



# PROTECTION OF THE MARINE ENVIRONMENT

DISCHARGES FROM MARINE PEN FISH FARMS

**A STRENGTHENED REGULATORY FRAMEWORK**

# 1. Introduction

Finfish farming in Scotland's coastal waters has grown and changed significantly since our existing regulatory framework was first introduced. The average size of farms has increased. There has also been a shift away from very sheltered, non-dispersive locations where farms were concentrated in the early stages of the sector's development. Our scientific understanding, including our ability to model the fate of discharges in the sea, has also substantially improved.

This document sets out our new regulatory framework for protecting the marine environment from discharges from fish farms.

The proposals for the new regulatory framework were presented in the Finfish Aquaculture Sector Plan. We have updated the original proposals as a result of feedback and discussion.

We launched the new framework on 31 May 2019. We intend to progressively refine the framework as our experience of applying it improves and as the industry continues to evolve. The SEPA National Aquaculture Stakeholder Advisory Panel will help us progressively develop the new framework.

The continued development of the framework will strengthen and future-proof our ability to deliver world-leading protection of the marine environment, whatever way the sector develops going forward.



# 2. Managing discharges into the sea

Finfish farming across Scotland operates using open-net pens. Fish faeces; any uneaten food; used fish medicines and other chemical treatments escape from these pens into the marine environment. The heavier, organic particles (the fish faeces and uneaten food) together with any medicines sticking to them are deposited on the sea floor. Natural biological process then break down and assimilate the material over time. Dissolved chemicals released from the farm, including any medicine residues and other chemicals not bound to the heavier organic particles, remain dispersed in the water column until broken down and assimilated.

To protect the environment, the organic matter and chemicals escaping through the nets have to be sufficiently diluted as they disperse and mix in the sea to avoid so that they do not reach levels that would harm sea life. The two main factors that determine whether wastes from a fish farm are sufficiently diluted are the:

- quantity of the wastes being released; and
- capacity of the sea to disperse the wastes.

The latter varies according to strength of tides and, to a lesser extent, winds. The quantity of organic wastes released into the sea from open-net pens depends on the amount of feed used and the biomass of fish. In other words, how big the farm is. The quantities of medicine released depend in part on farm size but also on a site's vulnerability to disease and infections; the use by the farm of non-chemical techniques to help manage disease and infection outbreaks; and the effectiveness of those techniques.

To protect the marine environment, waste releases, and hence farm sizes and medicine usages, have to be appropriately matched to the sea's capacity to disperse and assimilate wastes. As environmental regulator, it is our role to make sure this is the case.

# 3. Basics of our regulatory framework

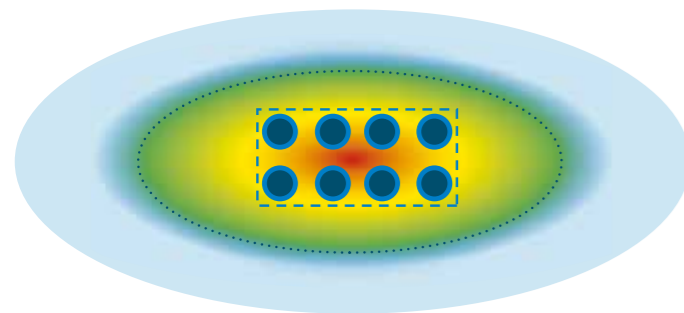
## Mixing zones

On the sea bed immediately around fish farm pens, there is a zone in which wastes are not fully mixed and dispersed in the surrounding sea. Under the regulatory framework, we will limit the maximum scale of this mixing zone (Figure 1).

The limit will be equivalent to the 100 metre-based limit we apply to all other discharges to the marine environment, including industrial discharges and discharges of sewage effluent via long-sea outfalls. Fish farm operators will

have to manage their sites so that there is no significant adverse impact on the biodiversity of sea life beyond the edge of the mixing zone. The mixing zone is defined as an area equivalent to that lying within 100 metres of the pens in all directions. However, the shape of the zone does not have to be symmetrical. It can extend more than 100 metres from the pens in some directions provided its total area does not exceed that of the equivalent symmetrical area.

Spatial limit on mixing zones (Figure 1)



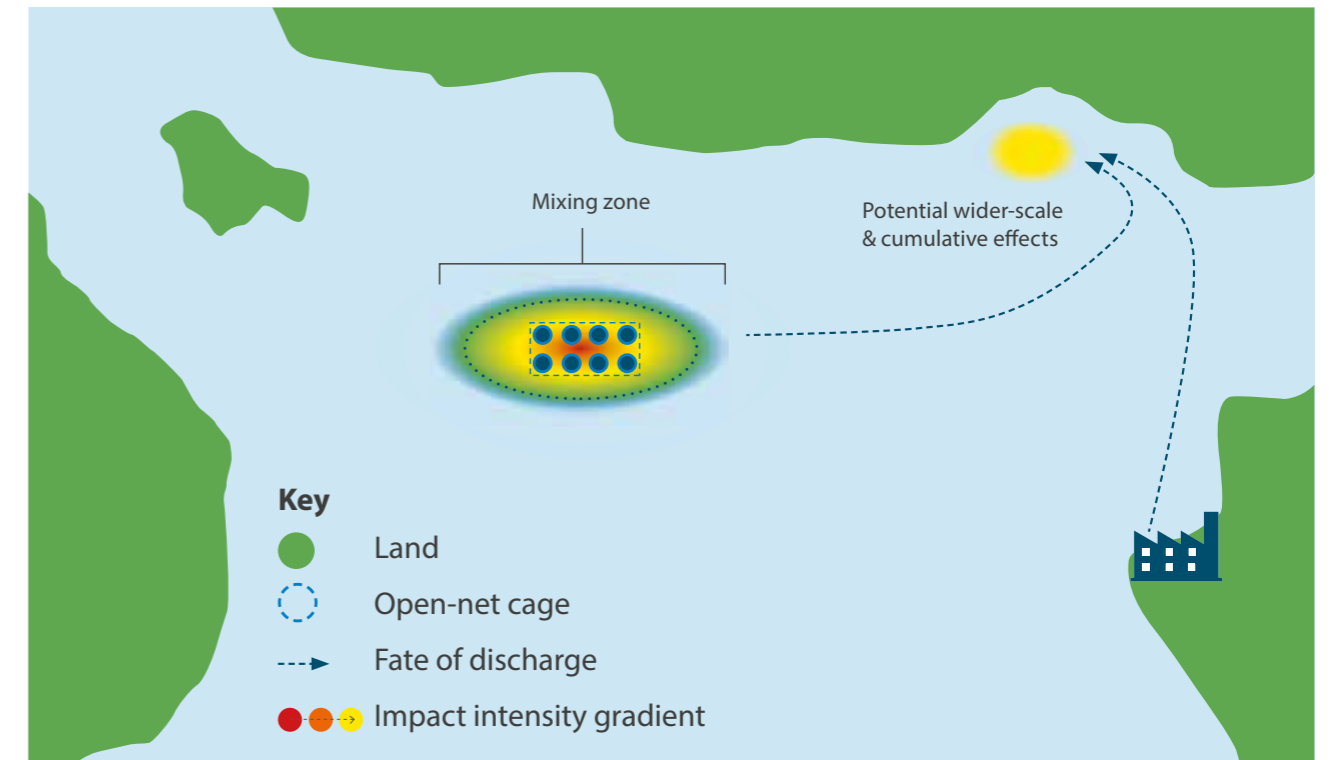
- Key**
- Fish cage
  - Good quality marine environment
  - Mixing zone limit
  - ● ● Impact intensity gradient

## Wider marine environment

Wastes can be carried by tides over considerable distances from the mixing zone. Most of this waste remains so diluted that it has no effect on the health of the marine environment. However, in some circumstances, there is a potential for wastes to combine with other wastes and accumulate in parts of the sea to levels that could harm sea life (Figure 2).

Fish farm operators will be required to demonstrate, and then manage their sites so that, where waste accumulation does occur, the degree of that accumulation is sufficiently limited to prevent it having a significant adverse impact on the biodiversity of sea life.

Cumulative risks to the wider marine environment (Figure 2)



- Key**
- Land
  - Open-net cage
  - - - - -> Fate of discharge
  - ● ● Impact intensity gradient

# 4. Application of new framework to organic wastes

## Improved management of waste inputs

To protect the marine environment, we include limits in permits that control the quantities of organic waste released into the environment. To do this, we need to use a parameter as an indicator of the quantities of organic waste released.

We have always used biomass as this parameter. In our draft sector plan, we proposed the alternative approach of using feed as the parameter. Our thinking was that the quantities of waste released into the sea are directly proportional to the quantities of feed used.

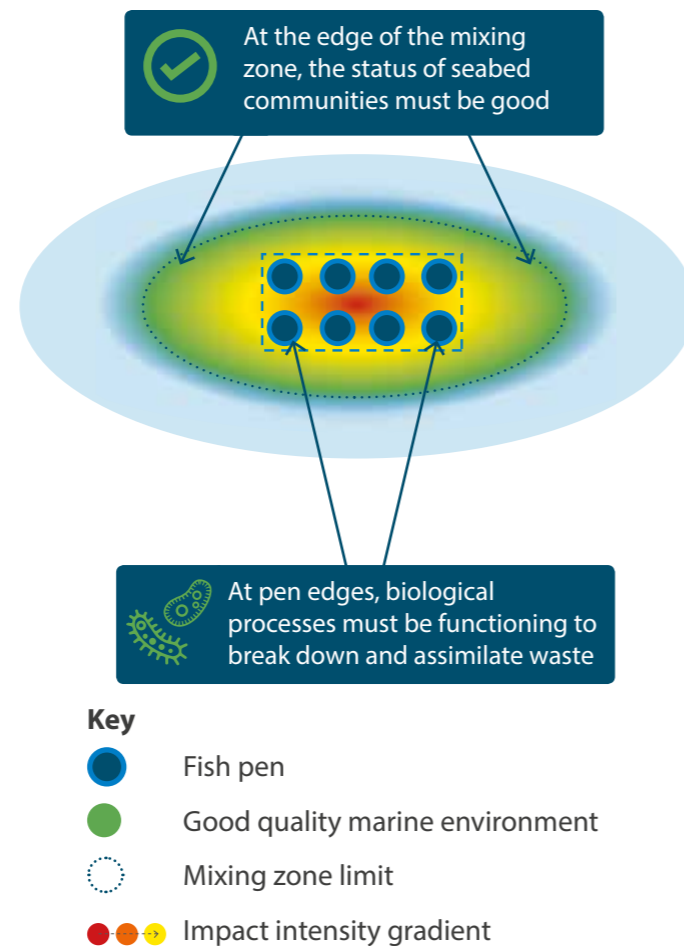
Based on further information we have received, we are still considering whether moving to using a feed limit or retaining a biomass limit in the permit is the most effective parameter to use. For SEPA to effectively regulate marine fish farms, this is a crucial decision to get right. Over the next three months, we will consult with all interested stakeholders on these options before we make a final decision. In the interim, we will continue to limit organic waste releases using fish biomass.

## Environmental requirements

The regulatory framework will deliver consistent control of the spatial extent of mixing zones for organic waste discharges (Figure 3).

- It will control the maximum severity of impact on seabed life permitted beneath the edges of the pens.
- It will require that, by the edge of the mixing zone, deposition is sufficiently low for the status of sea life on the seabed to be good.
- Where there is any accumulation of organic waste outside of the mixing zone, the level of that accumulation remains low enough to avoid adverse impacts on the status of sea life.

## Mixing zone controls on discharges of organic waste (Figure 3)



The pen-edge limit on the intensity of impact ensures that the wastes do not accumulate within the mixing zone to levels that would compromise the biological process needed to breakdown and assimilate them.

To assess whether environmental quality is good at, and beyond, the boundary of the mixing zone, we use environmental standards:

- for good status laid down in law in the form of directions issued by Scottish Ministers<sup>1</sup>; or
- where an appropriate standard has not yet been specified in directions, a standard representing equivalently good quality that we have derived using the best available science, including published research and expert advice.

The standards we use are aligned to a definition of good status agreed<sup>2</sup> across Europe.

Environmental standards have not yet been developed for all seabed habitats. For such habitats, which include rocky seabed, we will use visual imagery survey results to assess the condition of the habitats where they lie within the mixing zone of a farm. We will work closely with other experts in this field to ensure our assessments of the quality of these habitats are based on the best science. As more scientific data are collected on these habitats, we expect appropriate biological standards to be progressively developed.

In sheltered waters with weak tides, the pen edge requirements will normally be the dominant factor controlling the quantities of waste that can be discharged and, hence, the sizes of farms that can operate with open-net pens. At locations that are moderately dispersive, larger farms can be supported and the mixing zone size limit will start to be the dominant control on farm scale. At the most dispersive sites, little waste is deposited for long in mixing zones and avoiding any cumulative risks to the wider marine environment will become the primary factor governing the farm sizes that can be accommodated.

Large farms using open-net pens will need to operate in locations with sufficiently strong tides to disperse the organic wastes they produce. In more sheltered locations, small size farms would be accommodated but the development of large farms would require the capture and removal/treatment of a substantial proportion of the organic wastes that are produced.

<sup>1</sup> <https://www.gov.scot/publications/scotland-river-basin-district-standards-directions-2014/>  
<https://www.gov.scot/publications/solway-tweed-river-basin-district-standards-scotland-directions-2014/>

<sup>2</sup> The definition is set out in the [Water Framework Directive](#).

# 5. Application of the regulatory framework to medicine discharges

## Improved management of medicine input

Medicines and other chemical treatments for farmed fish can be extremely toxic to sea life at very low concentrations. We set standards to protect the environment from the direct consequences of discharges of pollutants. We also consider that the discharge of hazardous substances should be progressively reduced and consequently expect operators to minimise the discharges of medicines. We express this requirement as a permit condition.

Under the regulatory framework, we will expect farm operators to take all reasonable steps to minimise the need to discharge medicines into the environment by reducing the need to treat fish using medicines. Farmers should:

- minimise their need to use medicine by implementing all practicable, preventative steps to reduce the risks of infections, disease and parasites.
- utilise a range of available non-chemical treatments to help control disease and parasite outbreaks; and
- incorporate developments in new, more effective preventative techniques or non-chemical treatments
- treat medicines used to render them less harmful before discharging them to the environment.

These actions will help lower risks to the environment by reducing the quantity of medicines discharged and conserve the sea's capacity to accommodate discharges of medicines when their use is necessary.

We will require operators to report on the steps that they have taken to lower sea-lice infestations that will allow us to understand whether they are implementing a sufficient range of measures that minimise discharges of medicines.

## Environmental requirements

There are two main ways in which medicines, in particular sea lice medicines, are used to treat farmed fish. Some medicines are applied by immersing the fish in a solution of the medicine ("topical" medicines). This may be done in a bath at the pens or the fish may be taken into a tank containing the medicine solution on a boat, called a well-boat.

Other medicines are incorporated into fish food ("in-feed"). This medicated food is then fed to the fish over a number of days. During and following treatment, residues of the medicines are excreted by the treated fish. The residues typically stick to particles of organic matter in the fish faeces, which are then deposited on the seabed.

## Bath medicines

For medicine residues discharged from bath treatments on farms, we require new marine modelling techniques to be used so as to allow us to regulate the mass of medicine released from the farm. The new modelling approach will give us a much better understanding of the spread of the plume and the medicine concentration within the plume.

The permit will set conditions on the quantity of medicine that can be released in order to comply with **environmental standards**. We will apply the same approach to discharges from well-boats after their regulation passes to SEPA (expected in late 2019).

As part of our sector plan for finfish aquaculture, we will be reviewing our approach to how we protect the marine environment from discharges of topical medicines.

## In-feed medicines

For in-feed medicines, we apply the same 100 metre-based mixing zone limit that we use for organic waste discharges. We will require (as a condition within the permit) that, by the edge of the mixing zone and in any accumulations of wastes deposits beyond it:

- the concentrations of the medicines in the seabed do not rise above levels that have been determined<sup>3</sup> to have no adverse effects on sea life; and
- the status of seabed communities does not drop below good status as a result of in-feed medicine usage. These assessments will use, amongst other things, the same biological standards and criteria that we will use when assessing organic waste deposition.

## Next generation medicines

Next generation medicines and other chemicals include bespoke, newly developed medicines; medicines already in use in other sectors, such as agriculture; and medicines that stopped being used in marine pen fish farming some time ago but may be used again.

We will only consider authorising discharges of new medicines and other chemicals if sufficient data on likely harmful concentrations for sea life have enabled the establishment of a scientifically robust environmental standard.

The regulatory framework is based on using the sea's capacity to disperse and slowly breakdown and assimilate the residues. This approach is not suitable for any proposed medicine that is significantly more persistent in the environment or has more potential to bio-accumulate than the current suite of medicines. For medicines with such properties, we will expect farms to capture and de-nature the medicine before any residues are discharged.

<sup>3</sup> Standards are derived using a scientifically rigorous process that takes account of the available scientific evidence on the likely toxicity of the medicine to sea life. Standards are reviewed when the scientific evidence changes.

## 6. Managing applications

All new fish farms; increases in the size of existing farms; and new or increased discharges of medicines need to apply for a permit in advance.

The requirement for prior-authorisation allows us to make sure that the scale of the discharges from a proposed farm development are properly matched to the capacity of the surrounding sea to disperse and assimilate them. Under the regulatory framework, we check proposals match this capacity by assessing whether they would satisfy the mixing zone requirements and not contribute to cumulative impacts on the wider marine environment.

We need good, scientific information to make this assessment and applicants need to collect the information in advance of submitting an application to SEPA. The new regulatory framework structures the way the information is collected so that the applicant, SEPA and stakeholders can be confident that the full range of issues have been addressed.

The pre-application process will normally consist of:

- a screening process to identify the potential geographic footprint of the farm;
- engagement with local communities to identify the potential issues of concern;
- modelling of the expected dispersion of wastes in the vicinity of the site;
- marine (hydrodynamic) modelling of the wider-scale dispersion of waste and the potential cumulative effects with other discharges; and
- monitoring of the seabed in the vicinity of the site to understand the pre-development condition and its capacity to accommodate the proposal.

We will support the community and operators in the development of the supporting information. This will help ensure that, when an application is made, sufficient information is available to allow us to make a decision on whether a permit can be issued and, if it can, what conditions are required to protect the environment.

## 7. Managing permit compliance

Where we have issued a permit to a marine pen fish farm, the operator has a duty to comply with the conditions of the permit and thereby ensure the marine environment is not damaged.

We believe it is important that operators understand the environmental risk posed by their sites and undertake monitoring to ensure any impacts are limited to that permitted.

### Monitoring the operation of a farm

Farm operators need to ensure they stay within permit limits set to control the quantities of organic wastes and medicine residues released into the marine environment. These are the primary controls for protecting the environment.

Operators are required to maintain records relating to these limits, such as records of the types and quantities of medicines used. These records are important for operators to enable them to monitor performance against the permit limits. Farms also have to submit reports to us based on these records on a regular basis, normally quarterly. We use these reports and audits of farms records as one means of checking compliance.

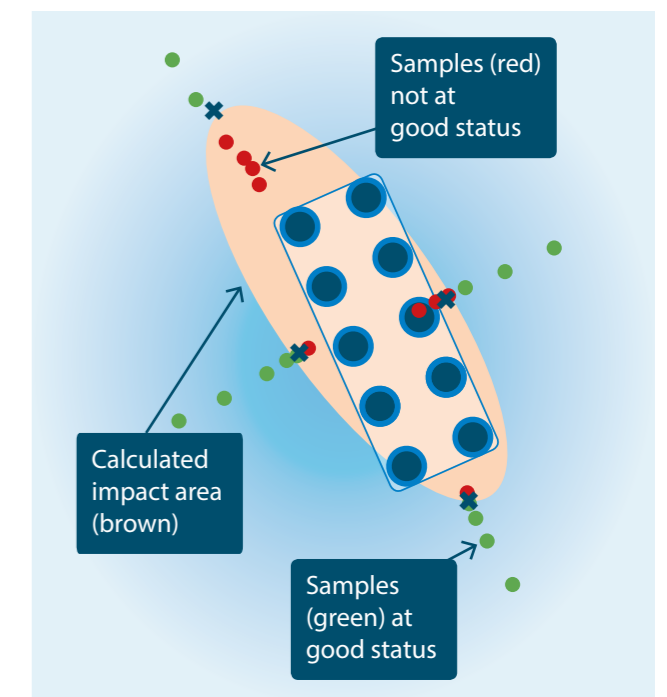
### Monitoring environmental performance

We also require operators to monitor the environment and report the results to us. This monitoring information allows operators to understand the environmental performance of their farms. It also gives us another means of identifying where there is a problem with the environmental performance of a farm that may require either a re-set of permit limits to better match the seas' capacity to assimilate waste or action to ensure compliance with permit limits.

This quality and quantity of environmental monitoring required is significantly greater than under our previous regulatory frameworks.

We require operators to monitor the seabed animals and medicine contaminants along four transects. This allows us to understand the spatial extent of impacts on the seabed. We can then compare this area with the mixing zone area specified in the licence. Where we are confident that the impact area is greater than that permitted, we will take appropriate action, including enforcement action if necessary. This could involve reducing the size of the farm or making a report to the procurator fiscal.

### Monitoring transects (Figure 4)



#### Key

- Fish pen
- Sample points (at good status)
- Sample points (not at good status)

It is the operator's job to undertake monitoring around their site. It is our job to provide the public with confidence that this monitoring information is a reliable description of the impact of a farm. To ensure that we, and the public, can have confidence in the results we will develop four types of audit.

- We are introducing a quality assurance scheme that will involve auditing the way that environmental samples have been collected and analysed; and the results managed and reported. It will ensure that the approach taken by the operator is in accordance with methods and standards specified by us. We have a lot of work to do to fully develop the scheme and hence, we will phase in its introduction.
- The new monitoring requirements will generate large quantities of data. We will undertake sophisticated data analysis to look for unexpected trends or patterns.
- We will increase the number of audits of fish farm performance we undertake, including audit monitoring of the environmental quality around the pens and surveys for potential cumulative effects on the wider marine environment.
- We will encourage other users of the marine environment to provide us with information about possible impacts from fish farms.

We will make all the appropriate and relevant information we hold about individual farms available. We will also work to make sure that information on the environmental performance and compliance of individual farms and the sector as a whole is presented in a way that can be easily understood. This will include working with other fish farm regulators to progressively improve Scotland's aquaculture website<sup>4</sup>.

Farms that operate well will get public recognition for doing so. Failures to protect the environment and comply with the permit conditions will not be tolerated. We will deal robustly with non-compliances using our expanded suite of enforcement options and in accordance with our Enforcement Policy. Our approach to taking enforcement action will be strengthened by the creation of an enforcement function which will proactively drive improvements in compliance.

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If you are a user of British Sign Language (BSL) the Contact Scotland BSL service gives you access to an online interpreter enabling you to communicate with us using sign language.

<http://contactscotland-bsl.org/>

<sup>4</sup> <http://aquaculture.scotland.gov.uk/>