers to develop. Thus the calibrated approach allows, in areas of heaviest deposition, compacted layers of wastes to develop. There are also some differences in the vertical dispersion coefficient and bed roughness (z_0).

The other significant differences between the two approaches is the input of actual, rather than fixed, waste solids and the use of spatially-varying flow fields from a hydrodynamic model to drive waste dispersion.

Table 7. NewDepomod parameter values resulting from the calibration process. Only values that differ from the SEPA standard default method parameter set are shown.

	SEPA Defaults	Calibrated
Horizontal (X, Y) dispersion coefficients (m^2 s^{-1})	0.1	0.3
Resuspension Z dispersion coefficient (m^2 s^{-1})	0.00289714	0.001
Bed roughness, z_0 (m)	0.001273	0.001
Number of bed model layers	3	10
Bed layer mass per grid cell (dLayerMass, kg)	3375	68
Bed model contractionT50 time scale (s)	Infinity	900
Bed model expansionT50 time scale (s)	1	604800
Bed model release height (m)	0.0	0.35
Bed model particle release position	CENTRE	RANDOM
Bed model sediment settling velocity distribution	GAUSSIAN	UNIFORM

Results from the calibration simulation are shown in Figure 9. Maximum deposition was 4,535 g m^{-2} (Table 8). Comparison between the modelled deposition and sampled IQI indicated that, for this site, a deposition rate of 233 g m^{-2} approximated the IQI = 0.64 boundary (Figure 8). The RMS error for the model-data comparison, using the equation shown in Figure 8, was 0.068, well within 10% of the IQI range (0 – 1). The modelled footprint, defined by the deposition rate of 233 g m^{-2}, was confined tightly around the pens (Figure 8), as observed in the observations (Figure 3), with an area of about 36% of the allowable mixing zone (Table 8).

These results demonstrate that NewDepomod can reproduce the observed IQI data with a reasonable degree of accuracy. A secondary calibration, using the same parameter set (Table 7) and described in the next section, will be used to establish a relationship between fixed-rate inputs of waste solids and the measured IQI in order to allow predictions of the footprint area and deposition for the proposed biomass.

Table 8. Observed and modelled footprint areas and modelled deposition intensity for Macleans Nose for the primary and secondary calibrations runs (Runs 1 and 2 respectively, Table 5).

	Run 1	Run 2
Maximum Biomass (tonnes)	3,000	3,000
Total Feed Load (tonnes)	5,168	7,665
Simulation Length (days)	525	365
Feed Per Day (tonnes day^{-1})	9.84	21.00
Maximum Deposition (g m^{-2})	4,535	8,524
Allowable Mixing Zone (m^2)	243,165	243,165
Observed Ellipse Area (m^2)	90,758	90,758
Modelled Footprint (m^2)	87,500	85,000
Mean Footprint Deposition (g m^{-2})	1,603.3	3,704.1
RMS Error	0.068	0.073
Correlation coefficient, r	0.919	0.906

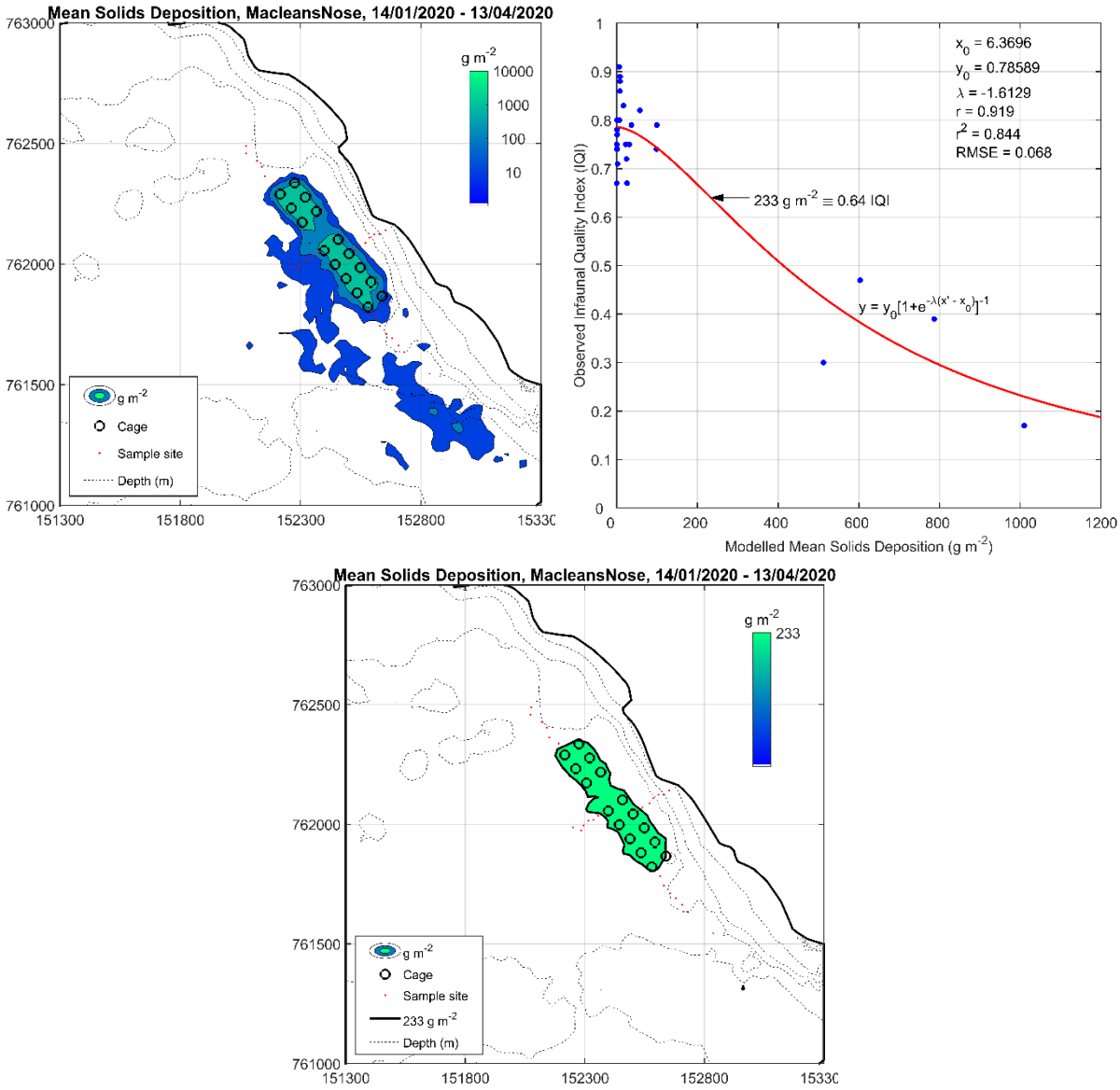

Figure 8. Modelled 90-day mean solids deposition (left) from 14th January – 13th April 2020 from the calibration simulation (Run 1). The pens (O) and IQI sample station locations from the April 2020 seabed survey (●) are indicated. The regression between the modelled deposition and observed IQI (top right) gives a critical deposition rate of 233 g m^{-2} resulting in a modelled footprint area (bottom).

3.2.2 Secondary Calibration Simulation: 3000 T

The secondary calibration used the same parameter set described above (Table 7), but, instead of using actual waste inputs, uses fixed rate inputs for waste feed and faeces (based on a feed load of 7 kg per tonne of biomass per day) for a consented biomass of 3000 tonnes with the model being run for one year (365 days) rather than the length of the production cycle. The results were again compared to the observed IQI and a second set of critical deposition metrics established. These metrics can then be used with the fixed rate inputs for the proposed biomass to demonstrate that environmental quality standards should not be breached.

The modelled footprint from the secondary calibration simulation (Run 2) is shown in Figure 9. Due to the higher intensity of inputs, the critical deposition threshold equating to an IQI = 0.64 was higher than that from Run 1 at 864 g m^{-2}. Nevertheless, the agreement between the model predictions and the observed IQI was still good, with an RMS error of 0.073, and the model clearly distinguishing between locations with an IQI less than 0.64 and those with greater.

The modelled intensity of deposition (i.e. the mean deposition within the footprint) was 3,704.1 g m^{-2}, over double the intensity from the primary calibration simulation (Run 1, Table 8).

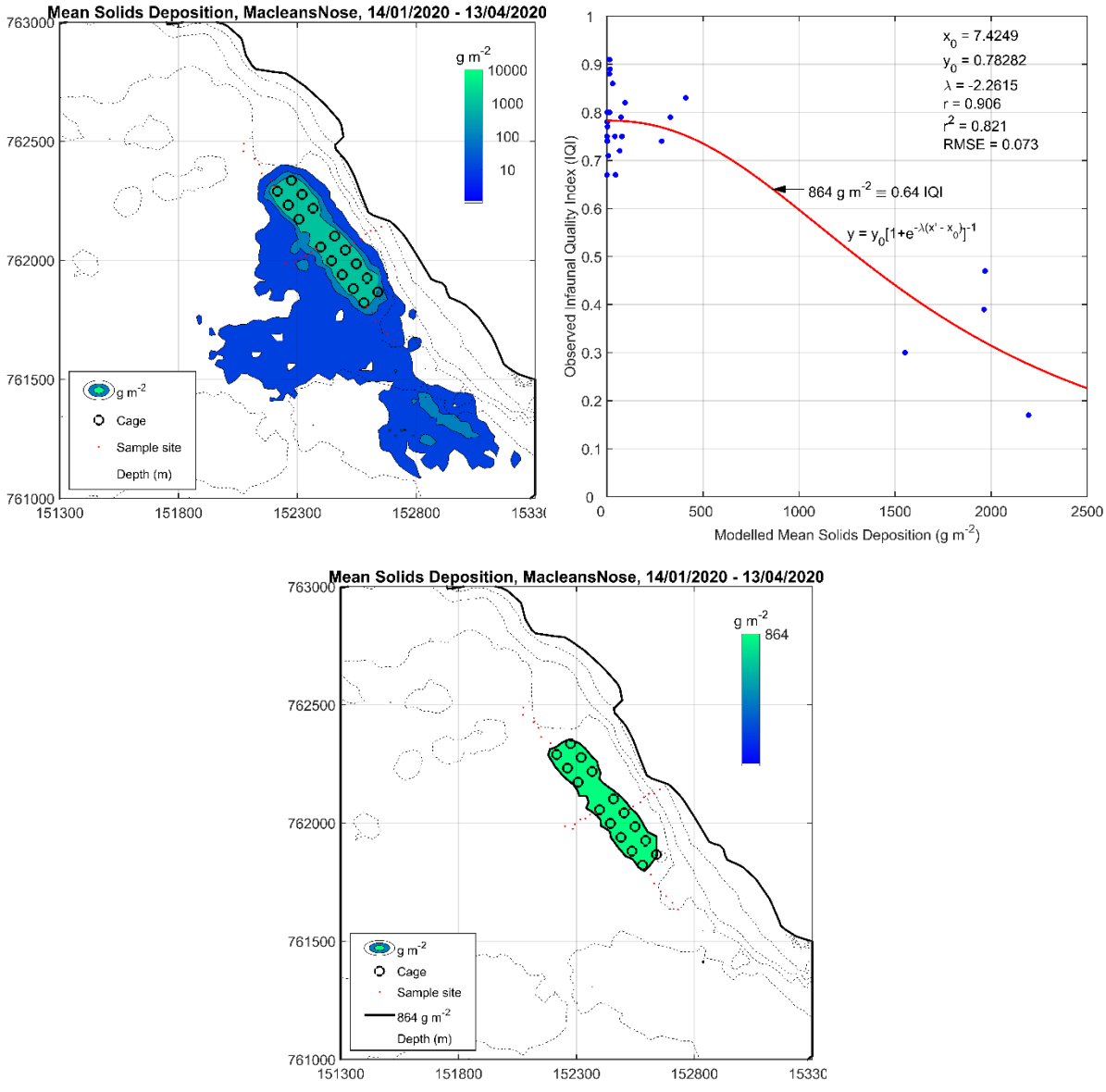

Figure 9. Modelled 90-day mean solids deposition (top left) from 14th January – 13th April 2020 from the secondary calibration simulation (Run 2). The pens (O) and IQI sample station locations from the April 2020 seabed survey (●) are indicated. The regression between the modelled deposition and observed IQI (top right) gives a critical deposition rate of 864 g m^{-2} resulting in a modelled footprint area (bottom).

3.2.3 Temporary Biomass: 3200 Tonnes

During the COVID pandemic in 2020 – 2021, the biomass at Macleans Nose reached 3200 tonnes as a temporary maximum biomass of 3300 tonnes was granted. The modelled footprint for 3200 tonnes is shown in Figure 10. The area of the footprint was only 39% of the allowable mixing zone (Table 9). The deposition intensity was 4,093.1 g m^{-2}, which preceded a seabed survey in January 2022 in which the pen edge (intensity) samples demonstrated compliance with the pen edge standard (Table 4).

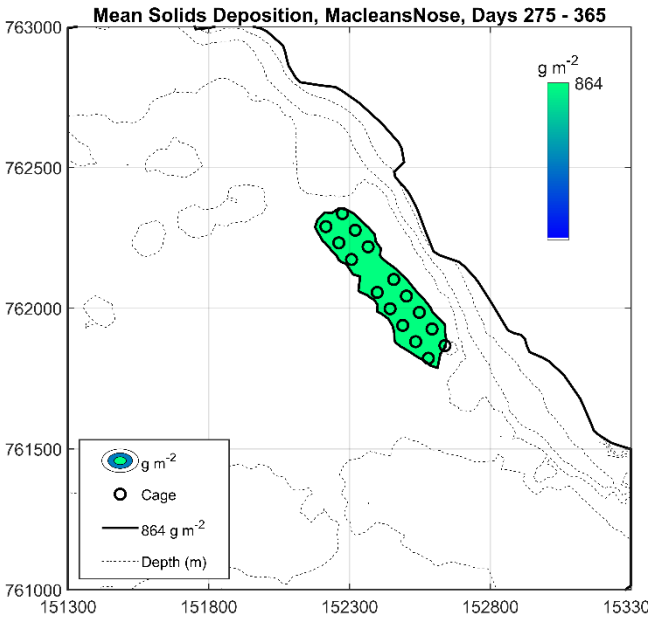

Figure 10. *The modelled footprint for Macleans Nose for the temporary (COVID) biomass of 3200 tonnes, using the calibrated NewDepomod method.*

Table 9. Summary of results for the proposed biomass of 3350 tonnes.

	3200 T	**3350 T**
Maximum Biomass (tonnes)	3,200	3,350
Total Feed Load (tonnes)	8,176	8,559
Simulation Length (days)	365	365
Feed Per Day (tonnes day^{-1})	22.40	23.45
Maximum Deposition (g m^{-2})	9,461	10,064
Allowable Mixing Zone (m^2)	243,165	243,165
Modelled Footprint Area (m^2)	94,375	95,625
Mean Footprint Deposition (g m^{-2})	4,093.1	4,218.2
Increase on 3000T deposition (Table 8, %)	10.5	13.9
Increase on 3200T deposition (%)	-	3.1

3.2.4 Forecast: 3350 Tonnes

The modelled footprint for the Macleans Nose farm using calibrated NewDepomod method is shown for the proposed biomass (Figure 11). The area of the footprint, as defined by the deposition rate of 864 g m^{-2}, was 95,625 m^2, 39.3% of the allowable mixing zone (Table 9). The maximum 90-day mean deposition was 10,064 g m^{-2}.

The predicted intensity of deposition (mean deposition rate within the modelled footprint) was 4,218.2 g m^{-2}. This is approximately 13.9% greater than the predicted intensity of deposition for 3000 tonnes, which preceded the compliant seabed survey of April 2020, and 3.1% greater than the predicted intensity of deposition for 3200 tonnes, which preceded the compliant seabed survey of January 2022. These results meet the SEPA guidelines regarding an increase of deposition intensity being less than 15% greater than the modelled intensity prior to a compliant seabed survey.

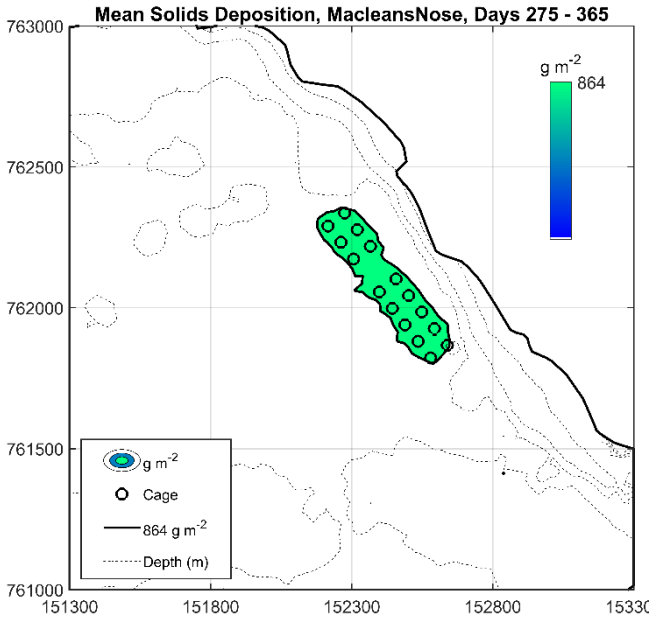

Figure 11. *The modelled footprint for Macleans Nose for the proposed biomass of 3350 tonnes, using the calibrated NewDepomod method.*

These results indicate that the proposed increase in biomass to 3350 tonnes will comfortably meet the mixing zone Environmental Quality Standard for salmon farm waste solids and meets the criteria for an allowable increase in deposition intensity.

4 SUMMARY AND CONCLUSIONS

The biomass of 3350 tonnes requested for consent at the Macleans Nose site, and the associated feed loading (8,559 tonnes), has been shown to meet pertinent Environmental Quality Standards. The calibrated NewDepomod method demonstrated that the site meets the

mixing zone criteria comfortably, and the deposition intensity at the proposed biomass is within the 15% increase allowed on the current modelled deposition intensity with a compliance seabed survey. The SEPA standard default method, suggests a minor failure of the mixing zone standard, but this method is specifically designed to provide a conservative prediction of particulate deposition.

Table 10. Summary of Results

Site Details	
Site Name:	Macleans Nose
Site Location:	Sound of Mull
Peak Biomass (T):	3,350
Feed Load (T/year):	8,559
Pen Details	
Number of Pens:	16
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NewDepomod Results	
Allowable Mixing Zone (m^2):	243,165
Maximum Deposition (g m^{-2}):	10,064
Modelled Footprint Area (m^2):	95,625
Mean Footprint Deposition (g m^{-2}):	4,218

5 REFERENCES

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