Innovation Site Requirements – Bullet Point Summary 13 May 2016

- Although SEPA currently has a policy stance that no farms larger than 2500 tonnes can be licensed under CAR and a duty that a risk assessment utilising appropriate modelling be undertaken before a CAR authorisation can be granted, it is likely to be possible that such requirements can be set aside by a person with the authority in SEPA's Scheme of Delegation allowing such an application to be accepted and determined;

- Annex B (below) sets out probable requirements for such a proposed site, these should be considered a reasonable draft but not a final position. They will be viewed as negotiable by industry representatives;

- The proposed site will require a bespoke license and monitoring protocol unlike the current form of authorisations;

- A farm of the scale discussed by the sector may allow the trialling of novel techniques and technologies (some of which are currently available others more conceptual) which may be mutually beneficial to SEPA and the sector;

- There will be considerable interest in the proposal both from the sector and environmental NGOs;

- There are some risks associated with such a strategy:
  - in terms of SEPA's credibility as a regulator,
  - in fulfilling our duties under CAR to ensure a proposal is risk assessed before authorisation;
  - that such an application might be "called-in" for determination by Scottish Ministers;
  - that the site will fail to be compliant with Standards as set down in WFD and the Ministerial Standards Direction and;
  - a significant site failure might have considerable impacts on third party interests.

- The timeframe for the preparation of an application is likely to run to more than 6 months, the period during which SEPA will launch a new, less conservative modelling framework and revolutionary licensing approach;

- The revised licensing approach will give the sector what they seek in terms of larger production units but in locations which are demonstrably capable of accommodating them and in a way that will ensure compliance with WFD Standards and Ministerial Directions.

Innovation Sites - 13 May 2016

Background

The licensing of marine cage fish farms in Scotland is based upon the concept of a footprint around the fish farm where a considerable degree of environmental harm is anticipated and accepted but that limitations are placed upon the intensity and the spatial extent of those effects. Scientific methods are used to describe the acceptable are of impact around farms dependent upon the local hydrographic and bathymetric conditions. Acceptable limits for the intensity of impacts are set based upon internationally defined measures and descriptions of impact and environmental degradation.

Current licensing and regulatory procedures

Marine cage fish farms are licensed by SEPA under the CAR regime. Applications for new fish farm sites and substantial variations are normally required to be accompanied by:

- Locally collected tidal/hydrographic data;
- Locally collected meteorological data;
- Modelling reports showing the probable impact of the proposed farm;
- Pre-development seabed survey data;
- CAR application details and fee.

All elements of the application are important but it is the output from the modelling process which suggests a likely sustainable tonnage for the fish farm and which therefore can be seen as representing a brake on growth or production at any given site. The license determination process will usually endorse the tonnage suggested through the modelling process. In some cases however it may lead to a lower tonnage limit being applied in the CAR licence – if for example there are substantial existing impacts or species of nature conservation interest on the seabed in the area. The version of the model currently used in the authorisation process was shown to have significant limitations in predicting the impact of large biomass farms and therefore a ceiling of 2500 tonnes was put in place in SEPA licensing policy when this model was adopted. This ceiling was established in consultation with the sector who at the time could not see circumstances when they would be likely to keep more than c2000tonnes of fish in an individual farm due to the liability if such a farm was hit by a serious disease outbreak.

Following the authorisation of the site under CAR, the impacts of the site will be measured through biennial self-monitoring programmes assessing the condition of the seabed and the diversity of seabed fauna. The scale of change in seabed communities from background conditions is used to determine the acceptability or otherwise of the operation of the fish farm upon the environment. The impacts are measured along a single transect running away from the farm with compliance required at a site-specific point some distance from the farm.

Where a farm is assessed as Satisfactory, operations can continue as authorised, where it is considered Unsatisfactory, SEPA will seek discussions with the operator to improve farm management. Repetitive Unsatisfactory classifications will lead to a reduction in the authorised biomass.

Impending changes to the licensing and regulatory framework

In late 2012, the Scottish Government let a ~£0.5M contract to the Scottish Association for Marine Science at Dunstaffnage in Argyll (SAMS) to improve the predictive capabilities of the DEPOMOD model. The contract was scheduled to run until Dec 2014. With an anticipated 6 month period following delivery of the new model for SEPA to undertake validation and

launch of the new software with the new version then being available for use by industry to prepare CAR applications.

The project has suffered substantial delays and SEPA only received a working version of the model in April 2016 suggesting that unless the validation process is rushed and shortened that the new version will now not be available for use by the sector until October 2016.

The new model will be more effective and accurate in predicting the impacts of larger sites and importantly, sites in more strongly tidal waters – one of the major drawbacks of the existing version. In order to ensure accuracy, the new version will need to be powered by longer tidal datasets. The current requirement is for 15days locally collected tidal data and for larger sites, the predictions from the new model will need to be accompanied by the outputs from a hydrodynamic model of the wider waterbody in which the farm is situated. These are substantial new requirements but reflect the scale of the discharges from fish farms and the risk that these may pose to waterbody standards.

In addition to the changes to the modelling software, SEPA is changing the form of licences and monitoring regime for marine cage fish farms. The new system is known as Depositional Zone Regulations (DZR) and the associated changes are substantial and represent the most significant revision of the licensing framework for cage fish farms. There are three key features:

- Control over biomass will no longer be imposed by SEPA;
- Compliance with seabed standards will be assessed spatially against a standard based on area rather than a linear transect;
- Monitoring will be undertaken by SEPA.

The main driver for change are the standards for seabed quality set down in The Ministerial Directions to SEPA on standards to be observed under the Water Framework Directive (the Standards Directions). The Directions set limits on the spatial area of impact around any discharge in the sea and for DZR the requirement in the Direction that no single discharge can adversely impact more than 0.5km^2 of seabed has been adopted.

Under the new regime, it is intended that operator of fish farms will still produce model reports that describe the likely sustainable biomass for a fish farm in a given area but that this is used as a descriptive condition in the CAR licence and not an absolute numeric limits. It is anticipated that sites will be operated at the described biomass for a growth cycle in order to validate the model predictions for the site in question. Where initial production demonstrates limited impact then the biomass on a site can be increased, in a measured step-wise fashion. If the site exhibits stress to the point where impact are approaching the spatial limit then no further increases should be considered. Where the spatial limit is breached then production will cease until seabed conditions improve.

The DZR system has considerable advantage for EPA and the sector and effectively allows ongoing and substantial increases in output at any site with the appropriate degree of environmental capacity. It endorses the oft quoted principal that the environment is the ultimate arbiter of the impacts of any process making discharges into the water environment.

Innovation Sites

The idea of an Innovation Site has been discussed in various incarnations with SEPA over almost the last decade, first known as a Demonstration Site (2007), then Concept Site (2013) and now an Innovation Site (2015). The most recent iteration is for a site with the following features:

- A very large fish farm site (6-8000tonnes) with a high biomass potentially replacing several smaller extant installations;
- An amount of medicine authorised suitable to treat the entire stock for sea louse infestations, this will be substantial, exceeding current licensing policy limits but may be a smaller amount of medicine than the gross amount which could be used at several smaller installations;
- Subject to real time monitoring using a system of sensors;
- Including the deployment of state-of-the-art non-chemical approaches to louse control.

The justifications for the authorisation of a site with these characteristics are that it will provide economies of scale placing the Scottish sector on a similar footing to the Norwegian sector. Also, although the local impacts may be significant, that the overall impacts across a waterbody may be less than those arising from the utilisation of a number of smaller farms. Finally, that it will be a proving ground for new approaches to louse treatment, real time sensors and possibly other novel technologies. It would also clearly make the operator involved a large (8 figure £ per 2 year growth cycle?) profit.

SEPA has been supportive of such a proposal in the past. Indeed in 2013, in concert with Marine Scotland, SEPA produced a paper outlining what the requirements would be to enable the establishment of such a fish farm site. The original requirements and a re-working of these which was presented to Marine Scotland following the initial discussions around the proposal for Innovation Sites during 2015 are attached as Annex A. These form the basis of a statement of the requirements for an Innovation site attached as Annex B.

Is it Possible to Authorise an Innovation Site?
It should be possible for SEPA to accept an application under CAR that meets the requirements as set out in Annex B. It should also be possible to issue an authorisation for a site based on an application that meets those requirements. The requirements are substantially greater than SEPA would normally request in connection with a new fish farm site but reflect the difference in scale and the substantial level of pollutants which such a site might give rise to – a 6000 tonne site is likely to have a population equivalent of 0.4 - 0.8 million people.

The reasons for doubt that issuing an authorisation under the current regime is feasible are as follows:

- Uncertainty over the risk posed to the water environment – SEPA is not confident over the use of the current model at biomasses above 2500tonnes and has a policy position that applications above this tonnage cannot be submitted;

- If we were to set aside this limitation and use the current version of DEPOMOD to determine the size of farm which might be sustainable, it is highly unlikely that a location will be found in the waterbodies mentioned for the innovation site that would be predicted to meet SEPA's standards for seabed quality;

- In considering the authorisation of such a site, we must be confident that the proposal will be likely to comply with the Standards in the Ministerial Direction with regard to benthic impacts;

- The policy limitations on sea louse chemical use mean SEPA may be unable to provide an authorisation for sufficient treatments to allow a prudent sea louse treatment strategy;

- While the aspiration to have real time sensor monitoring of fish farms is an excellent one, it is in no way practical at the moment, there are no available sensors nor is it even clear

what we might seek to monitor that would give an actual insight into the effects a farm is having on the environment;

- Environmental DNA or RNA monitoring looks like a credible way forward for *close to* real time monitoring but even that is not yet at the validation stage to allow us to derive decent conclusions about the scale of impacts at a farm.

Thus there are a number of hurdles to be overcome in determining an application of this type under the current licensing framework. It may however be possible, at the discretion of AMT or the relevant Director, to set aside the concerns above and authorise a site that does not comply with existing policy requirements. This might especially be the case where the proposal was in some sense "experimental".

Should SEPA Authorise an Innovation Site?

The proposal would, on the face of it require to be advertised (although again, this may be set aside in certain circumstances) and dependant on location will most likely be subject to considerable public interest. Was such an application to be subject to a "call-in" request it is not clear that it would survive such an examination by Scottish Ministers.

Issuing a licence under the current regime and utilising the current model to do so would represent a significant departure from the current approach which is supported by, and based on, the utilisation of the best available science. If the proposal to authorise the site was site was rejected following a call-in process or if it was authorised and found to fail to meet SEPA standards and have a major seabed impact then SEPA's credibility would suffer. In the absence of a dependable and proven modelling approach for sites of the magnitude proposed, it is not clear that SEPA could discharge its duty under CAR to assess the likely impacts of the proposal upon the environment before granting an authorisation.

Collecting the required tidal data, building a hydrodynamic model and collecting pre-development survey data is likely to take some time, considerably in excess of 6 months. In that timescale, it is intended to launch the new DZR regime as discussed above. While, as discussed above, authorising a site that meets the requirements in Annex B *might* be possible under the current licensing framework, it is not in doubt that it *would* be possible to issue such an authorisation for an appropriate location following the introduction of the new DEPOMOD model and DZR.

What is also clear is that an authorisation issued under DZR would be aligned with revised SEPA licensing policies for fish farming and have a system to ensure compliance with standards set down in the Standards Directions. These policies will have been subject to public consultation will be clear, transparent, have associated guidance for staff and should be robust in the face of appeal.

The timescales involved in developing an application that meets the requirements in Annex B, suggest that there is a low likelihood that such an application could be prepared and submitted substantially before the inception of the new DZR regime. It would seem ill-advised therefore to proceed to pursue an application in a sense against the current policy and licensing arrangements using the current version of DEPOMOD and prudent to encourage such an application to be submitted under the DZR system.

Conclusion

SEPA should authorise an Innovation Site if it meets the terms of the DZR application process following the introduction of this revised licensing system. Due to the risks of failing to comply with WFD/UKTAG Standards and an inability for SEPA to undertake a CAR risk assessment such a site should not be authorised before the arrival of a new modelling framework and DZR.

Annex A

1 Original Draft Concept Site Paper Produced with Marine Scotland September 2013

CONCEPT SITE(S) FRAMEWORK

Introduction

Scotland's Atlantic salmon farming industry has an opportunity to develop concept site(s) that test the potential for improved efficiency of production in Scottish waters utilising optimal technology and best practice that will minimise potential impacts on the marine environment.

Modelling

The existing standing biomass consent granted by the Scottish Environment Protection Agency (SEPA) is currently capped at a maximum of 2,500 tonnes for an individual SEPA consent granted under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). At a number of locations however, operators have deployed two non-overlapping "sites" side-by-side in reasonable proximity allowing a biomass substantially larger than 2,500 tonnes in two cage groups to be served with a single feed barge.

Scotland's salmon farming industry currently relies on a modelling tool known as DEPOMOD for the process of securing an authorisation to determine what biomass should be sustainable at any individual site. DEPOMOD is a tool which has been used for this purpose since 2005 and was validated and performs best for site locations that are over soft substrates and have un-complex water flows and bathymetry. A new version of the modelling tool is being developed that is intended to produce more accurate outputs for existing sites, and new sites that do not fit into those criteria. The new modelling tool should become available in 2015.

Outline Structure

Concept site development will be:

- Overseen by the Scottish Salmon Producers' Organisation;
- Developed using DEPOMOD (potentially in the existing side-by-side approach already in use) or alternatively for offshore sites be authorised in more exposed locations through the deployment of a mathematically robust, bespoke model to be reviewed and agreed by SEPA. The cost of developing a bespoke model would be borne by the operator;
- Developed with active engagement with Marine Scotland (MS), SEPA, and SNH, key local stakeholders including wild fishery interests and local authority, evidencing how the local community will benefit financially, or in kind, from the site;
- Located in its/their own fish farm management area or within an area with one operator (particular interest will be shown to those proposals that consolidate capacity). If joining an FMA, be in Area(s) with single year class production and
-

- synchronised fallowing (involving redefining the Area to provide optimum performance as necessary);

- Equipped to show technology stretch leading industry standards of equipment, staff training, energy efficiencies and the use of cleanerfish;

- Have in place sufficient medicinal consent, for bath and in-feed treatments, to treat the full site biomass. Bath treatments should be planned for completion within three days;

- Stocked to optimise production schedules, stock performance and minimise the need for the use of medicines. Irrespective of the proposed biomass and the method of derivation, to include the authorisation of chemotherapeutants for sea louse infestations which conform to existing licensing policies;

- Operators would be required to have a proven track record in aquaculture with consistently high performance against criteria for recognised standards such as the Freedom Food standards. It is expected that operators will subscribe to independent audit and inspection by a UKAS approved certifying body against an established certification scheme, and

- Committed to report on performance during growth cycle to both MS and SEPA, providing full data access and findings open and available for wider application to future farm location, design and maximum standing biomass.

2 Comments to Marine Scotland Following Innovation site meeting in Orkney November 2015

Hi Willie and Alastair

Glad that SEPA's attendance was of some utility, maybe a shame in some sense that our early discussions on the day were cut short by the necessary arrival of OIC participants as although we had given the biomass issue and "Deploy and Monitor" concept a bit of an airing there was more to be said in connection with those issues, and much more on other aspects of the proposal – I might touch on these here if I can too.

This I think is the fourth time that the issue of Demonstration/Concept/Innovation sites has been on the agenda and essentially our position has remained more or less the same throughout. As DEPOMOD generally appears not to provide a reliable prediction of sustainable biomass for sites above 2500 tonnes biomass we retain a presumption against licensing sites greater than that tonnage unless an applicant is prepared to invest in a more detailed hydro-dynamic model to demonstrate the environmental capacity will cope with a larger farm and our established environmental standards would be met. So far no-one has chosen to invest in such an approach, which we find surprising given the investment cost of establishing a farm of this size, the current profitability of the sector, and the relatively low cost of this type of predictive modelling.

SEPA has always maintained a position of welcoming new proposals, new data and advances in ways to match fish production to the environment's capacity to assimilate wastes. Our difficulty over the years with the proposals that have come forward as Demonstration or Innovation sites is that it is highly unlikely that Scotland's environment, or at least the parts of it that have been suggested for these sites could sustain sites of the scale proposed. This situation hasn't changed since such sites were first proposed (back in 2007) primarily because in the meantime the seas around Scotland haven't become substantially deeper nor subject to stronger currents. Importantly nor has there been a general proposal to move to waters which might exhibit such characteristics.

As you know, we consider that a much greater challenge now exists for the industry insofar as the possible loss of effective sea lice therapeutants may render the industry completely unable to rear fish in the conventional way. Time is of the essence here, there are a significant number of innovative techniques emerging to rear fish sustainably without reliance on chemicals. If Scotland does not face this reality head-on and soon, I think we may have a very severe problem on our hands. Any innovation programme which doesn't have an element of this problem is entirely missing the point.

Returning to the proposal which was the subject of the meeting last week, SEPA has no desire to attempt to quash any proposal for development out of hand and indeed would consider any proposal on its merits. On the face of it however, looking at site histories in Scapa Flow, most of the larger sites (and those are generally only a maximum of around 1000 tonnes) have what is best described as a chequered history. The largest site in Scapa Flow (South Cava) has a biomass limit of 1511 and is currently considered "Satisfactory" but has only had a single growth cycle at full biomass. All of the other larger sites: Chalmers Hope (1000 tonnes), Bring Head (968 tonnes) and West Fara (1000 tonnes) have significant histories of failures and indeed the latter site recently was subject to a biomass reduction in order to rein in the scale of impacts seen. These real life results ably demonstrate that a site of the scale of that discussed or even some substantial fraction of that tonnage would likely abjectly fail to meet seabed quality standards. I have no idea what size of farm would be predicted to be sustainable but establishing a site on a Deploy and Monitor basis with a biomass of 6000 tonnes when sites around 1000 tonnes are often seen to fail would make fools of us all but in particular SEPA. What's important to note is that the environment, not SEPA, is the final

arbiter. We are simply trying to interpret how we think the environment will respond based on a considerable degree of experience.

It is entirely possible that there are waters around Scotland and indeed particularly around Orkney which could sustain farms of the scale suggested – my comment at the meeting about the Pentland Firth was only partially flippant. If however such a proposal was being made for inshore waters where we already have experience and understanding of the types and scale of sites that are sustainable and where we are confident that modelling produces a good prediction, there seems little point in wasting time considering proposals for sites several times larger than that which are currently unsustainable. It would also be particularly foolhardy to proceed with such a proposal without attempting to use robust and validated models to predict the scale and intensity of the impacts that might arise and judge the proposal on those merits.

In considering the sites you suggested in Shetland, site histories there tell a similar tale of woe, there are 3 operational sites in Dury Voe: Loura Voe 3 (995 tonnes), Bellister (1910 tonnes), North Nesting 2 (995 tonnes) all of which are currently classified as "Unsatisfactory". There are too many sites in the Scalloway area to list here but again in many cases these demonstrate questionable histories and in most cases at relatively small biomasses. The Scalloway Islands area was where the largest farm in Scotland once operated, at Hildasay, with long term catastrophic environmental consequences – the final biomass of this site is not clearly understood but was probably in excess of 5000 tonnes. Again, it may be possible to find a location in either of these areas in Shetland where model predictions suggest a sustainable tonnage of the type of scale set out in connection with the Demonstration Project proposal but superficially at least, it seems unlikely.

As mentioned above, we didn't get far in the discussion about the broader proposals for the Demonstration Project. If we find ourselves in a position to proceed somewhere with a large scale site then the site will be subject to a bespoke set of requirements, these are pretty much analogous to those we discussed in connection with "Concept Sites" two years ago.

As discussed above, SEPA would require such a proposal to be subject to modelling using AutoDEPOMOD and a hydrodynamic model demonstrating that it was sustainable. The site would also be subject to current meter collection for the duration of the production cycle to aid with validation of the new model and SAMS would need to be on hand and funded if required, to help with such a validation process.

On monitoring, while the proposal from SAIC to deploy "sensors" to provide "real-time" monitoring data is interesting, SEPA would require frequent monitoring to be undertaken to SEPA's current monitoring standards – perhaps on a quarterly basis. This monitoring would be commissioned by SEPA but paid for by the operator and may include the use of novel techniques.

If the experiment is in some sense to test the capacity of inshore waters to sustain a very large fish farm then when at any point at which monitoring showed the site to be unsustainable then it would be a requirement of the "experiment" and a condition in any associated CAR licence that the experiment would cease. That is, that the farm would be de-populated or the biomass reduced to what is considered to be a sustainable level. Firm and realistic arrangements would also require to be put in place from the outset to deal with mass mortality or a need to cull and dispose of fish before completion production cycle – there are currently no facilities in Orkney or indeed in many other areas of Scotland that could handle waste arisings of such a scale.

Similarly, if another "experiment" is run to test the utility of alternate sea louse control strategies: thermolicers, exclusion strategies, cleaner fish, laser systems etc and based on the use of no more

than two chemical interventions per cycle, should a loss of sea louse control result then the experiment would stop and farm would be de-populated. For this latter reason for establishing a site, it is more appropriate to establish multiple smaller sites within the same water body, that will be exposed to similar levels of sea lice infestation, to test and compare the efficacy of those different strategies. It would be illogical to consider a site of the ground breaking size discussed in our meeting last week for lice control experiments as an ability to deploy "last resort" chemical treatments would be highly questionable on any site of that scale.

Again collection of real time hydrographic data and the use of a hydrodynamic model as well as DEOPOMOD may help to inform louse movements between the sites within the same waterbody and provide information on the fate of medicine residues and wastes from the sites to aid validation of the new version of the DEPOMOD model. As discussed above, firm and realistic arrangements would also require to be put in place from the outset to deal with mass mortality or a need to cull and dispose of fish before completion of the production cycle.

We're not trying to being obstructive here in connection with the proposal for a Demonstration Site, but challenging to ensure we get something worth doing and something which can be described as sustainable, scientific and innovative.

All the best

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Annex B

Innovation Site Requirements May 2016

1 A proposal for such a site would be required to be able to demonstrate compliance with standards for seabed quality as required for WFD, set down by UKTAG and as will be adopted for the DZR licensing system. That is, benthic effects not exceeding 0.5km2 in spatial area at a measure of impact of 0.75 IQI. Such compliance might be demonstrated through the use of modelling using AutoDEPOMOD the revised (2016) version once this is fully validated, and a site specific hydrodynamic model built by an appropriately qualified contractor to specifications provided by SEPA. The modelling outputs would be required to demonstrate that the proposal was sustainable according to the above standards both in the near field in terms of its site-specific impacts but also in the far field at a waterbody or wider scale.

2 In order to comply with the EU Natura Regulations and ensure that no species of relevant interest under those regulations was present and also to give a clear indication of pre-development seabed conditions seabed monitoring will be required. This pre-development biological monitoring will consist of a minimum of four transects with eight stations per transect. The scale of the transects to be guided by the outputs from the modelling process.

3 The site would be subject to current meter hydrographic data collection for the duration of the production cycle to aid with validation of the new model and an appropriate research body, such as SAMS, would need to be on hand and funded if required, to help with such a validation process.

4 Real-time monitoring sensors, the capability of which is understood and benchmarked and validated against current monitoring methods and standards, would require to be deployed with live data streamed directly to SEPA as well as the operator.

5 Field monitoring using established benthic ecology techniques and genetic techniques will require to be undertaken on a quarterly basis. This to be based on the same principle of four, 8 station transects as discussed in 2 above. This monitoring would be commissioned by, and reported to, SEPA but paid for by the operator.

6 The project would be required to have contingency arrangements in case at any point the above monitoring techniques showed the site to be non-compliant with current standards for seabed and water quality as discussed in 1) above. For example it would be a requirement and a condition in any associated CAR licence that production would cease, that is, that the farm would be de-populated or the biomass reduced to what is considered to be a sustainable level at the point at which it was evident that the site no longer met the standards discussed in 1) above. Firm and realistic arrangements would also require to be put in place from the outset to deal with mass mortality or a need to cull and dispose of fish before completion production cycle.

7 The site would involve the deployment of leading edge technology to deal with sea louse infestation but also a licensed quantity of sea louse medicines to ensure the entire site can be treated by a topical product within three days and a systemic product to treat the entire biomass.

8 Real time data on farm performance either in the form of data from sensors and/or SEPA monitoring and returns data etc will be published on the SEPA website or another public portal to allow public transparency and the dissemination of information on the site's performance to benefit of the wider sector.