Scottish Environment Protection Agency
Buidheann Dìon Àrainneachd na h-Alba

New Depomod Draft Guidance

September 2022

NewDepomod modelling is required to assess the likely localised impact from a fish farm. SEPA standards refer to the under cage and mixing zone impacts.

Marine modelling should also be undertaken to assess the far field associated risk. Pre-app screening will help determine the type of marine modelling required – please refer to the Interim Marine Modelling guidance for more information on this.

Default NewDepomod modelling is required for all sites. The required settings are listed in the appendix and have been tested at a number of sites, with the aim of being mildly conservative. This is to ensure the modelled passing biomass can in reality be sustained at the site. Calibrated NewDepomod modelling cannot be undertaken at new sites.

After a production cycle, extensive monitoring with a minimum of 4 monitoring transects should be carried out. This will provide the ability for calibrated NewDepomod modelling to be undertaken, and the authorised biomass at the site to be potentially increased.

Calibrated NewDepomod modelling will not be accepted without extensive monitoring – the old far field monitoring comprising of one transect and two monitoring points is insufficient.

Always use the latest version of NewDepomod to have the latest parameters available and to avoid using potentially wrong calculations.

Standard Default NewDepomod

Model Setup

Modelling option	Requirement
Domain size	2 km x 2 km
Cell size	25 m x 25 m squares
Bathymetry	Uniform – representative of depth under the pens.
Flow field	Uniform – from 1 or more current meter deployments Where the residual flow speed is ≥35% of the mean flow speed at the bed, the residual component should be removed from the flow data.
Flow data duration	90 days or greater
Number of flow depth records	3 or greater. At least: <5 m from water surface Pen-bottom <3 m from bed
Number of particles	10 per pen per time step
Time step	60 s

Table 1: Default model setup for solids

Requirements for the configuration of physical parameters used in the standard default method are described in Appendix A.

- For the Standard Default Method (SDM) of NewDepomod the bathymetry depth and flowmetry depth should be the same. The average depth is calculated from the depths of the individual hydrographic datasets submitted to SEPA (see HG Data for Aquaculture Applications_DRAFT_yyyymmdd_final.doc for more detail).

- Should the farm be over or at the edge of a steep slope, but the current meter is in significantly deeper water (i.e. more than 10m difference), the depth used in the bathymetry and flowmetry files should be adjusted to better reflect the water depth in the vicinity of the farm.
  In these cases, the bathymetry (site depth) and near-bed flowmetry depth in NewDepomod should use the average depth (or the most representative depth) of the seabed underneath the farm rather than the time-averaged deployment depth:

  - **SD = mean (or most representative) depth at site location**

- **Bed Flowmetry Value = (SD - Dav Bed Cell)*-1**
- **Site Depth = (SD)*-1**

The flowmetry mid and surface cell depth calculation is unchanged

Calibrated NewDepomod

Model Setup

Modelling option	Requirement
Domain size	2 km x 2 km
Cell size	25 m x 25 m squares
Bathymetry	Uniform/Spatially varying
Flow field	Uniform/ Hydrodynamic (modelled) spatially varying flow field
Flow data duration	90 days or greater
Number of flow depth records	3 or greater. At least: • <5 m from water surface • Pen-bottom • <3 m from bed
Number of particles	10 per pen per time step
Time step	60 s

Table 2: Calibrated model setup

- It is only appropriate to use a spatially varying representation of the local bathymetry when used in conjunction with a spatially varying flow field obtained from a Marine Model

- When calibrating NewDepomod, the recommended SEPA method is to adjust the vertical dispersion until the size of the 250gm^{-2} contour matches the monitored 0.64 IQI footprint.

- Other methods of calibration may be accepted; however, it is highly recommended that the proposed method is outlined as early as possible in the application process, via a method statement.

- Should the IQIs of one or more of the benthic monitoring transects not reach good status, i.e. 2 consecutive sampling points of 0.64 IQI or higher per transect, an impact ellipse cannot be calculated. In this case the method of matching impact ellipses of measured vs. modelled ellipse area can't be used. In this case an alternative acceptable method is to calibrate the site point by point by comparing modelled deposition with measured IQIs and establishing a flux contour corresponding to the 0.64 IQI threshold that correctly predicts IQI passes and

fails.

- Attempts to convert ITI to IQI will not be accepted.

- Once the existing site setup is successfully calibrated the same model setup is used for the proposed setup. Please note, the new pens should be within 180m from the centre of the old pens unless it can be demonstrated that the bathymetry and flow conditions are sufficiently similar to the conditions experienced at the calibrated site and remain unchanged.

Organic Solids

Model Setup and Processing:

Simulations should be made to explicitly model impacts arising from the discharge of organic solids. These simulations should represent the maximum biomass which is intended to be held on site at any point in time, run at a constant level for a period of 365 days. Feed inputs should be based on an assumed feed rate of 7 kg t^{-1} d^{-1}.

Setup option	Requirement
Run duration	365 days
Biomass	Peak
Feed rate	7 kg t^{-1} d^{-1}
Waste rate	3%
Feed water content	9%
Feed digestibility	85%
Feed carbon content	49%
Faeces carbon content	30%
Output period	Last 90 days
Output resolution	3 hourly or greater

Table 3: Model setup for Solids

- Outputs should be produced at a 3-hourly resolution (or greater) for the last 90 days of the model run.
- Model output from the last 90 days should be time-averaged in order to produce a representation of the average (mean) deposited mass in each domain grid cell for that period.
- The impacted area should be then calculated by summing up the areas of each time-averaged grid cell which exceeds the EQS. Do not use a contouring algorithm. The mean under-cage impact value is the average of the concentrations in all grid cells which exceed the EQS.

Standards:

- NewDepomod does not explicitly model IQI conditions. Therefore local-scale mixing zone and pen edge standards have been associated with the following model requirements. See table 4
- Areas subject to wave exposures of 2.8 or greater have been shown to be able to support

higher biomasses. As waves are not incorporated in NewDepomod, modelled standards for both pen edge and mixing zone are higher than in areas with low wave exposure. (Please note: This allowance is in relation to modelled footprints only. All farms must meet the monitoring standards given in table 4 (below).

Standard	Type	Definition	Model requirement
Pen-edge	Intensity	>1 species of enrichment polychaete at densities >1000 m^{-2} at pen edge locations	Mean deposited mass within the 250 g m^{-2} impact area should not exceed 2000 g m^{-2} where wave exposure is less than 2.8, or 4000g m^{-2} where wave exposure is 2.8 or greater.
Mixing zone	Extent	Total area (m^2) impacted to worse that 0.64 IQI should not exceed the 100 m composite mixing zone area (m^2)	Total area (m^2) with a mean deposited mass in excess of 250 g m^{-2} should not exceed the 100 m mixing zone area (m^2) where wave exposure is less than 2.8, or 120% of the mixing zone area (m^2), where wave exposure is 2.8 or greater.

Table 4: Solids EQS Standards for new sites (for monitoring and modelling)

Emamectin Benzoate

Model Setup and Processing:

- Simulations should be made to explicitly model impacts arising from the discharge of emamectin benzoate if such a consent is sought. These simulations should represent a single discharge of the total quantity under consideration.
- Runs should be made over a duration of 118 days and configured according to the modelling setup described in Table 5.
- Seabed impact outputs should be averaged over the final two days (day 116-118) of the run at a 3-hourly resolution or greater.
- The impacted area should be then calculated by summing up the areas of each time-averaged grid cell which exceeds the EQS. Do not use a contouring algorithm. The mean under-cage impact value is the average of the concentrations in all grid cells which exceed the EQS.

Setup option	Requirement
Run duration	118 days
Biomass	Peak
Feed rate	7 kg t^{-1} d^{-1}
Waste rate	3%
Feed water content	9%
Feed digestibility	85%
Feed carbon content	49%
Faeces carbon content	30%
Treatment duration	7 days
Linear excretion period	7 days
Quantity excreted during linear excretion period	10%
Excretion half-life	36 days
Decay half-life	250 days
Density of mud	1400 kg m^{-3}
Output period	Last 2 days
Output resolution	3 hourly or greater

Table 5: Model setup for EmBZ

Standards:

The following criteria are then used to identify a scenario which is likely to comply with local-scale “mixing zone” standards:

Standard	Type	Model requirement
Mixing zone	Extent	Total area (m^2) which exceeds the EQS (131 ng/kg of marine sediment - dry weight, 65.5 ng/kg of marine sediment - wet weight), should not exceed the 100 m composite mixing zone area (m^2)

Table 6: EmBZ EQS Standards for new sites (for monitoring and modelling)

NewDepomod Emamectin Benzoate (SLICE) Modelling:

The SEPA interim position statement on discharges of emamectin benzoate can be found here: https://www.sepa.org.uk/media/594312/position-statement-embz-july-2022.pdf

On 13th July 2022, following a public consultation in 2019 and an independent scientific peer review, the UK Technical Advisory Group1 published its finalised recommendations on revised environmental quality standards for emamectin benzoate. The new recommended standards set out by the advisory group will be taken into account by SEPA and are listed in Table 6.

The EQS for Emamectin Benzoate (EmBZ) is on our website under: https://www.sepa.org.uk/regulations/water/aquaculture/environmental-standards/

with a concentration of EmBZ at the edge of the 100m mixing zone of 131 ng/kg dry wt marine sediment. To be able to assess EmBZ modelling results from NewDepomod the dry weight (wt) EQS has to be converted to a wet weight EQS, which is 65.5 ng/kg.

Calculating the contour level:**131 ng/kg (dry wt) x (700/1400) = 65.5 ng/kg (wet wt)** (Eq. 1)

Where 1400 kg/m^3 is the wet bulk density and 700 kg/m^3 is the dry bulk density.

New Farm/ Application:

EmBZ EQS at the edge of the 100m mixing zone cannot be larger than 131 ng/kg dry weight or 65.5 ng/kg wet weight. Therefore, the size of the area at the 65.5 ng/kg wet weight contour has to be established.

Existing Farm/ Application:

- No increase in EmBZ can be authorised at farms which are currently permitted at the old EQS of 763 ng/kg wet weight. The currently authorised EmBZ (or a lower) quantity, previously called

the **TAQ** (**Total Allowable Quantity**), now called the **modelled maximum quantity**, should be modelled for the application. Modelling of a higher quantity will be refused.

- No new areas of seabed can be impacted at the old EQS. In order to ensure this, farms should be modelled with the existing cage layout and consented EmBZ amount and compared to the new cage layout and applied EmBZ quantity. Areas of seabed impacted at the new EQS (65.5 ng/kg wet wt) should be compared. Up to 15% new seabed impact is deemed acceptable to allow for model variation.
- If the area of new seabed is greater than 15% then subsequent runs should be undertaken with lower EmBZ amounts, until there is less than a 15% increase in new seabed impacted. An example can be found in Fig. 1.

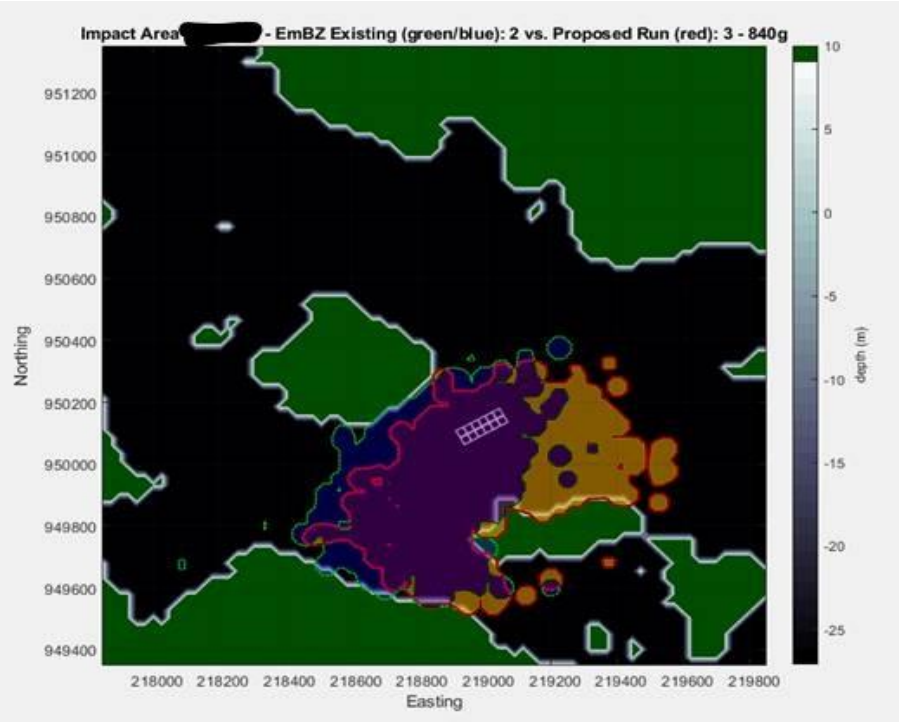

Fig. 1: EmBZ impact area at existing location and EQS (blue/green) vs. impact area at new location with existing EQS and yellow/red showing the new seabed impact. The yellow/ red area must cover less than 15% of existing area.

EmBZ retreatment/ Permit Conditions:

With the new Aquaculture Framework terminology has changed:

TAQ was the maximum amount of EmBZ that could be used to treat the fish. This is now called the *modelled max quantity*.

MTQ (Modelled Total Quantity) is no longer used. The dosage rate is now set on the licence instead.

Previously, the **TAQ** (Total Allowable Quantity) and **MTQ** (Maximum Allowable Quantity) were in the permit. These have been replaced by the **MEQ** (Maximum Environmental Quantity) and **dosage rate**.

The MEQ is the amount of EmBZ on the seabed which is associated with the predicted compliance with EQS and mixing zone criteria. It is not a treatment or release amount.
The MEQ takes the *modelled max quantity* and multiplies it by the maximum fraction of treatment mass, to calculate the peak quantity in the environment, if the *modelled max quantity* was used as a single treatment.
This peak in the environment is 72% of the treatment amount, so MEQ is 0.72 * *modelled max quantity* (or 0.72 * TAQ).
The MEQ is a fixed value relative to the *modelled maximum quantity*.
More information can be found in Appendix A.

Model Settings:

Calculating the vertical dispersion coefficient:

The vertical dispersion coefficient for the resuspension phase ($\sigma_{z,r}$) is defined in the ***model run physical properties*** file according to the label:

```
Transports.resuspension.walker.dispersionCoefficientZ='To_be_calculated'
```

The value of this parameter should be set as function of the **mean flow speed at the bed** (*u*, in m/s) as follows:

$\sigma_{z,r} = 0.0003\ u^{-0.762}$ (Eq. 2)

and the *'To_be_calculated'* part must be replaced by the numerical value calculated using the equation above.

Note that this parameterization represents a method for accommodating the numerical structure and associated emergent behaviour of the model. It is not considered to reflect true differences in the physical processes between sites of differing flow characteristics.

Model Templates:

Please download the NewDepomod model templates from GitHub which uses the settings listed in the appendix:
https://github.com/OceanMetSEPA

As noted above, the `Transports.resuspension.walker.dispersionCoefficientZ` parameter must be calculated for each model run.

Reporting of Model Results from the Solids and EmBZ Runs:

The following model results are to be reported to SEPA. The parameters can be found in the run log (*run log.txt)* in the *Results* folder created by NewDepomod:

- Eqs.benthic.mixingZone.area = the **100m Mixing zone** target area (m^2)
- Eqs.benthic.mixingZone.boundary.contour.approx.meanFlux= **mean undercage Intensity** EQS within the 250 g m^{-2} contour, for Solids only. This is calculated using squares instead of contours
- Eqs.benthic.mixingZone.approx.contourArea = **deposition area Extent** EQS (m^2) at the 250 g m^{-2} contour for both Solids and EmBZ. This is calculated using squares instead of contours.
- For existing applications, we require both the existing setup and the proposed setup
- When several runs of the same setup are conducted, all model results should be reported individually, as well as the average of the predicted impact area and under-cage mean deposition of these runs.
- Please submit all the output files from the reported runs.
- The most recent modelling metadata template should be filled in *modelling_metadata_template_vXX.xlsx*

Appendix A: Terminology Used in the Permit and the Retreatment Spreadsheet

TAQ – Total Allowable Quantity

The TAQ is the amount modelled in NewDepomod, and historically in AutoDepomod, which is shown to meet the environmental quality standards. (It was capped at 5 x MTQ or 5 maximum individual treatment amounts under the old regime). Where there were high amounts of export out of the model grid, a calculation was made to restrict the TAQ, often to the amount needed to treat peak biomass once.

The TAQ is now called the **modelled max quantity** in the new retreatment spreadsheet.

MEQ and MTQ are not comparable

The MEQ is not a release amount, it's a compliance level. It ensures that compliance is likely to be achieved in line with modelled predictions, which are established with reference to the EQS and mixing zone.

MTQ – Maximum treatment quantity

The MTQ was the amount required to treat the fish with a standard dose when the site was at full biomass (which is biomass * 0.35 for the dosage conversion).
The MTQ ensured that the rate of EmBZ released into the environment followed the release curve from the fish which is expected at 100% dosage.
(The dosage rate is now set in the permit instead.)

MEQ – Maximum Environmental quantity

The MEQ is the amount of EmBZ on the seabed which is associated with the predicted compliance with EQS and mixing zone criteria. It is not a treatment or release amount.
The MEQ takes the modelled max quantity and multiplies it by the maximum fraction of treatment mass, to calculate the peak quantity in the environment, if the modelled max quantity was used as a single treatment.
The maximum fraction of treatment mass is a proportion of material released at the peak of the release curve, which, due to decay and excretion (export is not taken into consideration), occurs 118 days

after treatment and is 72% of the initial treatment amount. (The calculation for that can also be found in the retreatment spreadsheet)

Hence, MEQ is 0.72 * TAQ.
MEQ is a fixed value relative to the modelled maximum quantity.

A site can be treated with a mass of EmBZ, as long as it stays within the MEQ. To do successive treatments and determine the cumulative amount on the seabed the new amount has to be tested in the retreatment spreadsheet, what mass can be used to meet the MEQ (predictive treatment).

Effective TAQ

This is the same as the MEQ.

Dosage Rate:

The dosage rate of EmBZ is 60 µg/ kg of fish per day over a 7 day period.

Appendix B: NewDepomod Standard Approach Configuration

NewDepomod **depomodinputsproperties** - Benthic and EmBZ Run settings:

File location:
NewDepomodProjects\SiteName\depomod\inputs

File name:
SiteName-1-NONE-allCages.depomodinputsproperties

```
Particle.characteristicLengthOfFaeces.dispersion=0.000500
Particle.characteristicLengthOfFaeces.distribution=UNIFORM
Particle.characteristicLengthOfFaeces.location=0.005000
Particle.characteristicLengthOfFeed.dispersion=0.001100
Particle.characteristicLengthOfFeed.distribution=UNIFORM
Particle.characteristicLengthOfFeed.location=0.011000
Particle.consolidationTimeOfFaeces=0.0
Particle.consolidationTimeOfFeed=0.0
Particle.degradeT50Carbon=Infinity
Particle.degradeT50Chemical=21600000
Particle.densityOfFaeces.dispersion=10.800000
Particle.densityOfFaeces.distribution=UNIFORM
Particle.densityOfFaeces.location=1080.000000
Particle.densityOfFeed.dispersion=11.800000
Particle.densityOfFeed.distribution=UNIFORM
Particle.densityOfFeed.location=1180.000000
Particle.diameterOfFaeces.dispersion=0.000300
Particle.diameterOfFaeces.distribution=UNIFORM
Particle.diameterOfFaeces.location=0.003000
Particle.diameterOfFeed.dispersion=0.000900
Particle.diameterOfFeed.distribution=UNIFORM
Particle.diameterOfFeed.location=0.009000
Particle.lengthUnitsSiConversionFactor=1.000000
Particle.massUnitsSiConversionFactor=1.000000
Particle.settlingVelocityOfFaeces.dispersion=0.003200
Particle.settlingVelocityOfFaeces.distribution=GAUSSIAN
Particle.settlingVelocityOfFaeces.location=-0.032000
Particle.settlingVelocityOfFeed.dispersion=0.009500
Particle.settlingVelocityOfFeed.distribution=GAUSSIAN
Particle.settlingVelocityOfFeed.location=-0.095000
Particle.velocityUnitsSiConversionFactor=1.000000
```

NewDepomod **Physicalproperties** – Benthic and EmBZ Run settings:

File location:
NewDepomodProjects\SiteName\depomod\models

File name:
SiteName-1-NONE.depomodphysicalproperties

```
Bathymetry.minimumSurfaceDX=25.0
Bathymetry.minimumSurfaceDY=25.0
Bathymetry.surfaceDX=25.0
Bathymetry.surfaceDY=25.0
Eqs.Benthic.impactedArea.contourLevel=4.0
Eqs.Benthic.impactedArea.targetArea=500000
Eqs.Benthic.impactedArea.targetAreaPercentageTolerance=1.0
Eqs.Benthic.minimumItiValue=10.0
Eqs.Benthic.minimumItiValuePercentageTolerance=1.0
Eqs.Benthic.samplingIti=30.0
Eqs.benthic.defaultBenthicFarField.critical=true
Eqs.benthic.defaultBenthicFarField.enable=true
Eqs.benthic.defaultBenthicImpactedArea.critical=true
Eqs.benthic.defaultBenthicImpactedArea.enable=true
Eqs.benthic.defaultBenthicNearField.critical=false
Eqs.benthic.defaultBenthicNearField.enable=true
Eqs.benthic.defaultBiomassStep.enable=true
Eqs.benthic.defaultChemicalFarField.critical=false
Eqs.benthic.defaultChemicalFarField.enable=false
Eqs.benthic.defaultChemicalNearField.critical=false
Eqs.benthic.defaultChemicalNearField.enable=false
Eqs.benthic.defaultFauxFarField.enable=true
Eqs.benthic.defaultFauxImpactedArea.enable=true
Eqs.benthic.defaultFauxNearField.enable=true
Eqs.benthic.defaultOverTreatmentFactorStep.enable=false
Eqs.biomass.step=50.00
Eqs.cageAreaPercentageTolerance=1.0
Eqs.cageVolumeAdjustment=1.0
Eqs.calcide.farFieldContour=0.002
Eqs.calcide.nearFieldContour=10
Eqs.calcide.rhoBulk=1216.0
Eqs.chemical.defaultBenthicFarField.critical=false
Eqs.chemical.defaultBenthicFarField.enable=true
Eqs.chemical.defaultBenthicImpactedArea.critical=false
Eqs.chemical.defaultBenthicImpactedArea.enable=true
Eqs.chemical.defaultBenthicNearField.critical=false
Eqs.chemical.defaultBenthicNearField.enable=true
Eqs.chemical.defaultBiomassStep.enable=false
Eqs.chemical.defaultChemicalFarField.critical=true
Eqs.chemical.defaultChemicalFarField.enable=true
Eqs.chemical.defaultChemicalNearField.critical=false
Eqs.chemical.defaultChemicalNearField.enable=true
```

```
Eqs.chemical.defaultFauxFarField.enable=true
Eqs.chemical.defaultFauxNearField.enable=true
Eqs.chemical.defaultOverTreatmentFactorStep.enable=true
Eqs.farFieldAreaAdjust=0.0
Eqs.farFieldAreaDistance=100
Eqs.farFieldAreaPercentageTolerance=1.0
Eqs.fluxTrigger=10000.0
Eqs.massBalancePercentage=80.0
Eqs.massBalancePercentageTolerance=1.0
Eqs.nearFieldAreaDistance=25
Eqs.nearFieldAreaPercentageTolerance=1.0
Eqs.nearFieldContourPercentageTolerance=1.0
Eqs.none.carbon.farFieldContour=1.0
Eqs.none.carbon.nearFieldContour=3.0
Eqs.none.iti.farFieldContour=10.0
Eqs.none.iti.nearFieldContour=30.0
Eqs.none.solids.farFieldContour=192.75
Eqs.none.solids.nearFieldContour=1555.97
Eqs.overTreatmentFactor.step=0.01
Eqs.parameter.limit=true
Eqs.slice.defaultChemicalExport.critical=true
Eqs.slice.defaultChemicalExport.enable=true
Eqs.slice.defaultChemicalExport.exportLimit=0.922
Eqs.slice.defaultChemicalExport.exportTime=10195200
Eqs.slice.defaultFauxChemicalExport.enable=true
Eqs.slice.defaultRecordSurfaces=true
Eqs.slice.defaultRecordTimes=10195200,19612800
Eqs.slice.farFieldContour=0.763
Eqs.slice.nearFieldContour=7.63
Eqs.slice.rhoBulk=1400.00
FeedInputs.activeIngredientFormulationConcentrationEmbz=10.0
FeedInputs.activeIngredientFormulationConcentrationTfbz=2.0
FeedInputs.activeIngredientPresentationConcentrationEmbz=0.05
FeedInputs.activeIngredientPresentationConcentrationTfbz=10.0
FeedInputs.biomass=
FeedInputs.compoundName.embz=EMBZ
FeedInputs.compoundName.none=NONE
FeedInputs.compoundName.tfbz=TFBZ
FeedInputs.deltaT=3600.0
FeedInputs.faecesCarbonPercentage=30
FeedInputs.faecesCompoundConcentration=13.18681
FeedInputs.feedAbsorbedPercentage=85
FeedInputs.feedCarbonPercentage=49
FeedInputs.feedCompoundConcentration=2
FeedInputs.feedWastedPercentage=3
FeedInputs.feedWaterPercentage=9
FeedInputs.massUnitsSiConversionFactor=1.0
FeedInputs.nullInputId=badf00d0-0123-4567-badf-00d0badf00d0
FeedInputs.numberOfTimeSteps=3600
FeedInputs.plugLoadPeriod=
FeedInputs.timeUnitsSiConversionFactor=1
Flowmetry.deltaT=
Flowmetry.lengthUnitsSiConversionFactor=1.0
Flowmetry.meterDepth=
Flowmetry.meterDepths=
```

```
Flowmetry.neapSpringNeapStartSample=
Flowmetry.numberOfTimeSteps=
Flowmetry.siteDepth=
Flowmetry.siteTide=
Flowmetry.siteXCoordinate=
Flowmetry.siteYCoordinate=
Flowmetry.springNeapSpringStartSample=
Flowmetry.timeUnitsSiConversionFactor=1.0
Model.biomassLimit=Infinity
Model.defaultCageVolumeAdjust=1.0
Model.defaultOverTreatmentFactor=1.0
Model.defaultSpecificFeedingRatePercent=0.7
Model.defaultStockingDensity=23
Model.iterationParameter.embz=OVERTREATMENTFACTOR
Model.iterationParameter.none=STOCKINGDENSITY
Model.iterationParameter.tfbz=OVERTREATMENTFACTOR
Model.maximumSpecificFeedingRatePercent=1.0
Model.maximumStockingDensity=30
Model.minimumSpecificFeedingRatePercent=0.1
Model.minimumStockingDensity=10
Model.run.number=-1
Model.run.numberOfParticles.embz=10
Model.run.numberOfParticles.none=1
Model.run.numberOfParticles.tfbz=10
Model.run.plugLoadPeriod.embz=5352
Model.run.plugLoadPeriod.none=0
Model.run.plugLoadPeriod.tfbz=168
Model.run.runType.embz=REFINING
Model.run.runType.none=SCOPING
Model.run.runType.tfbz=REFINING
Model.run.tide.embz=N
Model.run.tide.none=N
Model.run.tide.tfbz=N
Model.run.useNumber=true
Model.specificFeedingRatePercentUseMax=FALSE
Model.stockingDensityUseMax=TRUE
ModelTime.delta=60000
ModelTime.endTime.embz=10195200000
ModelTime.endTime.none=31989600000
ModelTime.endTime.tfbz=1728000000
ModelTime.releasePeriod.embz=10195200000
ModelTime.releasePeriod.none=31557600000
ModelTime.releasePeriod.tfbz=1296000000
ModelTime.startTime=0
ModelTime.timeUnitsSiConversionFactor=0.001
Particle.calcide.degradeT50Chemical=9936000
Particle.characteristicLengthOfFaeces.dispersion=0.0005
Particle.characteristicLengthOfFaeces.distribution=UNIFORM
Particle.characteristicLengthOfFaeces.location=0.005
Particle.characteristicLengthOfFeed.dispersion=0.0011
Particle.characteristicLengthOfFeed.distribution=UNIFORM
Particle.characteristicLengthOfFeed.location=0.011
Particle.consolidationTimeOfFaeces=0.0
Particle.consolidationTimeOfFeed=0.0
Particle.degradeT50Carbon=Infinity
```

```
Particle.degradeT50Chemical=21600000
Particle.densityOfFaeces.dispersion=10.80
Particle.densityOfFaeces.distribution=UNIFORM
Particle.densityOfFaeces.location=1080
Particle.densityOfFeed.dispersion=11.80
Particle.densityOfFeed.distribution=UNIFORM
Particle.densityOfFeed.location=1180.0
Particle.diameterOfFaeces.dispersion=0.0003
Particle.diameterOfFaeces.distribution=UNIFORM
Particle.diameterOfFaeces.location=0.003
Particle.diameterOfFeed.dispersion=0.0009
Particle.diameterOfFeed.distribution=UNIFORM
Particle.diameterOfFeed.location=0.009
Particle.lengthUnitsSiConversionFactor=1
Particle.massUnitsSiConversionFactor=1.0
Particle.none.degradeT50Chemical=Infinity
Particle.settlingVelocityOfFaeces.dispersion=0.0032
Particle.settlingVelocityOfFaeces.distribution=GAUSSIAN
Particle.settlingVelocityOfFaeces.location=-0.032
Particle.settlingVelocityOfFeed.dispersion=0.0095
Particle.settlingVelocityOfFeed.distribution=GAUSSIAN
Particle.settlingVelocityOfFeed.location=-0.095
Particle.slice.degradeT50Chemical=21600000
Particle.velocityUnitsSiConversionFactor=1
SeaWater.default.densityOfSeaWater=1027.0
SeaWater.default.kinematicViscosity=0.000001212
SeaWater.default.pressure=0.0
SeaWater.default.salinity=35.0
SeaWater.default.temperature=10.0
Transports.BedModel.bioTurbationMixingCoefficient=0.1
Transports.BedModel.characteristicLengthOfSediment.dispersion=0.00011
Transports.BedModel.characteristicLengthOfSediment.distribution=UNIFORM
Transports.BedModel.characteristicLengthOfSediment.location=0.0011
Transports.BedModel.contractionT50=Infinity
Transports.BedModel.dLayerMass=3375
Transports.BedModel.densityOfFaeces.dispersion=10.0
Transports.BedModel.densityOfFaeces.distribution=UNIFORM
Transports.BedModel.densityOfFaeces.location=1080.0
Transports.BedModel.densityOfFeed.dispersion=10.0
Transports.BedModel.densityOfFeed.distribution=UNIFORM
Transports.BedModel.densityOfFeed.location=1180.0
Transports.BedModel.densityOfMud.dispersion=0.0
Transports.BedModel.densityOfMud.distribution=DIRAC
Transports.BedModel.densityOfMud.location=1400.00
Transports.BedModel.expansionT50=1.000000
Transports.BedModel.internalFrictionAngle=23
Transports.BedModel.massErosionCoefficient=0.031
Transports.BedModel.massErosionExponent=1
Transports.BedModel.minimumSurfaceDX=25.00000000
Transports.BedModel.minimumSurfaceDY=25.00000000
Transports.BedModel.mixingDepth=0.05
Transports.BedModel.numberOfLayers=3
Transports.BedModel.releaseHeight.height=0.00000000
Transports.BedModel.releaseHeight.instanceName=CARTESIANBEDRELEASEHEIGHTF
IXED
```

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Transports.BedModel.releaseParticles.particlesPerArea=0.00160000
Transports.BedModel.releasePosition.instanceName=CARTESIANBEDRELEASEPOSIT
ION
Transports.BedModel.releasePosition.position=CENTRE
Transports.BedModel.settlingVelocityOfSediment.dispersion=0.00057
Transports.BedModel.settlingVelocityOfSediment.distribution=GAUSSIAN
Transports.BedModel.settlingVelocityOfSediment.location=-0.0057
Transports.BedModel.surfaceDX=25.00000000
Transports.BedModel.surfaceDY=25.00000000
Transports.BedModel.tauECritMin=0.020000
Transports.bed.instanceName=CARTESIANBEDNOTRANSPORT
Transports.bed.walker.dispersionCoefficientX=0.1
Transports.bed.walker.dispersionCoefficientY=0.1
Transports.bed.walker.dispersionCoefficientZ=0.0
Transports.bed.walker.type=LATTICEWALKER
Transports.bedSlope.criticalAngle=30.0
Transports.bottomRoughnessLength.rough=0.054
Transports.bottomRoughnessLength.smooth=0.001273
Transports.consolidation.instanceName=DEFAULTCONSOLIDATION
Transports.degrader.instanceName=DEFAULTPPARTICLEDEGRADER
Transports.g=9.80665
Transports.regime.frictionvelocity.type=LAWOFTHEWALL
Transports.regime.rough.constant=4.9
Transports.regime.rough.factor=5.6
Transports.regime.smooth.constant=0.0
Transports.regime.smooth.factor=0.65
Transports.regime.transitional.constant=0.0
Transports.regime.transitional.factor=8.18
Transports.release.instanceName=CARTESIANRELEASE
Transports.resuspension.instanceName=CARTESIANRESUSPENSIONTRANSPORT
Transports.resuspension.settling.allowBuoyant=false
Transports.resuspension.settling.modifiedSettling=false
Transports.resuspension.walker.dispersionCoefficientX=0.10000000
Transports.resuspension.walker.dispersionCoefficientY=0.10000000
Transports.resuspension.walker.dispersionCoefficientZ='To_be_calculated'
Transports.resuspension.walker.type=LATTICEWALKER
Transports.settling.alpha=0.64
Transports.settling.intercept.absoluteAccuracy=0.1
Transports.settling.intercept.maxVal=100
Transports.settling.intercept.maximalOrder=5
Transports.shieldsParameterJames.coefficientOfDrag=1.100
Transports.shieldsParameterJames.k10=1.0
Transports.shieldsParameterJames.k4=0.0
Transports.shieldsParameterJames.k5=1.0
Transports.shieldsParameterJames.k7=1.0
Transports.shieldsParameterJames.lambda=1.0
Transports.shieldsParameterJames.mu=0.375
Transports.shieldsParameterJames.theoreticalBedHieght=0.001
Transports.shieldsParameterJames.velocityProfileFactor=1.0625
Transports.suspension.instanceName=CARTESIANSUSPENSIONTRANSPORT
Transports.suspension.settling.allowBuoyant=false
Transports.suspension.settling.modifiedSettling=false
Transports.suspension.walker.dispersionCoefficientX=0.10000000
Transports.suspension.walker.dispersionCoefficientY=0.10000000
Transports.suspension.walker.dispersionCoefficientZ=0.00100000
```

```
Transports.suspension.walker.type=LATTICEWALKER
Transports.vonKarmanConstant=0.41
endOfDataMarker=endOfDataMarker
startOfDataMarker=startOfDataMarker
```

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