

# Aquaculture application modelling checklist for Industry

June 2024

Contents

[Aquaculture application modelling checklist for Industry 0](#_Toc169779364)

[List of tables 3](#_Toc169779365)

[List of figures 4](#_Toc169779366)

[List of abbreviations 5](#_Toc169779367)

[Site information 6](#_Toc169779368)

[HG Data 8](#_Toc169779369)

[Individual Deployment 8](#_Toc169779370)

[Multiple Deployments 9](#_Toc169779371)

[NewDepomod Modelling 11](#_Toc169779372)

[Solids Standard Default (all sites) 12](#_Toc169779373)

[EmBz Standard Default (all sites) 13](#_Toc169779374)

[Solids - Calibrated modelling (existing sites only) 15](#_Toc169779375)

[EmBz - Calibrated modelling (existing sites only. Must use Solids calibration settings) 16](#_Toc169779376)

[Marine Modelling 18](#_Toc169779377)

[Method Statement 18](#_Toc169779378)

[Marine Modelling Report 19](#_Toc169779379)

[Marine Modelling Solids 20](#_Toc169779380)

[BathAuto 24](#_Toc169779381)

[Marine Modelling Baths 25](#_Toc169779382)

[Cumulative Modelling Solids 30](#_Toc169779383)

[Cumulative Modelling Baths 31](#_Toc169779384)

[Nutrients (HD) modelling 32](#_Toc169779385)

[Sensitive features solids 33](#_Toc169779386)

[Sensitive features baths 35](#_Toc169779387)

[Dye/Drogue calibration study 36](#_Toc169779388)

[Any additional requirements 37](#_Toc169779389)

[NewDepomod Flowchart 38](#_Toc169779390)

##

## **List of tables**

[Table 1: Site Information to be completed. 6](#_Toc169779391)

[Table 2: Checklist for each individual deployment. 8](#_Toc169779392)

[Table 3: Checklist for multiple deployments. 9](#_Toc169779393)

[Table 4: Checklist for NewDepomod modelling. 11](#_Toc169779394)

[Table 5: Checklist for each individual Solids standard default NewDepomod. Should be completed for all sites. 12](#_Toc169779395)

[Table 6: Checklist for each individual EmBz standard default NewDepomod. Should be completed for all sites. 13](#_Toc169779396)

[Table 7: Checklist for calibrated Solids NewDepomod. 15](#_Toc169779397)

[Table 8: Checklist for calibrated EmBz NewDepomod. 16](#_Toc169779398)

[Table 9: Checklist for Marine Modelling Method Statement. 18](#_Toc169779399)

[Table 10: Checklist for Marine Modelling Report. 19](#_Toc169779400)

[Table 11: Checklist for Solids Marine Modelling. 20](#_Toc169779401)

[Table 12: Checklist for BathAuto. 24](#_Toc169779402)

[Table 13: Checklist for Marine Modelling of all bath chemicals. 25](#_Toc169779403)

[Table 14: Checklist for Marine Modelling of Azamethiphos. 26](#_Toc169779404)

[Table 15: Checklist for Marine Modelling of 3-hour Azamethiphos. 26](#_Toc169779405)

[Table 16: Checklist for Marine Modelling of 24-hour Azamethiphos. 26](#_Toc169779406)

[Table 17: Checklist for Marine Modelling of Cypermethrin. 27](#_Toc169779407)

[Table 18: Checklist for Marine Modelling of Deltamethrin. 28](#_Toc169779408)

[Table 19: Checklist for Cumulative Marine Modelling of Solids. 30](#_Toc169779409)

[Table 20: Checklist for Cumulative Marine Modelling of Baths. 31](#_Toc169779410)

[Table 21: Checklist for Marine Modelling of Nutrients. 32](#_Toc169779411)

[Table 22: Checklist for Sensitive Features in Marine Modelling of Solids. 33](#_Toc169779412)

[Table 23: Checklist for Sensitive Features in Marine Modelling of Baths. 35](#_Toc169779413)

[Table 24: Checklist for Dye/Drogue Study. 36](#_Toc169779414)

[Table 25: Checklist for any additional requirements, identified at Screening. 37](#_Toc169779415)

##

## List of figures

[Figure 1: Flowchart describing the checks and processes required for solids modelling. 37](#_Toc169611650)

## List of abbreviations

AMZ Allowable 100m Mixing Zone

EmBz Emamectin Benzoate

EQS Environmental Quality Standard

HG Hydrographic

HD Hydrodynamic (model)

MEQ Maximum Environment Quantity

MZ Mixing Zone

ND NewDepomod (model)

RCM Current Meter

SEPA Scottish Environment Protection Agency

TAQ Total Allowable Quantity

## Site information

Table 1: Site Information to be completed.

| **Site Name** | **Car Licence** |
| --- | --- |
|  |  |

Completed tables for this application (strikethrough non applicable rows and add relevant table number(s)):

| **Application includes:** | **Table number(s):** |
| --- | --- |
| **HG Data** |  |
| **ND Modelling** |  |
| **Method Statement** |  |
| **HD Model Calibration**  |  |
| **Solids Marine Modelling (individual site, cumulative, sensitive features)** |  |
| **Azamethiphos Marine Modelling (individual site, cumulative, sensitive features)** |  |
| **Deltamethrin Marine Modelling (individual site, cumulative, sensitive features)** |  |
| **Cypermethrin Marine Modelling (individual site, cumulative, sensitive features)** |  |
| **Azamethiphos BathAuto** |  |
| **Cypermethrin BathAuto** |  |
| **Deltamethrin BathAuto** |  |
| **Nutrients** |  |
| **Dye/Drogue**  |  |

## HG Data

HG data submitted to be used in NewDepomod modelling (90 days or larger) and/or for Calibration/ Validation of Marine Model.

### Individual Deployment

For each deployment:

Table 2: Checklist for each individual deployment.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Submit HG data report. This should include: * Deployment position.
* Deployment date.
* Deployed instrument.
* Bin numbers and depths.
* Water depth.
* Detailed maps of bathymetry with pen and RCM locations.

(see yymmdd\_HydrographicDataGuidanceForAquaculture.docx) |  |  |  |
| Submit each individual dataset in HG Analysis spreadsheet. For each, this should include:* Easting and Northing
* Depth/bin number
* Meter/station ID
 |  |  |  |
| Submit raw data (as outputted by instrument) for each dataset. |  |  |  |
| Sense check - Compare new data with existing data, if existing data present. |  |  |  |

### Multiple Deployments

Was more than 1 dataset used to create a 90 day or longer dataset?

If multiple deployments, then stitching is required.

Table 3: Checklist for multiple deployments.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Submit HG data report stitched.Stitching method should be discussed/described in the HG report. |  |  |  |
| Submit stitched dataset in HG Analysis spreadsheet.Weight averaged Eastings and Northings and depth should be included in the HG Analysis spreadsheet. |  |  |  |

## NewDepomod Modelling

Table 4: Checklist for NewDepomod modelling.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Benthic check (existing sites only). Pen edge must pass for past 2 production cycles.4 transect monitoring: Ellipse calculation must also be possible and meet 100m MZ of existing cage group, otherwise ND calibration using point to point method is required.Demonstrate in report that the last 2 production cycles passed. (Show ellipse calculation for 4 transect monitoring). |  |  |  |
| Submit ND report.Include run names. |  |  |  |
| Submit Run files. |  |  |  |
| Submit Metadata spreadsheet.Ensure all required sections covered and filled in correctly.Include run names. |  |  |  |

### Solids Standard Default (all sites)

Table 5: Checklist for each individual Solids standard default NewDepomod. Should be completed for all sites.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Check bed mean speed vs. bed residual current. If residual current >=35% remove residual current. |  |  |  |
| Check Vertical Dispersion Coefficient is calculated correctly (dependent on whether residual is/isn't removed). |  |  |  |
| Present wave exposure in Metadata spreadsheet and report.Check wave exposure calculated for RCM location.Acknowledge potential changes to limits (due to wave exposure) in report (see ND Flow Chart). |  |  |  |
| Ensure report is consistent with Metadata spreadsheet and model results. |  |  |  |
| Include table with comparison of existing vs. proposed model run results (100m Mixing Zone, modelled impact area, mean under cage impact) for solids in report. |  |  |  |
| Ensure modelled intensity and mixing zone criteria are met for solids.**Existing sites:** If not calibrating, validation with 4 transect monitoring must be undertaken.Refer to ND Flow Chart Sheet in tab "ND Flow Chart" for existing farms. |  |  |  |
| Sense check existing (if relevant) and proposed biomass against flow speed/ previous ND footprints.Near bed mean speed vs biomass should be in line with previous values. |  |  |  |

### EmBz Standard Default (all sites)

Table 6: Checklist for each individual EmBz standard default NewDepomod. Should be completed for all sites.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Check bed mean speed vs. bed residual current. If residual current >=35% remove residual current. |  |  |  |
| Check Vertical Dispersion Coefficient is calculated correctly (dependent on whether residual is/isn't removed). |  |  |  |
| Ensure report is consistent with Metadata spreadsheet and model results. |  |  |  |
| Include table with 100m Mixing zone, existing and proposed model run numbers and model impact areas in report for EmBZ.New sites and existing sites on 272ng/kg dry wt (or lower) EQS:For new and existing site on the 12ng/kg, 23.5ng/kg, 131ng/kg or 272ng/kg EQS, ensure modelled EmBZ footprint at the new UK Tag EQS (March 2023) contour of 136ng/kg wet weight (272ng/kg dry weight), is < 100m AMZ.Existing sites on the 763ng/kg wet wt EQS: Model the max quantity (TAQ) for existing farm layout and new farm layout then overlay footprints to ensure footprint area impacting new seabed at the new EQS 136ng/kg wet wt (272ng/kg dry wt) contour is <15%. Include overlap plot in report. |  |  |  |
| Ensure MEQ is correctly calculated in Metadata spreadsheet.MEQ is approx. 72% of the modelled max quantity (TAQ) amount. |  |  |  |

### Solids - Calibrated modelling (existing sites only)

**Required: Y/N**

If Yes:

Table 7: Checklist for calibrated Solids NewDepomod.

Should be completed for existing sites.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Check calibration method is plausible and well described in report. |  |  |  |
| Ensure report is consistent with Metadata spreadsheet and model results. |  |  |  |
| Include table with comparison of existing vs. proposed calibrated model run results (100m Mixing Zone, modelled impact area, mean under cage impact) for solids in report.Ensure modelled intensity and mixing zone criteria are met for solids. Intensity criteria: 15% increase in intensity permitted. Mixing zone criteria: Impact area up to 100% of AMZAlso refer to ND Flow Chart Sheet in tab "ND Flow Chart" |  |  |  |

### EmBz - Calibrated modelling (existing sites only. Must use Solids calibration settings.)

**Required: Y/N**

If Yes:

Table 8: Checklist for calibrated EmBz NewDepomod.

Should be completed for existing sites.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Ensure the same settings/ procedures were used for calibrated EmBZ run as in the Solids run. |  |  |  |
| Ensure report is consistent with Metadata spreadsheet and model results. |  |  |  |
| Include table with proposed model run numbers and results in report for EmBZ (100m Mixing Zone, modelled impact area numbers) in report.New sites and existing sites on 272ng/kg dry wt (or lower) EQS: For existing site on either the 12ng/kg, 23.5ng/kg, 131ng/kg EQS, ensure modelled EmBZ footprint at the new UK Tag EQS (March 2023) contour of 136ng/kg wet weight (272ng/kg dry weight), is <100m AMZ.Existing sites on the 763ng/kg wet wt EQS: Model the max quantity (TAQ) for existing farm layout and new farm layout then overlay footprints to ensure footprint area impacting new seabed at the new EQS 136ng/kg wet wt (272ng/kg dry wt) contour is <15%. Include overlap plot in report. |  |  |  |
| Ensure MEQ is correctly calculated in Metadata spreadsheet. MEQ is approx. 72% of the modelled max quantity (TAQ) amount. |  |  |  |

## Marine Modelling

**Required: Y/N**

### Method Statement

**Required: Y/N**

If Yes:

Table 9: Checklist for Marine Modelling Method Statement.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Method statement outlines the proposed modelling? |  |  |  |

* + **Pre-validation (Preval) checks made:**
		- Check the proposed method is reasonable, and all relevant steps of the modelling process are included.
	+ **Why is it checked?**
		- Ensure the modelling approach proposed is likely to produce acceptable modelling, which answers all questions needed for the determination.
		- Ensures issues/shortcomings of the method are caught as early as possible and reduces the risk of time/money being wasted.
	+ **What are the main things that can go wrong?**
		- Inappropriate modelling method produced.
		- Lack of information on all relevant steps.
		- If approved method statement not produced/ followed, the modelling produced might not meet SEPA standards and could be rejected, wasting significant time/money.
	+ **What can happen if quality is poor?**
		- Many iterations of the method statement would be required, before it can be approved.
	+ **Reject application? How can we mitigate this?**
		- Pre-app step: The method statement would be returned with advice on what is missing. Many iterations would be required if the appropriate standard is not met.
		- **Mitigation:** Follow SEPA guidance (yymmdd\_MarineModellingGuidance.docx) when producing a method statement. Address recommendations from Screening.

### Marine Modelling Report

Table 10: Checklist for Marine Modelling Report.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Mesh resolution appropriate. (Mesh grid resolution 25-50m around farms and sensitive features (average is 36m grid cells)). |  |  |  |
| Meteorological data used? Justified and appropriate? |  |  |  |
| Are boundary conditions and bathymetry used appropriate? |  |  |  |
| Is the calibration sensible/comparable to HG data? |  |  |  |
| Has model calibration data been submitted? |  |  |  |
| Is the validation sensible/comparable to HG data? |  |  |  |
| Has model validation data been submitted? |  |  |  |

* **Preval checks made:**
* Is marine modelling required?
* Evaluate risks of low model resolution and meteorological data choices.
* Check for evidence of calibration.
* Note: Marine modelling is complex to evaluate. We can carry out initial checks, but issues may arise later in the evaluation process.
* **Why is it checked?**
* Inappropriate model calibration, resolution etc, will result in a poorly performing model, which is unable to predict the impacts from solids/baths.
* **What are the main things that can go wrong?**
* Marine modelling not done but is required.
* Model grid resolution may be inappropriate for study area.
* Model is not calibrated against suitable data.
* **What can happen if quality is poor?**
* Marine Modelling may underestimate the scale and location of impacts.
* Marine modelling accuracy uncertain and cannot be used during determination.
* Missing information may take time and lead to application delays.
* **Reject application? How can we mitigate this?**
* Yes. Marine modelling issues can be time consuming to rectify and may need more time than is available at application.
* Key information should be immediately obvious in any report.
* **Mitigation:** Marine modelling is best dealt with in pre-application discussions. It is advisable that model calibration is submitted for checking prior to undertaking baths/solids modelling.

### Marine Modelling Solids

**Required: Y/N**

If Yes:

Table 11: Checklist for Solids Marine Modelling.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Modelled at peak biomass for the entire period or appropriate feed curve presented? |  |  |  |
| Recommended values used or otherwise justified? -Feed requirement = 7kg feed per tonne biomass per dayFeed Water Percentage = 9%Feed Waste Percentage = 3%Feed Absorbed Percentage = 85%Feed Carbon Percentage = 49%Faeces Carbon Percentage = 30% |  |  |  |
| Run-up period for the hydrodynamics included? |  |  |  |
| Run for 365 days (not including the run-up period)? |  |  |  |
| Runs start and finish in summer? |  |  |  |
| Solids particle parameters consistent with those used in calibration runs. If solids are uncalibrated, default parameters should be used:Decay: 0/sSettling Velocity of faeces: 0.032m/s (specified directly)Settling Velocity of feed: 0.095m/s (specified directly)Horizontal Dispersion: 0.1m2/sVertical Dispersion: 0.001m2/sErosion Threshold: 0.02N/m2/s |  |  |  |
| Plot of areal extent at the 250g/m2 contour and average concentration, averaged over the last 90 days of the model run (spatial plot)? |  |  |  |
| Plot of areal extent at the 250g/m2 contour and average concentration, averaged over the last 90 days of the model run included for each farm identified at Screening (spatial plot)? |  |  |  |
| Include table of area of averaged concentration at the 250g/m2 contour, averaged over the last 90 days of the model run for each farm included identified at Screening. |  |  |  |
| Output for both the suspended and deposited solids. |  |  |  |

* + **Preval checks made:**
* Check for key runs and information.
* Note: Marine modelling is complex to evaluate. We can carry out initial checks, but issues may arise later in the evaluation process.
* **Why is it checked?**
* Marine models can be calibrated to unique site conditions using monitoring data acceptable to SEPA.
* Marine modelling for solids highlights any risk of wider impacts from solids (including on sensitive features/from multiple farms).
	+ **What are the main things that can go wrong?**
* Key model runs are missing or are not obvious in the modelling report.
* Important plots and tables are missing.
* **What can happen if quality is poor?**
* Solids impact on wider environment cannot be assessed.
* Marine Modelling may underestimate the scale and location of impacts.
* Marine modelling accuracy uncertain and cannot be used during determination.
* Missing model runs and information may take time and lead to application delays.
* **Reject application? How can we mitigate this?**
* Yes. Marine modelling issues can be time consuming to rectify and may need more time than is available at application.
* Key information should be immediately obvious in any report.
* **Mitigation:** Re-emphasise that marine modelling is best dealt with in pre-application discussions.

### BathAuto

**Required: Y/N**

If Yes:

Table 12: Checklist for BathAuto.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Surface Mean Speed as in HG Sheet? |  |  |  |
| Correct number of pens, correct diameter? |  |  |  |
| Correct water body selected (Loch, Strait, Open Water)? |  |  |  |
| Distance to shore correct in km? |  |  |  |
| Correct water depth (m)? |  |  |  |
| Correct working (net) depth? |  |  |  |
| If 24hr Azamethiphos modelled, did the model achieve a correct passing run (check Run Log tab)? |  |  |  |

* + **Preval checks made:**
* Simple cross checks.
* Check against other sites to see if values are reasonable.
* **Why is it checked?**
* Simple tools give a conservative estimate of Bath Medicine dispersion amount, but no information on impact location.
	+ **What are the main things that can go wrong?**
* Incorrect use of simple tools.
* Simple errors
* Simple tools are inappropriate for the assessment against identified sensitive features.
* **What can happen if quality is poor?**
* Underestimate of scale of medicine impact.
* **Reject application? How can we mitigate this?**
	+ Yes, but only if simple tools are inappropriate. Applicant to enter pre- application discussions for Marine Modelling.
	+ **Mitigation:** Re-emphasise need for pre-application discussions and the identification of sensitive features.

### Marine Modelling Baths

**Required: Y/N**

If No:

Was BathAuto used or no Bath medicines applied for?

If Yes:

#### For All Bath Chemicals:

Table 13: Checklist for Marine Modelling of all bath chemicals.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Run-up period included in HD simulation? |  |  |  |
| Calibrated with dye and/ or drogue data?  |  |  |  |
| Bath particle parameters same as used in calibration runs? |  |  |  |
| Bath particles in the top 0 - 5m of the water column (or consistent with net depths at treatment, if shallower), considered in the output? |  |  |  |

#### Azamethiphos:

Table 14: Checklist for Marine Modelling of Azamethiphos.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Decay rate of 5.6 days (or 8.6 days) used?  |  |  |  |
| Time series of maximum concentrations of Azamethiphos for the entire run period?  |  |  |  |

####

#### For 3 hours:

Table 15: Checklist for Marine Modelling of 3-hour Azamethiphos.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Single release of 3hr mass? |  |  |  |
| Time series plot showing the area above the 250ng/l? |  |  |  |
| Time series output from the beginning of treatment to 3hrs? |  |  |  |
| Add lines in time series plot at 3hrs after the first treatment and allowed mixing zone area established using BathAuto. |  |  |  |

#### For 24 hours:

Table 16: Checklist for Marine Modelling of 24-hour Azamethiphos.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Realistic treatment regime modelled? |  |  |  |
| Neap and spring runs conducted? |  |  |  |
| Time series plot showing the area above the 40ng/l? |  |  |  |
| Include lines to area time series plot at 72hrs after final treatment and the allowed mixing zone area of 0.5km2. |  |  |  |
| Time series output of maximum concentrations of Azamethiphos for the entire run period? |  |  |  |
| Include lines to max. concentration time series plot at 72hrs after final treatment and the allowed MAC of 100ng/l. |  |  |  |
| Spatial plots of extent and concentrations at EQSs and various time steps in between? |  |  |  |

####

#### Cypermethrin:

Table 17: Checklist for Marine Modelling of Cypermethrin.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Modelled without decay? |  |  |  |
| Single release of the 6hr mass? |  |  |  |
| Neap and spring runs conducted? |  |  |  |
| Time series plot showing the area above 16ng/l? |  |  |  |
| Time series output from the beginning of treatment to 6hrs? |  |  |  |
| Include lines to area time series plot at 6hrs after the first treatment and the allowed mixing zone area established using BathAuto. |  |  |  |
| Spatial plot at 6hrs of extent and concentrations? |  |  |  |

#### Deltamethrin:

Table 18: Checklist for Marine Modelling of Deltamethrin.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Modelled without decay? |  |  |  |
| Single release of the 6hr mass? |  |  |  |
| Neap and spring runs conducted? |  |  |  |
| Time series plot showing the area above 6ng/l? |  |  |  |
| Time series output from the beginning of treatment to 6hrs? |  |  |  |
| Include lines to area time series plot at 6hrs after the first treatment and the allowed mixing zone area established using BathAuto. |  |  |  |
| Spatial plot at 6hrs of extent and concentrations? |  |  |  |

* + **Preval checks made:**
* Is marine modelling of baths required?
* Check for key runs and information.
* Check for evidence of calibration.
* Note: Marine modelling is complex to evaluate. We can carry out initial checks, but issues may arise later in the evaluation process.
* **Why is it checked?**
* Marine models can be calibrated to unique site conditions using monitoring data acceptable to SEPA. This prediction can indicate extra capacity for bath medicine releases compared to simple modelling tools. Often essential for large sites over 2500t.
	+ **What are the main things that can go wrong?**
* Marine modelling not done.
* Simple tools used may not be appropriate.
* Model is not calibrated against suitable data.
* Key model runs are missing or are not obvious in the modelling report.
* Important plots and tables are missing.
* **What can happen if quality is poor?**
* Simple tools are not appropriate.
* Marine Modelling may underestimate the scale and location of impacts.
* Marine modelling accuracy uncertain and cannot be used during determination.
* Missing model runs and information may take time and lead to application delays.
* **Reject application? How can we mitigate this?**
	+ Yes. Marine modelling issues can be time consuming to rectify and may need more time than is available at application.
	+ Key information should be immediately obvious in any report.
	+ **Mitigation:** Re-emphasise that marine modelling is best dealt with during the pre-application process.

### Cumulative Modelling Solids

**Required: Y/N**

If Yes:

Table 19: Checklist for Cumulative Marine Modelling of Solids.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| All farms included in Screening modelling?  |  |  |  |
| Include all sensitive features identified at Screening and follow steps from corresponding section above. |  |  |  |

* + **Preval checks made:**
* Is cumulative solids modelling required?
* Check for key runs and information - ensure all sites highlighted at Screening are included.
* Note: Marine modelling is complex to evaluate. We can carry out initial checks, but issues may arise later in the evaluation process.
* **Why is it checked?**
* Ensure the wider environment is not unacceptably impacted in addition to impacts from other farms by additional proposed biomass.
* Ensure interactions between farms are not likely to result in farms failing due to wrongly attributed discharges.
	+ **What are the main things that can go wrong?**
* Marine modelling of cumulative solids not done.
* Key model runs are missing or are not obvious in the modelling report.
* Important plots and tables are missing.
* **What can happen if quality is poor?**
* Marine Modelling may underestimate the scale and location of impacts.
* Marine modelling accuracy uncertain and cannot be used during determination.
* Missing model runs and information may take time and lead to application delays.
* **Reject application? How can we mitigate this?**
	+ Yes. Marine modelling issues can be time consuming to rectify and may need more time than is available at application.
	+ Key information should be immediately obvious in any report.
	+ **Mitigation:** Re-emphasise that marine modelling is best dealt with during the pre-application process.

### Cumulative Modelling Baths

**Required: N**

If Yes:

Table 20: Checklist for Cumulative Marine Modelling of Baths.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| All farms included in Screening modelling? |  |  |  |
| Include all sensitive features identified at Screening and follow steps from corresponding section above. |  |  |  |

* + **Preval checks made:**
* Is cumulative baths modelling required?
* Check for key runs and information - ensure all sites highlighted at Screening are included.
* Note: Marine modelling is complex to evaluate. We can carry out initial checks, but issues may arise later in the evaluation process.
* **Why is it checked?**
* Ensure the wider environment is not unacceptably impacted in addition to impacts from other farms by additional proposed baths medicine.
* Ensure interactions between farms are not likely to result in farms failing due to wrongly attributed discharges.
	+ **What are the main things that can go wrong?**
* Marine modelling of cumulative baths not done.
* Key model runs are missing or are not obvious in the modelling report.
* Important plots and tables are missing.
* **What can happen if quality is poor?**
* Marine Modelling may underestimate the scale and location of impacts.
* Marine modelling accuracy uncertain and cannot be used during determination.
* Missing model runs and information may take time and lead to application delays.
* **Reject application? How can we mitigate this?**
	+ Yes. Marine modelling issues can be time consuming to rectify and may need more time than is available at application.
	+ Key information should be immediately obvious in any report.
	+ **Mitigation:** Re-emphasise that marine modelling is best dealt with during the pre-application process.

### Nutrients (HD) Modelling

**Required: Y/N**

If Yes:

Table 21: Checklist for Marine Modelling of Nutrients.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Include all sensitive features identified at Screening. |  |  |  |

* + **Preval checks made:**
* Is marine modelling of nutrients required?
* Ensure advice at Screening is followed regarding what level of nutrient modelling is needed.
* Check for evidence of calibration.
* Check for key runs and information.
* Note: Marine modelling is complex to evaluate. We can carry out initial checks, but issues may arise later in the evaluation process.
* **Why is it checked?**
* Marine models can be calibrated to unique site conditions using monitoring data acceptable to SEPA.
	+ **What are the main things that can go wrong?**
* Marine modelling not done.
* Model is not calibrated against suitable data.
* Key model runs are missing or are not obvious in the modelling report.
* Important plots and tables are missing.
* **What can happen if quality is poor?**
* Simple tools are not appropriate.
* Marine Modelling may underestimate the scale and location of impacts.
* Marine modelling accuracy uncertain and cannot be used during determination.
* Missing model runs and information may take time and lead to application delays.
* **Reject application? How can we mitigate this?**
	+ Yes. Marine modelling issues can be time consuming to rectify and may need more time than is available at application.
	+ Key information should be immediately obvious in any report.
	+ **Mitigation:** Re-emphasise that marine modelling is best dealt with during the pre-application process.

### Sensitive Features Solids

**Required: Y/N**

If Yes:

Table 22: Checklist for Sensitive Features in Marine Modelling of Solids.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Include all sensitive features identified at Screening. |  |  |  |
| Plots, with features overlaid, showing the extent and concentration of impact for the various timescales required? |  |  |  |
| Time series of concentration at the sensitive feature point (or polygon centre), time series of maximum concentrations? |  |  |  |
| Depth profile at EQS averaged over 90 days for solids, at the sensitive feature point (or polygon centre)? |  |  |  |

* + **Preval checks made:**
* Identification of Sensitive Features.
* **Why is it checked?**
* Solids model output required to assess the risk to sensitive marine life.
	+ **What are the main things that can go wrong?**
* Sensitive features not identified at an early stage.
* Modelling is unsuitable to allow assessment, or the required information is not available.
* **What can happen if quality is poor?**
* Cannot assess the risk posed to sensitive features. The permit cannot be determined.
* **Reject application? How can we mitigate this?**
	+ Check application for required information.
	+ Check with SEPA Ecology colleagues.

### Sensitive Features Baths

**Required: Y/N**

If Yes:

Table 23: Checklist for Sensitive Features in Marine Modelling of Baths.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Include all sensitive features identified at Screening. |  |  |  |
| Plots, with features overlaid, showing the extent and concentration of impact for the various timescales required? |  |  |  |
| Time series of concentration at the sensitive feature point (or polygon centre), time series of maximum concentrations? |  |  |  |
| Depth profile at each EQS for baths, at the sensitive feature point (or polygon centre)? |  |  |  |

* + **Preval checks made:**
* Identification of Sensitive Features.
* **Why is it checked?**
* Bath model output required to assess the risk to sensitive marine life.
	+ **What are the main things that can go wrong?**
* Sensitive features not identified at an early stage.
* Modelling is unsuitable to allow assessment, or the required information is not available.
* **What can happen if quality is poor?**
* Cannot assess the risk posed to sensitive features. The permit cannot be determined.
* **Reject application? How can we mitigate this?**
	+ Check application for required information.
	+ Check with SEPA Ecology colleagues.

### Dye/ Drogue Calibration Study

**Required: Y/N**

If Yes:

Table 24: Checklist for Dye/Drogue Study.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Submit dye/drogue report and dye/ drogue data if identified at Screening. |  |  |  |
| Plots of dye plumes and/ or drogue tracks? |  |  |  |

* + **Preval checks made:**
* Check for appropriate calibration method and result.
* **Why is it checked?**
* Marine models can be calibrated to unique site conditions using monitoring data acceptable to SEPA.
	+ **What are the main things that can go wrong?**
* Model is not calibrated against suitable data.
* **What can happen if quality is poor?**
* Marine Modelling may underestimate the scale and location of impacts.
* Marine modelling accuracy uncertain and cannot be used during determination.
* **Reject application? How can we mitigate this?**
	+ Yes. Marine modelling issues can be time consuming to rectify and may need more time than is available at application.
	+ Key information should be immediately obvious in any report.
	+ **Mitigation:** Re-emphasise that marine modelling is best dealt with during the pre-application process.

### Any additional requirements

**Required: Y/N**

If Yes:

Table 25: Checklist for any additional requirements, identified at Screening.

| **Check required** | **Info submitted (Industry)** | **Info checked (SEPA)** | **Checking notes (SEPA)** |
| --- | --- | --- | --- |
| Identified at Screening. |  |  |  |

* + **Preval checks made:**
* Check any additional information requested at Screening has been included.
* **Why is it checked?**
* Additional information requested is required as part of the determination process, and a decision cannot be made without it.
	+ **What are the main things that can go wrong?**
* Information not included or is of an unacceptable standard.
* **What can happen if quality is poor?**
* The scale and location of impacts may be underestimated.
* The current condition/presence of a feature/waterbody may not be known.
* **Reject application? How can we mitigate this?**
	+ Yes, issues regarding additional information (often surveys/reports) can be time consuming to rectify and may need more time than is available at application.
	+ Key information should be immediately obvious in any report.
	+ Check with SEPA Ecology colleagues.
	+ **Mitigation:** Re-emphasise that additional information identified at pre-application should be provided.

# NewDepomod Flowchart



Figure 1: Flowchart describing the checks and processes required for solids modelling for existing sites.

|  |
| --- |
| **Notes on Flowchart:** |
|  |
| \*1. Two comparable production cycles. We mean that the production cycles are similar in nature. Similar biomass peaks and feed usage. For example, the two production cycles would not be comparable if the biomass limit had been changed over the past two years. |
| \*2. Validating default NewDepomod against new framework monitoring is essential, to be able to evaluate the accuracy of default NewDepomod predictions and to avoid cases where default NewDepomod modelling is allowing a biomass not supported by monitoring. \*3. Modelled deposition is derived from NewDepomod, which may use the default SEPA settings or be calibrated against transect monitoring data. The current modelled deposition rates for default NewDepomod were derived from testing against observed data. The lower limit applies at sites with a wave threshold less than, or equal to, 2.8 as defined by information on the [**Marine Scotland Wave Exposure map**](https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=780.)**.**\*4. Where ecology can be demonstrated to be in very good condition, SEPA can take this into account as part of the determination and where appropriate allow for increases greater than 15%. For example, if the IQI was close to the moderate/poor boundary or better.[\*5. This step will only be required if marine modelling has been identified as being required at the pre-application Screening stage.](https://www.sepa.org.uk/regulations/water/aquaculture/screening-modelling-and-risk-identification-report/) |

For information on accessing this document in an alternative format or language, please contact SEPA by emailing equalities@sepa.org.uk

If you are a user of British Sign Language (BSL), the [Contact Scotland BSL](http://contactscotland-bsl.org/) service gives you access to an online interpreter, enabling you to communicate with us using sign language.