Appeal Ref No. AP2/2015

Aquaculture Licences Appeals Board

Technical Advisor's Interim Report

Description: An assessment of aquaculture licence appeals in respect of an application to establish a salmon farm at Shot Head, Bantry Bay.

Licence Application

Department Ref No: T5/555A

Applicant: Bradan Fanad Teoranta t/a Marine Harvest Ireland.

Minister's Decision: Granted Licence for site T5/555A for a 10 year period

Appeal

Type of Appeal: Granting of licence to Bradan Fanad Teoranta t/a Marine Harvest Ireland for a salmon farm at Shot Head, Bantry Bay.

Appellant(s): AP2/1/2015 Save Bantry Bay
AP2/2/2015 Residents of Roosk, Adrigole
AP2/3/2015 John Brendan O'Keeffe
AP2/4/2015 Denis O'Shea, Kieran O'Shea and Jason O'Shea
AP2/5/2015 Bantry Salmon and Trout Anglers Association
AP2/6/2015 Marine Harvest Ireland
AP2/7/2015 C. Harrington, V. O'Sullivan, P. Murphy, C. Forker
AP2/8/2015 Coomhola Salmon & Trout Anglers' Association
AP2/9/2015 Galway Bay Against Salmon Cages
AP2/10/2015 Salmon Watch Ireland
AP2/11/2015 John Hunt
AP2/12/2015 Friends of the Irish Environment
AP2/13/2015 Inland Fisheries Ireland
AP2/14/2015 Federation of Irish Salmon and Sea Trout Anglers

Observers: None

Technical Advisor: Dr. Graham Saunders

Date of site Inspection: 2nd, 3rd and 4th August, 2016

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1.0 General Matters / Appeal Details

1.1 Appeal Details & Observer Comments / Submissions

Date Appeal Received:

Appeal No.	Date Received by ALAB
AP2/1/2015	07/10/2015
AP2/2/2015	08/10/2015
AP2/3/2015	07/10/2015
AP2/4/2015	08/10/2015
AP2/5/2015	12/10/2015
AP2/6/2015	13/10/2015
AP2/7/2015	13/10/2015
AP2/8/2015	13/10/2015
AP2/9/2015	14/10/2015
AP2/10/2015	16/10/2015
AP2/11/2015	16/10/2015
AP2/12/2015	16/10/2015
AP2/13/2015	16/10/2015
AP2/14/2015	16/10/2015

Location of Site Appealed: Shot Head, Bantry Bay, Co. Cork

1.2 Name of Appellant(s):

Appeal No.	Appellant	Address
AP2/1/2015	Save Bantry Bay	Newtown House, Bantry, Co. Cork P75PH61
AP2/2/2015	Residents Of Roosk, Adrigole	Roosk, Adrigole, Co. Cork
AP2/3/2015	John Brendan O'Keeffe	Roosk, Trafrask, Adrigole, Co. Cork
AP2/4/2015	Denis, Kieran and Jason O'Shea	Not provided
AP2/5/2015	Bantry Salmon and Trout Anglers Association	Baurgorm, Bantry, Co. Cork
AP2/6/2015	Marine Harvest Ireland	Rinmore, Ballylar, P.O. Letterkenny, Co. Donegal F92 T677
AP2/7/2015	Harrington, O'Sullivan, Murphy, Forker	Glengarrif, Co. Cork/ Ahakista, Durrus, Co. Cork
AP2/8/2015	Coomhola Salmon and Trout	Coomhola Bridge, Coomhola, Bantry,

Appeal No.	Appellant	Address
	Anglers Association	Co. Cork
AP2/9/2015	Galway Bay Against Salmon Cages	10 Colmans Road, Shantalla, Galway
AP2/10/2015	Salmon Watch Ireland	59 Amiens Street, Dublin 1 DOI P786
AP2/11/2015	John Hunt	Slip Park, Bantry
AP2/12/2015	Friends of the Irish Environment	Kikatherine, Eyeries, County Cork P75 CX53
AP2/13/2015	Inland Fisheries Ireland	3044 Lake Drive, Citywest Business Campus, Dublin 24
AP2/14/2015	Federation of Irish Salmon and Sea Trout Anglers	Teelia Rd, Carrick Co. Donegal

1.3 Name of Observer (s)

No official observations outside of Appellants/Applicants response were submitted.

1.4 Grounds for Appeal

The grounds for appeal are summarised below.

Appellant 1

Substantive Issues

1. Carrying capacity	The Appellant suggested that the bay has reached the limit of its ability to support multiple aquaculture activities.
2. Inadequate EIS	The Appellant expressed dissatisfaction with the Environment Impact Statement submitted in support of licence application, stating that the EIS failed to adequately address a range of issues.
3. Threats to wild salmon from sea lice	The Appellant maintains that the installation of the salmon farm will have a significant detrimental impact on wild salmon through an increased exposure to sea lice.
4. Threats to wild salmon from escaped farm fish	The Appellant expressed concern over the risk of genetic dilution and disease transfer from interactions between escaped farm fish and wild populations.
5. Site suitability	The Appellant questioned whether the location of the proposed site is too exposed, with an increased risk

	of storm damage and escape events.
6. Nutrient discharges	The Appellant expressed concern over nutrient discharges from the proposed installation and the potential for an increased algal bloom risk.
7. Toxic chemical pollution	The Appellant raised concerns over the use of pesticides in salmon farms.
8. Impacts on vulnerable/ protected species and habitats	The Appellant raised concerns over the local impacts on otters, seals, cetaceans and fresh water pearl mussel.
9. Impacts on shellfish culture	The Appellant raised concerns on the impact on local mussel farms.
10. Impacts on in-shore fisheries	The Appellant expressed concern over a conflict with inshore fishing activity and the risk of entanglement and gear loss. In addition, further concern was raised in respect of the effect of pesticides on commercially fished crustacean species and a nearby herring spawning areas.
11. Amenity impact (tourism)	The Appellant drew attention to the area's increasing popularity with tourists and a growing leisure economy, with the Glengarriff Local Area Plan and the Adrigole Local Area Plan acknowledging the importance of marine tourism.
12. Public consultation	The Appellant maintains that insufficient public consultation was undertaken contrary to the Cork County Development Plan's reference to the Bantry Bay Charter.

Non-Substantive Issues

1. Licence approval process	The Appellant maintains that the aquaculture licence approval process is flawed and may be subject to conflicts of interest.

Appellant 2

Substantive Issues

1. Public consultation	The Appellant maintains that insufficient public consultation was undertaken

2. Threats to wild salmon from sea lice	The Appellant maintains that the installation of the salmon farm will have a significant detrimental impact on wild salmon through an increased exposure to sea lice and that insufficient scientific research had been applied to assessment of this threat.
3. Impacts on vulnerable/ protected species and habitats	The Appellant raised concerns on the impact of the fish farm practices and deterrent devices on seals, cetaceans and seabirds.

Non-Substantive Issues

1. Licence approval process	The Appellant maintains that the aquaculture licence approval process is flawed and may be subject to conflicts of interest.

Appellant 3

Substantive Issues

1. Amenity impact (tourism)	The Appellant maintains that the fish farm will have a negative visual impact, deterring tourist visitors.

Non-Substantive Issues

1. Farmed fish are dangerous to human health	The Appellant maintains that farmed salmon are dangerous to human health due to artificial or genetically modified feed, and the presence of toxic chemical residues.

Appellant 4

Substantive Issues

1. Impacts on in-shore fisheries	The Appellant raised concerns regarding the impact of fish farm pesticide applications on the spawning and development of locally fished shellfish (crustacean) populations.
2. Toxic chemical pollution	The Appellant expressed concern regarding the discharge of dangerous substances and the impact on water quality.
3. Carrying capacity	The Appellant expressed doubts over the ability of

	Bantry Bay's tidal circulation to adequately disperse fish farm discharges of chemicals.
4. Navigation	The Appellant maintains that the proposed fish farm location constitutes a threat to navigational safety for small vessels, forcing them to make route deviations into less safe waters during periods of north or north-westerly wind directions.

Non-Substantive Issues

1. Government policy	The Appellant questioned government priorities, suggesting that aquaculture may be favoured above traditional inshore fisheries.
2. Licence approval process	The Appellant maintains that the aquaculture licence approval process is flawed and may be subject to conflicts of interest.

Appellant 5

Substantive Issues

1. Threats to wild salmon and sea trout from sea lice	The Appellant maintains that the installation of the salmon farm will have a significant detrimental impact on wild salmon smolts and sea trout through an increased exposure to sea lice and asserts that all of the available research was not taken into consideration.
2. Inadequate EIS/EIA	The Appellant disputes the conclusions presented to Minister Coveney regarding the sea lice threat to wild populations of salmon and sea trout.
3. Threats to wild salmon from escaped farm fish	The Appellant maintains that escaped farmed fish constitute a significant threat to wild populations through the spread of disease, transfer of parasites, the over-running of redds and through genetic dilution.
4. Site suitability	The Appellant questioned whether the location of the proposed site is too exposed, resulting in an increased risk of storm damage and escape events.
5. Amenity impact (angling)	The Appellant stated that there had not been adequate consideration of the potential economic effects on local tourism income from angling,

	resulting from fish farm impacts on declining wild salmon populations.

Non-Substantive Issues

1. SEA not undertaken	The Appellant asserts that a Strategic Environmental Assessment in respect of changes to national policy on fish farming is required under the SEA Directive (2001/42/EC).

Appellant 6

Substantive Issues

1. Licence conditions (stock limits)	The Appellant requested that the licence condition specifying production limits be changed from a biennial production limit by harvested weight to a Maximum Allowable Biomass (MAB), limiting the biomass of live fish on the site at any given time.
2. Licence conditions (production schedule)	The Appellant requested that the licence condition limiting harvesting of stock to a period between 17 and 22 months be relaxed to accommodate variation in the production cycle and to mitigate natural events that my cause loss of fish.
3. Licence conditions (cage dimension and type)	The Appellant requested a removal of the licence condition that specified the dimensions and spatial arrangement of the fish pens and feeding barge (while remaining within the boundaries of the overall licenced site area) to allow for upgrades or improvements in pen and mooring technology and to accommodate the application of changes in best practice.
4. Licence conditions (underwater archaeology)	The Appellant requested a withdrawal of the licence requirement to undertake further works for the protection of underwater archaeology because (i) no evidence of archaeological interest was found during a previous commissioned marine geo-archaeological assessment and (ii) the condition has not been imposed on other marine operators undertaking similar operations.

Non-Substantive Issues

1. Licence conditions (change of Applicant name)	The Appellant requested that the licence be issued to a different name to that under which the original licence application was sought. This is due to a name change as a result of corporate reorganisation.

Appellant 7

Substantive Issues

1. Amenity impact (tourism)	The Appellant drew attention to Bantry Bay's attraction as a tourist destination along the Wild Atlantic Way and has suggested that the farm site will have a significant negative visual impact, which will affect businesses dependent on tourism.
2. Threats to wild salmon from sea lice	The Appellant maintains that the installation of the salmon farm will have a significant detrimental impact on wild salmon through an increased exposure to sea lice.
3. Amenity impact (angling)	The Appellant stated the proposed site falls within a well-known "hot spot" for popular sea angling species and expressed concerns for the fish farm's chemical discharge impacts on juvenile fish.
4. Pollution	The Appellant expressed concern that the fish farm could affect water quality which would deter water sports enthusiasts.

Non-Substantive Issues

1. None

Appellant 8

Substantive Issues

1. Impacts on vulnerable/ protected species and habitats	The Appellant referred to the presence of beds of two species of calcareous red algae, collectively known as "maerl" and suggests that these beds, mentioned as relevant to the EU Habitats Directive are likely to be threatened by the close proximity to the fish farm.

Non-Substantive Issues

1. Licence approval process	The Appellant complained that the aquaculture licence approval process is flawed and may be subject to conflicts of interest.

Appellant 9

Substantive Issues

1. Threats to wild salmon from sea lice	The Appellant maintained that the installation of the salmon farm will have a significant detrimental impact on wild salmon through an increased exposure to sea lice and that insufficient scientific research had been applied to assessment of this threat.
2. Impact on shellfish	The Appellant raised concerns regarding the impact of fish farm pesticide applications on the spawning and development of shellfish (crustacean) populations.
3. Disease control	The Appellant raised an objection to the granting of a licence to Marine Harvest on the basis of an unwillingness to share information on disease outbreaks, with Marine Harvest's refusal given for reasons of commercial confidentiality. The Appellant points out that that information sharing is required under local aquaculture management systems.

Non-Substantive Issues

1. Regulation of the salmon farming industry	The Appellant maintains that there is little or no regulation of the salmon farming industry in Ireland.

Appellant 10

Substantive Issues

1. Threats to wild salmon from sea lice	The Appellant maintains that the installation of the salmon farm will have a significant detrimental impact on wild salmon through an increased exposure to sea lice and that this threat was insufficiently assessed in the EIS and EIA.

2.	Threats to wild salmon from escaped farm fish	The Appellant maintains that escaped farmed fish pose a significant risk to local wild salmon populations and that this threat is insufficiently assessed in the EIS and EIA.
3.	Cumulative impacts	The Appellant pointed out that neither the EIS or EIA address the issue of cumulative effects resulting from multiple aquaculture installations within the Bantry Bay catchment.
4.	Licence conditions (production schedule)	The Appellant pointed out that the farm production schedule provided by the Applicant indicates a possible increase in risk to wild salmon smolts due to the fallow period being in September/October rather than January/February; the latter being closer to the sensitive spring time period. The Appellant observed that this does not follow the DAFM recommendation for best practice.
5.	Licence conditions (fallowing)	The Appellant pointed out that synchronised production is necessary to optimise the value of fallowing, but that is was not clear in the EIS and EIA that synchronised management is in place in Bantry Bay.
6.	Licence conditions (Synchronised Bay Management)	The Appellant pointed out that there is a lack of clarity as to whether synchronised management of fish farming is in place in Bantry Bay and requests that a regime is established to protect wild salmonids.

Non-Substantive Issues

1.	Licence approval process	The Appellant complained that the aquaculture licence approval process may be subject to conflicts of interest.

Appellant 11

Substantive Issues

1. None

Non-Substantive Issues

1.	Licence approval process	The Appellant maintains that the aquaculture licence

	approval process is flawed and may be subject to conflicts of interest.

Appellant 12

Substantive Issues

1. Public consultation	The Appellant maintains that insufficient public consultation was undertaken contrary to the Cork County Development Plan's reference to the Bantry Bay Charter.
2. Pollution	The Appellant questioned the assessment of current flow and water circulation in Bantry Bay provided in the EIS, disagreeing with the conclusion that discharges from the proposed fish farm would be quickly dispersed and transported beyond The Bay.
3. Cumulative impacts	The Appellant suggested that Bantry Bay may be susceptible to plankton blooms and that the proposed fish farm's cumulative contribution to nutrient loads within the Bay has not been fully investigated.
4. Impacts on vulnerable/ protected species and habitats	The Appellant expressed concern for fish farm impacts on particular marine species, including bed-forming calcareous red algae (maerl), a sea squirt (*Phallusia mammillata*) and on local herring spawning grounds. Concern was also expressed for disturbance to Arctic tern and common seal.
5. Threats to wild salmon from sea lice	The Appellant maintains that the installation of the salmon farm will have a significant detrimental impact on wild salmon through an increased exposure to sea lice.
6. Toxic chemical pollution	The Appellant raised concerns over the use of pesticides in salmon farms and their possible impacts on the environment.
7. Licence conditions (Synchronised Bay Management)	The Appellant pointed out that is no evidence of collaboration between existing fish farm operators and that this compromises the control of sea lice.
8. Licence conditions (production and fallowing)	The Appellant observed that the proposed stocking and fallowing regime does not follow the DAFM recommendation for best practice.
9. Noise impacts	The Appellant stated that noise impacts had not been

	adequately considered in the EIS.
10. Inadequate EIS	The Appellant has expressed dissatisfaction with the Environment Impact Statement submitted in support of licence application, stating that the EIS failed to adequately address a range of issues.
11. Disease control	The Appellant raised an objection to the granting of a licence to Marine Harvest on the basis of an unwillingness to share information on disease outbreaks, with Marine Harvest's refusal given for reasons of commercial confidentiality.
12. Absence of a local aquaculture management scheme	The Appellant maintains that the licencing of aquaculture developments should be put on hold until Bantry Bay establishes a Co-ordinated Local Area Management Scheme (CLAMS).

Non-Substantive Issues

1. Sustainability of the aquaculture industry	The Appellant commented on the sustainability of the salmon farming industry and the issues surrounding the preparation of farm feed.
2. Climate change	The Appellant commented on the contribution of the fish farming industry on climate change.
3. Inadequate compliance, enforcement and monitoring	The Appellant maintains that there has been a poor compliance record within the aquaculture industry in general and with the licence Applicant in particular.

Appellant 13

Substantive Issues

1. Threats to wild salmon from sea lice	The Appellant maintains that the installation of the salmon farm will have a significant detrimental impact on wild salmon through an increased exposure to sea lice and that insufficient scientific research had been applied to assessment of this threat.
2. Site suitability	The Appellant questioned the suitability of the site location in terms of exposure to weather and its significance in respect of presenting a barrier to marine species movement or migration.
3. Licence conditions	The Appellant observed that the proposed production

	(Synchronised Bay Management)	strategy is contrary to best practise set in Single Bay Management Agreements and is at odds with the principle of synchronous production, which would require cooperation between the two fish farm companies operating in the Bay.
4.	Licence conditions (production and fallowing)	The Appellant observed that the proposed stocking and fallowing regime does not follow the DAFM recommendation for best practice and that the licence conditions should be amended to include synchronous stocking with input of smolts in March to comply with the DAFM strategy for the minimisation of lice presence during the annual wild salmon and sea trout migration.
5.	Cumulative impacts	The Appellant commented that the cumulative effect of all existing and proposed fish farm production has not been assessed.
6.	Threats to wild salmon from escaped farm fish	The Appellant commented that the potential impact of large escapes of farmed fish has not been adequately addressed in the EIS.
7.	Amenity impact (angling)	The Appellant suggested that a reef feature within the licence area would be an important lost amenity for sea angling.

Non-Substantive Issues

1. None

Appellant 14

Substantive Issues

1.	Threats to wild salmon from sea lice	The Appellant maintains that recent scientific reports support their view that salmon farms present a risk to wild salmon smolts.
2.	Toxic chemical pollution	The Appellant maintains that pesticides from the proposed farm constitute a pollution risk.

Non-Substantive Issues

1.	Licence approval process	The Appellant maintains that insufficiently wide scientific advice is taken during consideration of fish

		farm licence applications.
2.	International impacts	The Appellant observed that the granting of the Bantry Bay licence contributes towards a lack of global protection of wild salmon stocks.
3.	Government policy	The Appellant expressed disapproval of Irish Government policy on the development of the fish farming industry.

1.5 Minister's submission

Section 44 of the Fisheries (Amendment) Act 1997 part 2 states that:

"The Minister and each other party except the Appellant may make submissions or observations in writing to the Board in relation to the appeal within a period of one month beginning on the day on which a copy of the notice of appeal is sent to that party by the Board and any submissions or observations received by the Board after the expiration of that period shall not be considered by it"

The deadline for receipt of submissions accordance with Section 44(2) was set at 23rd of November, 2015.

No submissions are enclosed from the Minister in the light of appeals.

1.6 Applicant response

The Applicant may submit a response to appeal submissions under the provision set out in Section 44(2) of the Fisheries Amendment Act 1997 which states:

"*The Minister and each other party except the Appellant may make submissions or observations in writing to the Board in relation to the appeal within a period of one month beginning on the day on which a copy of the notice of appeal is sent to that party by the Board and any submissions or observations received by the Board after the expiration of that period shall not be considered by it*."

The deadline for receipt of submissions accordance with Section 44(2) was set at 23rd of November, 2015.

The Applicant made submissions both as Appellant in respect of some aspects of the licence conditions (Appellent 6 in Section 1.4) and as respondent to other Appellant submissions. The Applicant response of the 20th November 2015 is outlined here and where possible the issue addressed is referenced back to the appropriate Appellant(s).

(i) Public consultation (Appellants 1, 2 and 12)

The Applicant pointed out that the requirement for an aquaculture scoping process is not underpinned by either EU or Irish environmental legislation, rather being a historical policy with its roots in a previous administrative entity. The Applicant outlined the current interpretation of issuing a "scoping letter" seeking input into the EIA and EIS to be compiled as part of the licence application process. The Applicant maintains that DAFM approval of the draft scoping letter and associated recipient list was sought and received before sending and every endeavour was made to circulate to all interested parties.

A list of Statutory Consultees was provided to Marine Harvest Ireland by AFMD and these and others were duly supplied with a full set of application document, including the EIS. The Applicant states that the licence application was widely publicised in the press (two local and one national newspaper) and all documentation relating to the application was made publicly available *via* the MHI website, thus satisfying the public consultation requirements.

(ii) Pollution impacts, hydrography and waste transport (Appellants 1, 4, 7 and 12)

The Applicant made reference to the Appellant's broad stated dissatisfaction with evaluation of the impacts of discharged chemicals and organic waste from the proposed site and the associated concern over the evaluation of the hydrographical regime and dissipation rates. The Applicant asserts that the level of detail submitted to cover these aspects surpassed any previous licence submissions and suggests that the Appellants either failed to read the technical information supplied, or simply ignored the detail provided within the EIS.

The Applicant pointed out that the models used to describe the dispersal of soluble contaminants was derived from empirical data, i.e. from "real world" observational data and was extended well beyond the Shot Head site in order to evaluate combined effects. The modelling was supported by the provision of detailed information relating to seasonal variation in the feeding, growth and harvesting regimes of the proposed farm, together with waste production streams. The fate of solid waste (predominantly faeces) was evaluated separately using dispersion modelling undertaken by a commissioned consultant (RPS), but with reference to the empirical hydrographical data that was applied to the soluble waste transport modelling. In addition, the Applicant states that levels of contaminants were evaluated in the context of internationally established threshold levels (Environmental Quality Objectives [EQO] supported by Environmental Quality Standards [EQS]), with their results indicating that the discharges from the proposed farm would remain well within acceptable limits throughout the licence period.

To address concerns raised during the consultation period, the Applicant commissioned a further study, incorporating updated hydrographical modelling techniques developed since the publication of the EIS. The report from this study was submitted with the

Applicant's response and was intended to provide greater certainty and objectivity to the modelling predictions.

The Applicant highlighted the following points from the new report:

- The updated work incorporated a tidal surge model that was calibrated against multiple hydrographical datasets in order to verify tidal flow simulations. This was consistent with the EIS conclusions in respect of flow rates within the Bay and residual flow direction, acting to dilute and transport waste out of the Bay, rather than forcing accumulation within the Bay basin.

- The updated work incorporated analysis of wave climate for Shot Head, with a comparison against other aquaculture sites within the Bay. The results indicate that the Shot Head site is located at a relatively exposed position, but this information will inform the selection of a suitably robust installation design.

- The updated work confirms the EIS conclusion that, in a worst case scenario, discharges of nutrients from the proposed farm (as represented by estimates of concentration of phosphorus, nitrogen and biological oxygen demand) will remain below internationally-defined acceptable limits and that these discharge levels will never be sufficient to contribute to, or stimulate, harmful plankton blooms. Similarly, farm medication dispersal will be sufficient to maintain levels below specified EQS thresholds.

- The evaluation of the fate of solid waste undertaken in the EIS is reproduced in the submitted updated report. The Applicant restated that solid settlement is predicted to reach 12 – 13 mm in depth under the cages, reducing to less than 1 mm at 100 m distance in a worst case scenario. The Applicant further emphasised that the turnover of remnant food and faecal matter in the aerobic environment beneath the cages would be reasonably rapid, resulting in fine particulates, which would, in turn, be dispersed in the water column.

(iii) Impact on seal populations (Appellants 1, 2 and 12)

The Applicant observed that both grey and harbour (or common) seal are present in Bantry Bay, but only harbour seals routinely frequent the inner bay area, with a number of haul-out sites within the Glengarriff Harbour SAC, for which harbour seal is a qualifying species. The Applicant noted the 5 km proximity of the closest haul-out site to Shot Head and adds that it may be necessary to assess the requirement for anti-predator nets or acoustic deterrents. It is also noted that harbour seal disturbance has not previously been attributed to fish farm activity in surveys carried out by NPWS.

(iv) Nutritional quality and food safety (Appellant 3)

The Applicant refuted allegations concerning the nutritional quality of farmed fish, pointing to a superior balance of protein to fat when compared to red and white meat.

The Applicant also pointed out that farmed fish are routinely monitored for the presence of residues of prohibited substances, veterinary drugs, pesticides, heavy metals, dyes and other contaminants in accordance with EU Directive 96/23/EC and that no non-compliant samples have been identified since 2005.

The Applicant also addressed the alleged use of genetically modified organisms (GMO) in fish farm feed, stating that all MHI salmon is organically certified to EU standards which prohibits the use of GMO ingredients in salmon diets.

(v) Impacts on wild salmonids (Appellants 1, 2, 5, 7, 9, 10, 12, 13 and 14)

The Applicant referred to broad Appellant concerns in respect of disease, sea lice and escapes in the context of the decline of wild salmon populations, pointing out that a major historical decline was reported in Bantry Bay rivers well before the arrival of the fish farming industry. The Applicant, however, acknowledged the potential risks associated with interaction of wild and farmed stock, but maintained that the selected location of modern salmon farms minimise this risk, which is further improved by disease and lice infestation control methods.

The Applicant referred to appeal submissions that appear to be in conflict, indicating either continued decline or a post drift-netting ban recovery, while asserting that for hydrographical reasons sea lice have a limited opportunity for travel from rivers and no capacity at all for transport into rivers.

The Applicant outlined the importance of their own disease management profile and their effort to maintain healthy and profitable stock, referring to their coverage of this subject in the EIS and reiterating that the proposed farm site will be certified for organic production. The Applicant also pointed out that modern fish farming techniques have seen improvements in stocking conditions, reducing fish stress, which has, in turn, led to a reduction in the incidence of disease.

The Applicant directly referred to Appellant concerns on sea lice infestation and implications for wild stock, acknowledging that the reasons behind variation in natural lice seasonal occurrence are not well understood, but that there is certainty that first occurrence on farmed fish originated from wild fish. The Applicant goes on to assert that while copepodids from local rivers may reach Shot Head, they will be unable to travel in the reverse direction, from the proposed farm location to the salmon river estuaries (with the exception of the Adrigole River), due to the residual outward current drift. The Applicant went on to cite empirical observations and modelling evidence in support of their belief that there would be a low incidence of farm-to-wild stock transferral. They further pointed to the recent lifting of angling closures in three rivers, despite the continued operation of three fish farms in the area.

The Applicant provided an overview of the National Lice Treatment Strategy as adopted by MHI, together with the national framework under which sea lice monitoring takes place. They also described the contribution of MHI commissioned research using larval dispersal models to the understanding of lice infestation pathways within Bantry Bay, providing a summary of the findings of this research. The Applicant maintained that the results of this study indicate that even at high nominal densities originating from the Shot Head site and taking into account wind forcing effects, the probability of wild salmon encounters with copepodids remains very low in any part of Bantry Bay. They further state that the model also indicates that copepodids originating from wild stock present a low risk of infestation to any fish farm operating in the Bay. The Applicant declared a high degree of confidence in the modelled results and maintained that, unless fault can be found with the basis on which the model is built, the results represent a robust prediction of sea lice dispersal patterns.

The Applicant confirmed that, as stated in the EIS, only licenced sea lice treatments will be applied and best practice will be followed in order to avoid the possibility of sea lice resistance.

The Applicant referred to previous farm escape events in Bantry Bay and pointed out that no losses had been attributable to MHI installations, further stating that they had invested heavily in modern pen and mooring technology and operated appropriate escape mitigation policies, together with comprehensive inspection and monitoring procedures.

(vi) Visual/tourism impacts (Appellants 1, 3 and 7)

The Applicant stated that one of the reasons for selection of the Shot Head site was its low visual impact, further indicating that the installation colour will be dark and would be expected to merge into the surrounding landscape. The Applicant maintains that there will be no impact on the number of tourist visitors.

(vii) Impact on calcified seaweeds (maerl) (Appellant 8 and 12)

The Applicant maintained that waste dispersal modelling indicates that there will be no impact on maerl habitats.

(viii) Navigation (Appellant 4)

The Applicant maintained that on the basis of expert advice the proposed farm at Shot Head presents no hazard to navigation in Bantry Bay.

(ix) Noise (Appellant 12)

The Applicant maintained that beyond sound from day-to-day activity and some vessel movement, which will be attenuated within a short distance from the site, there will be no noise issues.

(x) Inadequate compliance, enforcement and monitoring by the Applicant (Appellant 14)

The Applicant refuted accusations of poor compliance and operational practices and outlined MHI's achievements, awards and certifications, emphasising that international sustainability and environmental standards will be applied to the Shot Head site. It was also pointed out that MHI is subject to regulatory audits by a range of agencies.

1.6.1 Other Responses

Four additional submissions were received in response to the Applicant's appeal (see section 1.4: Appellant 6). These are summarised below.

Response 1 (Save Bantry Bay)

The Respondent referred to the Applicant's request for the name to be changed on the aquaculture and foreshore licence to reflect organisational changes and a resulting name change of the Applicant company.

The Respondent, invoking licence conditions 10(5), 10(6) and 10(7), argued that the circumstances under which this name change is requested constitute a departure from compliance procedure.

Response 2 (John Brendan O'Keeffe)

The Respondent referred to the absence of a consideration of the Dromagowlane (also known as Dromagoulane or Dromagolane) River in the EIS, suggesting that is has significance for both wild salmon and freshwater pearl mussel.

The respondent also lodged complaints in respect of conflicts of interest, water abstraction, impact on terrestrial archaeology, visual and navigational impacts.

Response 3 Denis Kieran & Jason O'Shea

The respondent referred to the Applicant's request for the name to be changed on the aquaculture and foreshore licence to reflect organisational changes and a resulting name change of the Applicant company.

The respondent invoked licence conditions 10(5), and 10(6), pointing out that Ministerial approval will be required to initiate a licensee name change.

The respondent expressed concern over the Applicant's request for relaxation of stocking schedules, suggesting that this would lead to a lack of compliance with single bay management guidelines.

Response 4 (Salmon Watch Ireland)

The respondent expressed support for the Applicant's request to change the licence condition from a biennial production limited by harvested weight to regulation a Maximum Allowable Biomass (MAB) basis.

The respondent, in objecting to the Applicant's request to relax specified harvesting periods, welcomed the imposition of a defined harvesting period under the terms of the licence, but further requested that further constraints be applied to prevent harvesting during February to June to mitigate impacts on juvenile salmon migration.

The respondent objected to the licence conditions relating to fallowing.

The respondent indicated that they have no expertise in floating cage technology, but broadly supported the Applicant's request for licence flexibility in the selection of appropriate pen and mooring technology.

The respondent objected to the Applicant's request for a licensee name change, questioning the Applicant's reasons for doing so, in particular the company name change and pointed to a lack of clarity on where the power for statutory approval for such a change is held.

2.0 Consideration of Non-Substantive Issues

A number of broad issues were raised by the Appellants, largely in the form of general criticisms of the aquaculture industry and its practices and products, or as complaints levelled against Irish Government practices and policy on aquaculture in general and fish farms in particular.

These issues and the reasons why these were considered as non-substantive issues and are not considered further in this report are listed below with an indication of the Appellant(s) who raised them.

1. *Dissatisfaction with licence approval process - conflict of interest (Appellants 1, 2, 4, 8, 10, 11 and 14)*

Appellants expressed broad dissatisfaction with the licence approval process with a common theme of a lack of impartiality amongst government/ministerial advisors, government agency staff or ALAB staff, often concluding with accusations of conflicts of interest. This is not an area that is appropriate for exploration in the current appeals

process and is best addressed through a general procedural review of the entire aquaculture consents process.

2. *Disapproval of government policy on aquaculture (Appellant 9)*

A review and evaluation of Irish government policy on aquaculture falls outside the remit of this report.

3. *Farmed fish is dangerous to human health (Appellant 3)*

An examination of the human health risks of consuming farmed fish falls outside the remit of this report. We note, however, the Applicant's response of the 23rd of November 2016 (see Section 1.6) in which they maintain that farmed fish are routinely monitored for the presence of residues of prohibited substances, veterinary drugs, pesticides, heavy metals, dyes and other contaminants in accordance with EU Directive 96/23/EC and that no non-compliant samples have been identified since 2005. They also point out that all MHI salmon is organically certified to EU standards which prohibits the use of GMO ingredients in salmon diets.

4. *Strategic Environmental Assessment (SEA) required in response to changes in government policy on fish farming (Appellant 5)*

Appellants have made reference to recent Irish Government policy statements and associated publications, such as *Food Harvest 2020* and *Harnessing Our Ocean Wealth - An Integrated Marine Plan for Ireland*, which promote the expansion of the aquaculture industry in Ireland. It is argued that these represent changes in policy which under EU Directive 2001/42/EC requires a SEA to be undertaken before any further aquaculture licences can be granted.

This is a matter for consideration at a government level and is beyond the scope of the present Shot Head appeals consideration process.

5. *Change of Applicant name (Appellant 6)*

The Applicant has requested that the Licensee name be amended to reflect a corporate restructuring which has precipitated a re-branding of the original Applicant. Some Appellants have objected to this, expressing concerns over future corporate liability. We believe this to be a matter exclusively for the consideration of the Licensing Authority, with a subsequent requirement for approval by the Minister and not for evaluation within the appeals process.

6. *Lack of regulation of salmon farming industry (Appellant 9)*

A critical examination of the regulatory structure governing the Irish aquaculture industry is beyond the scope of the Shot Head licence appeals process.

7. *Absence of local aquaculture management scheme (Appellant 12)*

It is our understanding that local aquaculture management schemes are in their infancy in Ireland and remain voluntary. CLAMS (Co-ordinated Local Aquaculture Management Systems), initiated to encourage the development of localised action plans for Irish aquaculture in conjunction with Single Bay Management, is promoted by Bord Iascaigh Mhara (BIM) and has been referred to in our examination of the proposed production strategy at the Shot Head site (Section 9.1). CLAMS is, however, explicitly removed from the licensing and regulatory process and is not intended for use in the consideration of individual site licences (BIM, undated). On this basis, we consider the absence of a fully adopted CLAMS strategy in Bantry Bay a non-substantive issue at this time.

8. *Issues in respect of the sustainability of the salmon farming industry (preparation of farm feed) (Appellant 12)*

The world-wide concerns relating to the environmental sustainability of feed production for the aquaculture industry is beyond the scope of the Shot Head licence appeals process.

9. *The contribution of the fish farming industry to climate change (Appellant 12)*

The contribution of the fish farming industry to global climate change is beyond the scope of the Shot Head licence appeals process.

10. *Applicant's record of inadequate compliance, enforcement and monitoring (12)*

The Applicant's corporate compliance history and competence for operating within Ireland is a matter for direct consideration by the Licencing Authority. The Technical Advisor does not have the mandate or the capacity to review the Applicant's (and associated subsidiaries) historical competence or compliance throughout the global aquaculture industry within the context of the present appeals process.

11. *Impact of the Bantry Bay licence on the global protection of wild stocks (Appellant 14)*

An evaluation of the individual impact of the proposed Shot Head fish farm on global wild salmon populations would constitute a lengthy and substantial academic undertaking which would not be appropriate for the present appeals process.

3.0 Oral Hearing Assessment

In line with Section 9 of the Fisheries Amendment Act 1997 an oral hearing may be conducted by the ALAB regarding the license appeals. An oral hearing has been requested by three Appellants.

We suggest that an Oral Hearing is appropriate in this instance due to the remaining or unresolved uncertainties subsequent to a request for further clarification under Section 47 of the Fisheries (Amendment) Act, 1997 in respect of the unaddressed issues outlined in this report, the details of which are provided in Section 10.3.

4.0 Minister's file

In line with particulars of Section 43 of the Fisheries Amendment Act 1997 the following documented items were sent to the ALAB from the Minister and were reviewed:

No.	Date[1]	Item
1	05/2011	Copy of EIS (3 volumes: Main Report, Appendices, Non-technical Summary).
2	20/06/2011	Copy of MHI application form, including projected production tonnage, costs, maps, co-ordinates and cage layout drawings.
3	20/12/2011	Letter from DAFM to MHI providing a list of Statutory Consultees.
4	11/01/2012	Copies of letters issued by the Applicant to Statutory Consultees notifying of a revised application (enclosing updated application document and EIS.
5	12/01/2012	Copies of Public Notice newspaper advertisements (3)
6	17/01/2012 – 22/02/2012	Copies of Statutory Consultee responses to licence application.
7	18/01/2012	Copies of (77) letters of objection to, and support for, the licence application following public notice.
8	27/02/2012	Copies of Statutory Consultee submissions as sent from DAFM to MHI.
9	12/03/2012	Copy of MHI response to Statutory Consultee submissions.
10	14/03/2012	Additional report on navigational issues submitted to AFMD from the Marine Survey Office, DTTAS.
11	16/03/2012	MHI response to Inland Fisheries Ireland's submission.
12	23/03/2012	Copies of internal government/agency correspondence and advice in respect of the licence application.
13	14/05/2012	Copy of correspondence from the DAFM Regional Engineer regarding site exposure.
14	26/06/2012	Copy of letter from Bantry Bay Harbour Commissioners indicating intent to request the addition of previously absent tanker anchorage locations to navigational charts.

[1] Dates are given as document stamped received dates, where applicable, or in the case of correspondence compendiums the last date is given.

No.	Date[1]	Item
15	06/2012	Archaeological report provided by MHI.
16	03/02/2014	Copy of letter from the Marine Institute to DAFM outlining addition information that should be requested from MHI in respect of compliance with SI No. 477/2008.
17	03/03/2014	Copy of MHI response for additional information in respect of compliance with SI No. 477/2008.
18	19/06/2014	Copies of correspondence from DAFM to MHI in respect of public publishing of Statutory Consultee submissions.
19	20/09/2014	Copies of Public Notice newspaper advertisements (3) dated between 17/09/14 and 20/09/14.
20	14/11/2014	Copies of (42) responses to the public notice.
21	20/11/2014	Letter from DAFM to MHI giving notice of a further round of consultation.
22	24/11/2014	MHI responses to public notice submissions.
23	26/11/2014	Copy of letter sent by MHI with response to public notice submission and inviting Statutory Consultees to submit further observations or submissions (2nd round of Statutory Consultation).
24	06/12/2014	Copies of Public Notice newspaper advertisements (3) dated between 27/11/14 and 06/12/14.
25	15/01/2015	DTTAS comments on public responses to public notice regarding issues with navigational safety.
26	25/02/2015	Letter from DAFM instructing MHI to make information relevant to the Minister's Decision publicly available in accordance with the EIA Directive and to issue a Public Notice (text supplied) in specified newspapers.
27	12/06/2015	Copy of EIA prepared by DAFM.
28	31/07/2015 – 13/08/2015	Ministerial correspondence with recommendations for granting of an Aquaculture and Foreshore Licence.
29	05/09/2015	Recommendations from DAFM for the granting of the Aquaculture and Foreshore Licence approved and signed by the Minister.
30	Undated	Copy of draft Regulation SI 236 of 1998 as amended.
31	Undated	Copy of draft Foreshore Licence.
32	Undated	Copy of draft Aquaculture Licence.
33	Undated	Copy of Statutory Instrument SI No. 477/2008.
34	Undated	Copy of EIA Directive 2011/92/EC.
35	Undated	Screenshot of MHI web page listing information available for download in respect of the Shot Head application.
36	Undated	Copy of list of supplementary licence conditions.

5.0 Context of the Area

5.1 Physical descriptions

Bantry Bay is a long marine inlet located in south-west County Cork (Figure 1). It is the largest of the long marine inlets in south-west Ireland and is approximately 35 km long, running in a south-west to north-easterly direction. The entrance to the Bay is approximately 10 km wide, steadily narrowing to 3-4 km at its head. Bere Island, situated on the north shore, adjacent to Castletownbere, and Whiddy Island lying near the head of the Bay on the southern shore are the two largest islands in the Bay.

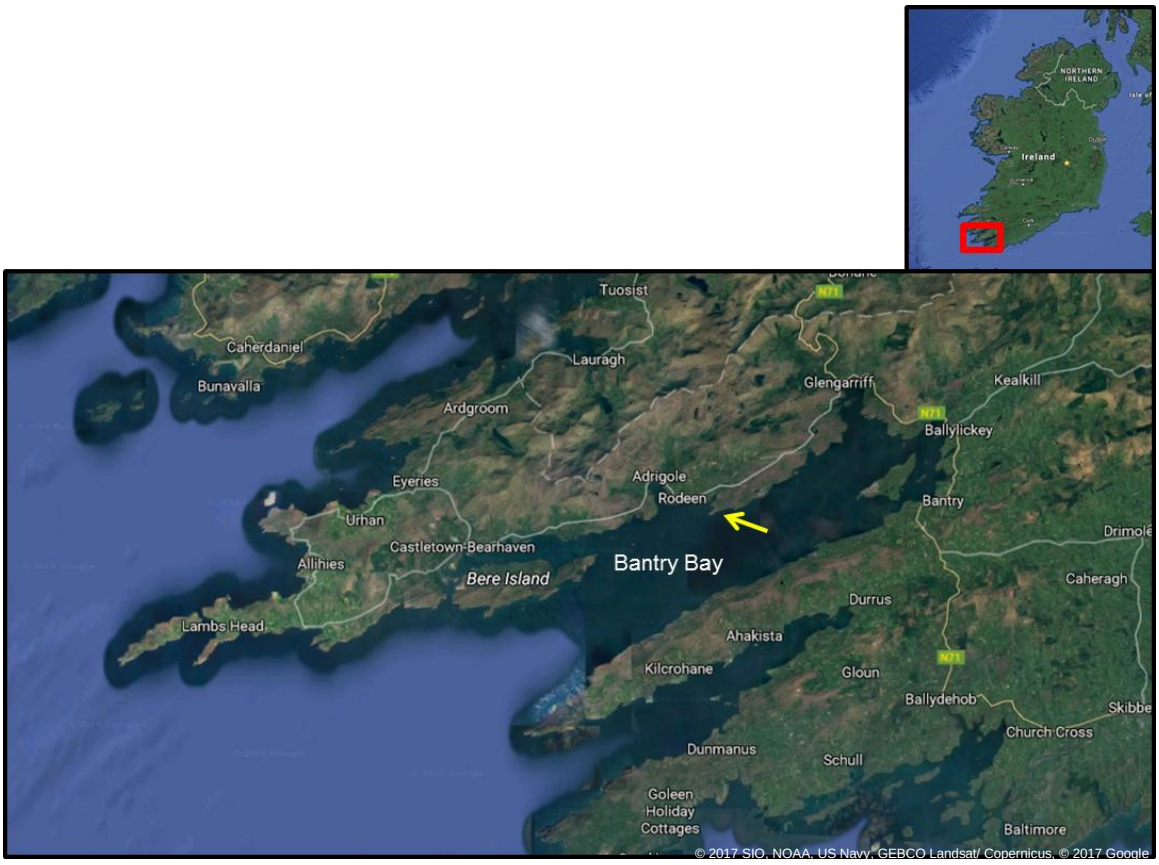

Figure 1. Bantry Bay. The yellow arrow indicates the location of the Shot Head proposed licence area.

The main population centres around the Bay include Bantry (3,348 in 2011), Castletownbere (868 in 2006), Glengarriff (870 in 2006) and Adrigole (457 in 2006).

The Bay is relatively deep in nature, with 20 – 30m water depth at the head of the Bay. It is predominantly SW facing and therefore open to the prevailing south westerly winds, which tends to be direction of the wind for around 35% of the time, with winds above Beaufort Force 4 (irrespective of direction) occurring for 50% of the time in south-western Ireland.

Bantry Bay is located in a temperate climate with the closest weather station being Sherkin Island Marine Station (24 km to the south), which, on average, records over 1200 mm of rain per annum. It has a 30-year long term average maximum air temperature of 18^{o}C (July/Aug) and minimum of 5^{o}C (January/February). The extreme ambient seawater temperature range for Bantry Bay is from 4ºC (rarely, in January or February) to 23ºC (rarely, between July and September). There is little temperature variation with water depth in the winter months, due to vertical mixing. However, during the summer, a thermocline can develop in deeper areas, giving a vertical temperature gradient between the seabed (cooler) and the surface.

Freshwater flow into Bantry Bay is seasonally variable reducing in the summer, but high rainfall, particularly in the winter months, feeds a large number of small rivers and streams, which are prone to periods of spate. The main rivers draining into the Bay are the Clashduff /Adrigole River, the Glengarriff River, the Coomhola River, the Owvane River and the Mealagh River. The Clashduff /Adrigole and Glengarriff Rivers originate in the Caha Mountains, while the Coomhola River passes down the Borlin Valley. Both the Coomhola and Owvane Rivers enter the Bay close to Ballylicky. The Mealagh River reaches the sea *via* the Donemark Falls, just north of Bantry town. Collectively the Coomhola, Owvane and Mealagh River constitute the main drainage for the eastern end of Bantry Bay catchment.

5.2 Resource Users

5.2.1 Aquaculture activity

Bantry Bay is a major centre for marine aquaculture with a variety of species being famed. These are:

Finfish:

Salmonid culture has a considerable presence in Bantry Bay. At present there are four licensed salmon farm sites in Bantry Bay. Two are situated on the northern shore near Roancarrig Rocks in outer Bantry Bay and comprise a smolt site and a grower site approximately 6 – 8 km west of the proposed Shot Head site; these are owned by the Applicant. The other two sites, towards the head of the Bay, are owned by Fastnet Irish Seafood and also comprise a smolt site and a grower site. The two Fastnet sites near Gearahies on the southern shore of the bay are approximately 5.5 km from the proposed Shot Head site. The Roancarrig sites are licensed to harvest 2,000 tonnes of salmon per

annum, whilst the Gearahies sites are licensed to produce 500 tonnes per annum. Both companies produce certified organic salmon at their Bantry Bay sites.

Shellfish:

Shellfish farming is the dominant aquaculture activity, with mussel culture being biggest employer. There are some 50 shellfish aquaculture licences in the bay. There are five Designated Shellfish Areas in Bantry Bay, designated under the Quality of Shellfish Waters Regulations 2006 (SI 268 of 2006) and Article 5 of EU Shellfish Directive, 2006/113/EC. The overriding majority of aquaculture licences for the growing of shellfish in Bantry Bay lie within these areas.

The specific cultured shellfish species include:

Rope Grown (Suspended) Mussel Culture

In Bantry Bay, most of the production of rope grown mussel (*Mytilus edulis*) is concentrated east of Whiddy Island, in the inner part of Bantry Bay, with significant additional production in Berehaven, in the outer part of Glengarriff Harbour, in Adrigole Harbour, along the southern shore of the Bay near Reen Point, and a short distance further south-westwards seaward of Gearhies. The tonnage harvested in 2012 is understood to be around 3,300 to 3,480 tonnes.

Clams

Relatively small amounts of clams (*Ruditapes decussatus*) are grown in Bantry Bay and in 2011 the tonnage harvested amounted to 24.9 tonnes.

Scallops

Scallops (*Pecten maximus*) are grown intensively and extensively in Bantry Bay. The main intensive aquaculture areas are Traillaun Harbour, Bere Island and East of Whiddy Island. Extensive scallop growing is also carried out in these areas in addition to the mouth of Glengarrif Harbour.

Abalone

There is an abalone hatchery and farm located on Bere Island, and a hatchery near Quarry Point, west of Bere Island.

5.2.2 Angling activity

Rod fishing for salmon and sea trout is undertaken in a number of the rivers entering Bantry Bay. Table 5.1 provides the catch returns for 2014.

Table 5.1. Total rod and line catches for 2014 for salmon and sea trout rivers entering Bantry Bay. Source: Inland Fisheries Ireland (2014).

River	Salmon	Sea trout
Clashduff /Adrigole	No records	No records
Coomhola	25	No records
Owvane	7	No records
Mealagh	No records	2

A catalogue of sea angling sites, together with a map, has been produced by Inland Fisheries Ireland (http://www.fishinginireland.info/sea/maps/docs/Bantry%20Bay.doc). The catalogue indicates that there are 18 identified sites suitable for shore angling within Bantry Bay. Shot Head is a recognised location for angling activity, favoured for spinning for mackerel and Pollack or float fishing for wrasse. There are no other angling sites close to the proposed fish farm site.

5.2.3 Tourism

The South-West region (Cork/Kerry) is the most popular domestic holiday destination in Ireland with around 22% of holidaymakers travelling to this region (Fáilte Ireland, 2016a), and some 1.5 million overseas visitors to County Cork in 2014 (Fáilte Ireland, 2016b). The potential of the marine tourism industry has been clearly acknowledged, with Ireland's coastline (excluding Dublin) estimated to contribute some €2 billion to the Irish economy (Fáilte Ireland, 2014).

No definitive figures are available for tourism in Bantry, but it is generally agreed that tourism and recreation are important contributors to the local and regional economy of Bantry Bay, with the scenic Wild Atlantic Way being a considerable attraction to the region. In addition, boat and shore sea angling, leisure boating (yachting and kayaking), swimming, whale and dolphin watching, bird watching, walking, scuba diving and other water sports are key components of marine tourism in the region (Cork County Council, 2008). In addition, a number of cruise liners make scheduled stops to the Bay, mooring in Bantry Inner Harbour and contributing to local tourist trade.

5.2.4 Agricultural Activity

Agriculture accounts for the majority of land use in the Bantry Bay area and creates employment for approximately 20% of the local population, with dependence on agriculture marginally above the national average. Farm sizes in the area, however, tend to be smaller than the national average, being less than 20 hectares, except in some

upland areas. The uneven and boggy terrain limits agricultural use, with grassland for grazing of beef or milk cattle and sheep being the most common usage. In the year 2000, the last year for which data are available, there were a total of 34,268 cattle and 103,571 sheep on the Castletown and Bantry Rural Districts combined. A site inspection confirmed that the coastal area adjacent to the licence site was largely used for grazing, with gated and fenced farming access to the north-west of the licence area.

5.2.5 Inshore Fishing Activity

Detailed or high resolution spatial data on the extent and distribution of inshore fishing in Bantry Bay is not currently available, but information on fishery activity in Irish inshore waters has been compiled from expert information and survey data. The Marine Institute provided a comprehensive summary of the information relevant to the current licence application in their submission of 2014. This is reproduced below.

Pot fisheries

- A pot fishery for shrimp (Aug – Feb) occurs around Bere Island and east to inner Bantry Bay. Some of the fishery may overlap with the proposed farm site but the affected footprint is likely to be insignificant generally. It is not possible to determine, without finer scale fishing data, the extent to which individual vessels would be affected.

- Brown crab and lobster potting occurs on harder ground along the south shore of Bantry Bay and westwards.

- Potting for prawns occurs along the south and north shores of Bantry Bay, mainly in the inner Bay, east of Bere Island. This activity is seasonal. Up to four vessels may be involved. This fishery occurs in the area of the proposed farm. The video data and the operation of a commercial pot fishery around and in the site would seem to contradict the view in the EIS that the densities of *Nephrops* at the site are not commercial.

Trawl Fisheries

- The ROV data presented in the EIS is insufficient to say whether the burrow density is too low to support economic exploitation of *Nephrops*. There is a significant prawn fishery in outer and mid Bantry Bay, on mud substrates and an important pot fishery for prawns in or near to the site and in inner Bantry generally.

- VMS [Vessel Monitoring System] data for vessels >15 m shows regular fishing activity by bottom trawlers fishing for *Nephrops* in the middle of the Bay, south of the proposed farm site but not in the vicinity of the proposed site.

- Trawlers <I5m in length and not reporting VMS are also known to fish this same area. There may be up to 10 vessels involved.

- VMS data for vessels >I5m shows mid-water trawling activity in the middle of the Bay. This represents a targeted sprat fishery in autumn/winter. This fishery may be sporadic; depending on fish abundance. In addition, vessels <I5 m may be involved. The fishery does not overlap with the proposed site.

Dredge Fisheries

- Small scale fisheries for bivalves (scallop, clams) may occur in the area south and west of Bere Island. Clams (surf clam and razor clam) are not currently harvested in the area. These fisheries do not overlap with the proposed site.

5.2.6 Leisure Users of the water body & surrounding area

The following leisure activities (in no particular order) are regularly undertaken in or around Bantry Bay:

Coastal

- Horse riding. Horse riding and pony trekking is undertaken at a number of locations around Bantry Bay, with a network of well-maintained bridle paths incorporating coastal views available.

- Angling. Angling for sea trout and salmon is undertaken in the Coomhola, Owvane and Mealagh Rivers.

- Walking/hiking. Walking and hiking is a popular activity in the Bantry Bay area, with a number trails, paths and specifically designed "loop walks". Routes may take in elements of the natural environment, sometimes with information boards illustrating species of local interest, or may pass by features of archaeological or cultural significance.

- Golf. Bantry Bay golf course is a particularly scenic course situated on the coast just north of Bantry.

- Cycling. The scenic narrow roads are popular with cyclists, with a number of routes and trails being promoted (see: http://www.mapmyride.com/ie/bantry-m/).

- Bird watching. The Bantry Bay area is considered a good location for observing a wide range of both land- and seabird species, with a large number of migratory and nesting species being recorded throughout the year.

Marine

- Yachting/sailing. Bantry Harbour has visitor moorings and an established sailing club, with a new marina due to be completed behind the town pier by 2017. The north shore of the Bay also provides numerous sheltered anchorages, moorings and small marinas, the most popular of which are Adrigole Harbour, Glengarriff Harbour, Castletownbere and Lawrence Cove marina.

- Kayaking and canoeing. The sheltered embayments along the Bantry Bay coastline are considered to be well-suited for kayaking or canoe excursions which are often cited as a good way to see dolphins, porpoises and seals.

- Scuba diving. There are a number of recognised locations that are considered good for scuba diving within the Bay (see: http://www.tempoweb.com/diveireland/bantry.htm). Dive sites cover a wide range of depths up to the limits of recreational diving, can be accessed either by boat or from the shore and includes wreck diving options. There is a recreational diving school with premises just outside Bantry.

- Marine wildlife watching. Whale, dolphin, seal and seabird watching is becoming increasingly popular and is a major attraction in Bantry Bay, with a number of boat operators offering marine wildlife watching excursions, the most popular of which operate from Castletownbere and Glengarriff.

- Sea fishing. Bantry Bay has been described as the least fished section of the Cork coastline, but nevertheless has a number of popular shore angling sites distributed along its coastline, with commonly-caught species including: wrasse, conger, bull huss, coalfish, mackerel, pollack, whiting, sand eel, bass, dogfish, thornback ray, mullet, flounder and dab. Fishing from boats is also undertaken in the Bay.

5.2.7 Other Activities

Other relevant activities include:

Tarmac Fleming Quarry
A quarry currently owned by Tarmac Fleming is located at Leahill approximately 2.5 km along the coast from the Shot Head licence area. The quarry is not presently active and we understand that the site it is seeking a new owner and may not become operational again. According to the EIS, the quarry covers an area of some 50 hectares and has estimated reserves of 120 million tonnes of quartzite sandstone, used principally in road construction, with major markets in southern England and France. A deep-water jetty extension was built in 1998 which has accommodated bulk vessels of up to 96,000 DWT.

Conoco Philips Bantry Bay Oil Terminal

The oil terminal on Whiddy Island serves as a storage and distribution facility for oil products. Tanker traffic delivers products from the Arabian Gulf, while smaller vessels distribute oils and fuels to other terminals around Europe. In general, the vessels that service the Bantry Bay terminal are comparatively small in size, mostly under 100,000 DWT and predominantly within the range 20,000 to 50,000 DWT.

5.3 Environmental Data

Water Quality

5.3.1 Environmental Protection Agency (EPA) Results

The EPA Marine Monitoring Programme undertakes analyses of general components in water samples at a large number of coastal and transitional waters around Ireland. Bantry Bay is not one of the bays covered by this programme. The closest bays that are monitored are Kenmare River and Roaringwater Bay to the north and south respectively. Both of these bays were classed as "unpolluted" (EPA, 2012). Both summer and winter dissolved inorganic nitrogen and molybdate reactive phosphorus levels in Kenmare were the lowest levels on the reference scales i.e. less than 25 mg/l and 20ug/l respectively while in Roaringwater Bay (near Baltimore) these levels were slightly elevated.

5.3.2 WFD Monitoring Programme

The proposed site falls within the Outer Bantry Bay Coastal Waterbody (IE_SW_170_0000), which currently returns an overall "Unpolluted" status. The nearest river monitoring site is Trafrask Br., approximately 1.7 km from the licence area, which is currently classed as "High Status"

5.3.3 Shellfish Flesh Monitoring Programme

Shellfish flesh classifications are carried out under the European Communities (Live Bivalve Molluscs) (Health Conditions for Production and Placing on the Market) Regulations, 1996 (S.I. No. 147 of 1996)). Sampling is carried out by the Sea Fisheries Protection Authority (SFPA) on at least a monthly basis. The licensed area is within "Gearhies" (CK-BB-GS) area which is classed as "A*" for mussels. The "*" denotes that it is a seasonal classification for the period 1st December to 1st of March outside of which the classification reverts to Class B.

5.3.4 Bathing Water Quality

Bathing Water quality is not monitored by the EPA within Bantry Bay. The nearest location where bathing water quality is monitored is Barley Cove, approximately 24 km to the southwest. For the 2014 and 2015 bathing seasons, Barley Cove achieved excellent water quality status. In 2012 it achieved sufficient water quality status and complied with EU mandatory values. Barley Cove had good water quality status for the previous 10

years. For the 2014 and 2015 bathing seasons, Derrynane, to the north of Kenmare River, also achieved Excellent water quality status.

5.4 Statutory Status

5.4.1 Nature Conservation Designations

The proposed site is not located within a *Natura* 2000 or any other protected area recorded on the NPWS list of Protected Sites in Ireland (https://www.npws.ie/protected-sites). The Bantry Bay catchment does, however, contain a number of designated sites for nature conservation comprising:

- Special Areas of Conservation (3)
- Special Protected Areas (3)
- Natural Heritage Areas (4)

Details of each nature conservation site are provided in Table 5.2.

Table 5.2. Nature conservation sites within the Bantry Bay area. The sites are listed in order (closest first) of distance from the proposed Shot Head fish farm site. Features of marine or coastal significance are shown in red text. Source: NPWS website (https://www.npws.ie/protected-sites), accessed in July 2016.

Site Name	Designation Status	Features of Interest	Approx. distance from proposed site
Trafrask Bog NHA	Natural Heritage Area	• Peatlands	1.2 km
Leahill Bog NHA	Natural Heritage Area	• Peatlands	3.1 km
Sheep's Head to Toe Head SPA	Special Protected Area	• Peregrine (*Falco peregrinus*) • Chough (*Pyrrhocorax pyrrhocorax*)	5.3 km

Caha Mountains SAC	Special Area of Conservation	• Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* • Natural dystrophic lakes and ponds • Northern Atlantic wet heaths with *Erica tetralix* • Alpine and Boreal heaths • Blanket bogs (if active bog) • Siliceous rocky slopes with chasmophytic vegetation • *Geomalacus maculosus* (Kerry Slug) • *Trichomanes speciosum* (Killarney Fern)	5.5 km
Sheep's Head SAC	Special Area of Conservation	• Northern Atlantic wet heaths with *Erica tetralix* • European dry heaths • *Geomalacus maculosus* (Kerry Slug)	5.7 km
Hungry Hill Bog NHA	Natural Heritage Area	• Peatlands	7.8 km
Glengarriff Harbour and Woodland SAC	Special Area of Conservation	• Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) • *Geomalacus maculosus* (Kerry Slug) • *Rhinolophus hipposideros* (Lesser Horseshoe Bat) • *Lutra lutra* (Otter) • *Phoca vitulina* (Common Seal)	9.8 km
Beara Peninsula SPA	Special Protected Area	• Fulmar (*Fulmarus glacialis*) • Chough (*Pyrrhocorax pyrrhocorax*)	12.2 km

Pulleen Harbour Bog NHA	Natural Heritage Area	• Peatlands	20.8 km
The Bull and The Cow Rocks SPA	Special Protected Area	• Storm Petrel (*Hydrobates pelagicus*) • Gannet (*Morus bassanus*) • Puffin (*Fratercula arctica*)	43.8 km

5.4.2 Protected Species

Mammals
Otter, two seal species and a range of cetacean species are known to be resident or frequent visitors to Bantry Bay and all receive protection under the Wildlife (Amendment) Act (1976 - 2005), including protection of their "resting places" and from "wilful interference". In addition, otter and all cetacea are classed as Habitats Directive Annex IV species and are afforded strict protection under this Directive.

Both grey and harbour (or common) seals are resident in Bantry Bay and haul-out at various shore locations around the entire bay area. As is common along indented Atlantic coastlines, each species tends to exhibit a spatial preference, with grey seal densities concentrated in the mouth of the Bay, while harbour seals are more commonly observed in the inner Bay. The Shot Head area is not a favoured location for seals and the closest known haul-out sites (for harbour seal) are Garinish West approximately 4.7 km to the east and Orthon's Island, approximately 4 km to the north-west. Harbour seal is a qualifying feature of the Glengarriff Harbour and Woodland SAC, which is approximately 9.8 km from the Shot Head site.

The Irish Whale and Dolphin Group sightings database records 47 sightings of seven cetacean species between 1991 and 2013 in Bantry Bay. These species are:

- Common dolphin
- Harbour porpoise
- Bottle-nose dolphin
- Risso's dolphin
- Pilot whale
- Minke whale
- Sperm whale

Cetaceans are regular, but infrequent visitors, but the Bay is not considered to be an important foraging or breeding area for them and Shot Head is not likely to be of any particular significance in terms of cetacean visitors.

Otter sightings or records of the presence of spraints from around Bantry Bay are available on the National Biodiversity Centre database and indicates that otters are known to forage around the Shot Head area.

Birds
Bird species are included as qualifying features in the Sheep's Head to Toe Head SPA, the Beara Peninsula SPA and the more distant and offshore Bull and The Cow Rocks SPA (Table 5.2). The former site is designated for terrestrial species only (peregrine and chough) and is therefore of no consequence to the Shot Head site in view of its entirely marine setting. The other sites, although designated for seabird species, are located at a considerable distance from the Shot Head and are thus also highly unlikely to sustain any impact from the proposed fish farm.

In addition to the above, the EIS notes that there are a number of proposed NHAs with seabird interests within 5 to 8 km of the Shot Head site, these being:

- Orthon's Island
- Sheelane Island
- Roancarrigmore
- Roancarrigbeg

All bird species receive a degree of protection under the general terms of the Birds Directive and so it is appropriate to establish a broader view of the potential interactions that the farm installation may have on seabird populations.

A wide range of seabird species have been recorded around Bantry Bay, which serves as a stopping point for summer and winter migrating visitors, or as a permanent residence for others, the most common being common gull, herring gull, greater black-backed gull, and cormorant. A study undertaken by Roycroft *et al.* (2007) recorded all seabird species on multiple visits throughout 2001 – 2003 (inclusive) along a transect circuit that extended out to the mouth of the Bay and running along both the southern and northern coastlines, passing in close to Shot Head. Their conclusions indicated that, in general, seabird densities appear to be higher towards the outer reaches of the Bay in the summer months and tend to be in lower numbers, but concentrated in the inner Bay in winter. Observer records indicate that Shot Head did not appear to have a particular significance for any seabird species.

5.4.3 Statutory Plans

There are no statutory plans that specifically deal with Bantry Bay. The Bay is, however, covered under the Cork County Development Plan 2014, which was adopted by the Members of Cork County Council on the 8th December 2014 and came into effect on 15th January 2015.

The 2014 Cork County Development Plan states:

"*The Government's Food Harvest 2020 report sets out the strategy for the medium-term development of the agri food (including drinks), fisheries and forestry sector for the period to 2020.*

It contains the industry vision for the sector and sets ambitious targets for expansion over the next decade. It contains recommendations aimed at achieving sustainable growth, increasing efficiency, higher productivity and competitiveness in primary agriculture, forestry and fisheries as well as in food and drink production. The growth targets for the industry are underpinned by significant production increases in the milk, beef, sheep, pigment, poultry and aquaculture sectors."

On the subject of business development, Objective EE 9-1of the Plan states:

"*Business Development in Rural Areas*
The development of appropriate new businesses in rural areas will normally be encouraged especially where:

- *The scale and nature of the proposed new business are appropriate to the rural area,*
- *The development will enhance the strength and diversity of the local rural economy,*
- *The proposal will not adversely affect the character and appearance of the landscape,*
- *The existing or planned local road network and other essential infrastructure can accommodate extra demand generated by the proposal,*
- *The proposal has a mobility plan for employees home to work transportation,*
- *Where possible the proposal involves the reuse of redundant or underused buildings that are of value to the rural scene; and,*
- *The provision of adequate water services infrastructure.*"

Section 6.11 of the Plan refers specifically to fishing and aquaculture, stating:

"*Commercial Fishing and Aquaculture represent an important economic activity in rural coastal areas. This plan supports the provision of appropriate harbour infrastructure that facilitates a modern and innovative fishing industry.*

The Council recognises and will continue to support the sustainable development of the aquaculture industry in order to maximise its contribution to employment and the economic wellbeing of rural coastal communities and the economic wellbeing of the county. This plan also recognises the important role aquaculture can play in the diversification of rural areas."

Objective EE 11-1 of the Plan states:

"*Fishing and Aquaculture*
a) Support the use of existing port facilities for the catching and processing of fish as an economic activity that contributes to the food industry in the County.
b) Support and protect designated shellfish areas as an important economic and employment sector."

5.4.4 Water Quality Status

The WFD water quality status of the Outer Bantry Bay coastal water body, together with the Inner Bantry Bay, Glengariff Harbour and the Adrigole Harbour transitional water bodies are all classed as "High Status".

5.5 Man-made heritage

The Record of Monuments & Places (RMP), based on The Sites and Monuments Record (SMR) files housed in the National Monuments Services offices, lists two sites of archaeological interest close to Shot Head (Table 5.3). These are located landward and immediately north of the licence area.

Table 5.3. Site and Monuments Record for the Townland of Roosk.

No.	Type	Townland	Eastings	Northings
C0117-010	Children's burial ground	Roosk	484838	84863
C0117-012	Bullaun stone	Roosk	485923	85948

The National Museum of Ireland Topographical File, which contains an archive of previous archaeological excavations and records of artifacts recovered, returns no records for the area adjacent to the proposed fish farm.

Bantry Bay does have a rich maritime history and documented historical ship losses have occurred in the Bay. The inventory of wrecks lists 39 vessels as being lost within or around the Bay, with a further 93 locations indicated as sites where wreckage may be present. There are no recorded wreck sites or sites of possible wreckage within or adjacent to the proposed development site. The most notable and best-preserved wreck in the Bay is the French frigate *La Surevillante* which was lost in 1797 and lies approximately 8.6 km from the eastern margin of the licence area.

A geo-archaeological survey undertaken on behalf of the Applicant revealed the remains of a deserted village close to the shore at Mehal Head, over 300 m east of the licence area.

6.0 Section 61 Assessment

Section 61 of the Fisheries Amendment Act 1997

This Act states that:

"*The licensing authority, in considering an application for an aquaculture licence or an appeal against a decision on an application for a licence or a revocation or amendment of a licence, shall take account, as may be appropriate in the circumstances of the particular case, of:*
(a) the suitability of the place or waters at or in which the aquaculture is or is proposed to be carried on for the activity in question;
(b) other beneficial uses, existing or potential, of the place or waters concerned;
(c) the particular statutory status, if any, (including the pro-visions of any development plan, within the meaning of the Local Government (Planning and Development) Act, 1963 as amended) of the place or waters;
(d) the likely effects of the proposed aquaculture, revocation or amendment on the economy of the area in which the aquaculture is or is proposed to be carried on;
(e) the likely ecological effects of the aquaculture or proposed aquaculture on wild fisheries, natural habitats and flora and fauna, and
(f) the effect or likely effect on the environment generally in the vicinity of the place or water on or in which that aqua-culture is or is proposed to be carried on-

(i) on the foreshore, or

(ii) at any other place, if there is or would be no discharge of trade or sewage effluent within the meaning of, and requiring a licence under section 4 of the Local Government (Water Pollution) Act, 1977, and

(g) the effect or likely effect on the man-made environment of heritage value in the vicinity of the place or waters."

6.1 Site Suitability

The proposed licence area is considered a suitable location for the proposed salmon farm for the following reasons:

1. The hydrological characteristics of the location provide for a safe and suitable depth profile (a projected 30-40 m beneath the cages) for the proposed cage arrangement and design.

2. Comprehensive modelling data indicate that the site is hydrologically isolated from adjacent main rivers and other fish farms in terms of current flows on which farm discharges and lice plumes may be carried.

3. The proposed site does not fall within any areas designated for nature conservation (see Section 4.4.1), being approximately 5.0 km from the nearest SAC, 10.6 km from the nearest SPA and 0.9 km from the nearest NHA. All of

these sites are designated exclusively for terrestrial features of interest (habitats and species). The marine setting of the farm structure, with no anticipated associated shoreward infrastructure activity at the site itself, effectively isolates it from these areas, presenting no impact to them. The closest conservation sites with marine species interests are the Glengarriff Harbour and Woodland SAC (9.4 km away), designated for harbour seal and otter and the Beara Peninsula SPA (11.5 km away), designated for Fulmar. While it is possible that the species concerned may visit Shot Head, it is highly unlikely that the operation of the fish farm will have any impact on populations of these species regardless of whether they are resident within or outside the designated areas.

4. The sea area and land overlooking the site carries no significance for tourism and recreational uses. The site is not visible from the R572 road, which constitutes part of the Wild Atlantic Way, due to the rising terrestrial topography and the steeply shelving shoreline to the west and high cliff to the east. There are no sign-posted sites of interest along the shores that overlooks the site and there is evidence of only occasional recreation walker usage within sight of the licence area.

5. The results from benthic surveys undertaken within the licence area indicate the seabed is largely sedimentary with a small area of low-lying rocky reef. Both the epi- and infaunal communities are typical for the north-east Atlantic and are probably widespread in Bantry Bay itself. There was a possible single observation of the sea squirt *Phallusia mammillata*, which is thought to be only present in Bantry Bay, but this species is known to achieve very high densities at other locations in the Bay. The deposition of settleable discharges from the proposed fish farm is expected to degrade the seabed communities immediately beneath the cages, but given their unremarkable nature, this will represent a small loss that will not have a significant impact on the benthic ecology of Bantry Bay as a whole.

6. There are a maximum of five domestic dwellings from which the licence area may be visible. These are all located on properties elevated and set back from the clifftop on the north-eastern corner of the licence area and it is likely that only two or three will have partial sight of the mooring buoys, with perhaps only one property having a restricted view of the fish cages. In this respect visual impact will be minor.

7. The proposed licence site is situated close to the northern coastline of the Bantry Bay and the seaward boundary extends no more than 700 m from the shore. This leaves over 4 km of navigable water between the seaward licence area boundary and the southern shore of the Bay. While the farm facility may require a minor deviation for small vessels steaming along the north shore, it will be appropriately marked with navigational buoys and lights and will not constitute a navigational

hazard. Overall, it will represent a negligible inconvenience to the majority of marine traffic.

There is, however, some unresolved concern over the potential presence of salmonid populations in the Dromagowlane River, the mouth of which is some 1.2 km north, but segregated from the licence area by the Shot Head peninsula, making the seaward travel distance of the order of 2.5 km. We believe that the proximity to a possible migration route to and from a salmonid containing river requires additional care when reviewing site suitability.

6.2 Other uses

We are unaware of the licence site and the adjacent shore and sea area having any unique or specific uses attributed to them.

We understand that small vessels may make use of the shelter that the shelving shore and cliffs provide along this section of coastline during strong northerly wind conditions and will therefore be required to deviate southwards to avoid the proposed fish farm installation, potentially incurring a minor addition to fuel costs and inconvenience.

Shot Head is a recognised shore angling site, although the exact favoured area is not known. We would anticipate, however, that the cage structures and mooring arrays would be beyond casting distance for shore anglers assuming that they were attempting to fish along the steep and almost inaccessible shore immediately northward of the licence area. We assume it is more likely that angling takes place on the Shot Head promontory to the west of the site which would be unaffected by the fish farm operation.

Although the site is not known to be utilised by commercial fishing vessels, a submission by the Marine Institute raised doubt over the density of *Nephrops* in the deeper muddy portion of the licence area, suggesting that this might constitute a possible commercially viable prawn ground. Further information has been sought, both from the Applicant and the Marine Institute as part of a Section 47 request and the outcome is discussed in Section 10.3 of this report.

6.3 Statutory Status

The proposed licence area currently falls under no particular or specific statutory status and there are no known instances where the establishment and operation of the fish farm would breach statutory restrictions, other than those specifically relating to aquaculture operations.

The site is to be marked with radar reflectors, winkie lights and navigational buoys as required by statutory requirements set out by the Commissioners for Irish Lights.

As previously stated, the licence application is in keeping with the stated aspirations of the Cork County Development Plans of 2014, specifically:

"*The Council recognises and will continue to support the sustainable development of the aquaculture industry in order to maximise its contribution to employment and the economic wellbeing of rural coastal communities and the economic wellbeing of the county. This plan also recognises the important role aquaculture can play in the diversification of rural areas*"

6.4 Economic effects

The primary tangible economic impact that the granting of the Shot Head licence would have in the area would be the generation of local employment, with an expected associated benefit to local traders, service providers and businesses. MHI indicate that over a four year operational period around five, increasing to eight people will be employed full-time maintaining the Shot Head operation (Table 6.1), which is projected to produce harvest values of €14,234,500 in year two and €15,088,040 in year four, with a profit margin expected to be 10% to 15% of gross turnover.

Table 6.1. Employment schedule for the proposed Shot Head facility

Year	No. employed
Year 1	5
Year 2	7
Year 3	8
Year 4	8

There are very few, if any, quantifiable adverse economic impacts, as there has been no identified revenue-generating activity associated with the licence area or the shore and sea area around it.

Farming on the land adjacent to the site will continue unhindered and, since the nearby coastline is not a sign-posted or favoured tourist destination and is not visible from tourist roads, it is not likely to impact on local income from tourism.

There is the possibility that a known shore angling site may become less attractive, while the moorings and slipway in the Trafrask embayment to the north of the Shot Head peninsula may conceivably receive fewer pleasure boating visitors, because their passage from- and to the Inner Bay will have to navigate past the cage structures.

There has been some suggestion that the presence of the farm site may force working vessels using the shelter of the south-facing cliffs during strong northerly winds to deviate to the south, thus incurring extra fuel costs. This, again, is not possible to quantify

and would seem to be an extremely minor burden on the broader maritime economy of the area.

6.5 Ecological Effects

The production of salmon at the Shot Head site will have a number of ecological impacts. Some impacts can be predicted with a high degree of certainty whilst others are difficult to predict.

6.5.1 *Natura* 2000 sites

The proposed site is not located within a *Natura* 2000 site or any other protected area recorded on the NPWS list of Protected Sites in Ireland (https://www.npws.ie/protected-sites and see Table 5.2). The closest adjacent sites are designated for terrestrial habitat and species interests and the fish farm will have no interaction with these elements and therefore there no anticipated impacts. A site at Glengarriff is designated for harbour seal and otter, but this is over 9 km away and will not be affected by the operation of a fish farm at Shot Head.

6.5.2 Marine mammals

Cetaceans are known to visit Banry Bay throughout the year, but it is widely accepted that the entire bay area holds no particular breeding or foraging significance for the seven species that have been recorded as regular visitors and no impact is expected.

Both grey and harbour seals are present in Bantry Bay, with the closest known haul-out sites from Shot Head for harbour seal at Garinish West and Orthon's Island, approximately 4.7 and 4.0 km distance, respectively (Roycroft *et al.*, 2007). Grey seal haul-out sites are restricted to the mouth of the Bay. All current aquaculture activity occurs away from these sites and to date has had no effect on seal numbers in Bantry Bay. The addition of a fish farm at Shot Head is not expected to cause any addition disturbance to seals and will therefore have no impact on Bantry Bay seal populations.

Otters have been recorded along the shoreline close to the licence area but as the marine activity of otters is generally confined to the shore and adjacent shallow waters, the disturbance from the fish farm will be insignificant.

6.5.3 Birds

The proposed site is not within any designated conservation area with a bird interest and it is some distance away from established SPAs (see Table 5.2, Section 5). Fish farms are intrinsically attractive to some seabird species, in particular cormorant. Anti-predation measures, such as protective netting, have occasionally led to entanglement and death of individual seabirds on existing sites in the Bay. For sea bird species that may visit the

site, these incidents are expected to be infrequent and will thus have an insignificant effect on their populations.

6.5.4 Benthos

The seabed habitats and species recorded within the licence area were broadly unremarkable and reflect the range of substrates present. The observed marine communities constitute commonly-recorded species at a normal abundance and diversity for north-east Atlantic temperate waters. The epibenthos was sparse and restricted to a small number of taxa, while the infauna was diverse and indicative of unpolluted and undisturbed conditions.

The presence of the sea squirt *Phallusia mammillata* was tentatively recorded within the licence area. The Irish occurrence of this species is restricted to Bantry Bay, but it is known to be common and widespread throughout the Bay, achieving high densities elsewhere and is consequently not expected to be significantly impacted.

Maerl beds are found in the Bay with the closest known occurrence being an unconfirmed bed off Gerahies, some 5.3 km to the south-east of the licence area. All maerl bed records are well beyond the distance over which deposition or other seabed disturbance from the proposed fish farm would be expected to exert an impact, therefore this habitat is not considered to be at risk.

Species of economic importance including Dublin Bay prawn, (*Nephrops norvegicus*), shrimp (*Palaemon serratus* and *Crangon crangon*), and scallop (*Pecten maximus*) are present throughout Bantry Bay. These species were either not recorded in the benthic survey or were present in low numbers, possibly with the exception of *N. norvegicus*. We note that the EIS states that the number of burrows found for this the species during their benthic survey indicated that they were unlikely to be present in commercially exploitable numbers. In a subsequent submission, however, the Marine Institute suggest these numbers may have been underestimated.

Discharges of settleable solids, combined with predicted low residual water movement (RPS, 2015) will significantly impact the benthic habitats directly beneath the fish cages and most of the sessile epifauna is expected to be lost. The infaunal communities will be substantially degraded and are likely to be dominated by more pollution tolerant species. In addition, the sporadic use of Slice® for dietary treatment of sea lice may temporarily exceed the EQS and thus may lead to transitory effects on benthic crustaceans, such as crabs and lobsters. These impacts are, however, expected to be confined to within the licence area and no effects are anticipated on benthic habitats and species in the rest of the Bay.

6.5.5 Fin fish

Both Atlantic salmon (*Salmo salar*) and Brown/Sea trout (*Salmo trutta*) are at risk of impacts from sea lice and escapes of farmed fish from the Shot Head site. The ecological effects of these possible impacts are however very difficult to predict with any certainty.

Escaped farmed salmon can impact on wild salmonid populations *via* resource competition in the riverine environment and through interbreeding and subsequent genetic dilution of native traits, resulting in reduced fitness. Escapee salmon may also transfer diseases and parasites, although evidence for this limited. The impact of escapee fish would be at its greatest following large episodic escapes from the proposed site and this should be considered as a potential impact. Trickle escapes involving low numbers of farmed salmon are not expected to impact significantly on wild salmonids.

Typically, open cage salmon farms are a reservoir of sea lice, which may impact wild salmonid populations, particularly sea trout. To avoid transfer to wild fish, salmon farm installations should be situated at an adequate downstream distance from salmonid rivers. In addition, sea lice should be more strictly controlled during the spring period when wild salmonids commence their migrations into open sea. As sea trout are likely to remain resident in Bantry Bay throughout the year they are particularly susceptible to infections, as they remain under constant threat from sea lice originating from fish farms. Sea lice have, however, been generally well controlled in Bantry Bay since 2008 and hydrological modelling shows good separation between all farm sites and the main rivers in the Bay. On this basis, it is expected that sea lice effects on wild salmonids will be limited.

There is a question, however, over the small Dromagowlane River, which is in close proximity to the site. Sea lice from the Shot Head site have the potential to impact any salmonids that are associated with this river. The presence of salmon in this river has been confirmed and the implications are considered further in Section 10.3 of this report.

The ecological effect on finfish other than salmonids within the Bay is expected to be insignificant. In context of the wider bay, the loss of feeding ground arising from the deposition of settleable solids will be negligible. Nutrient releases will not breech EQS and therefore no impact by harmful algal blooms (HABs) is expected on the fin fish population of Bantry Bay. Residues of discharged pesticides such as emamectin benzoate (EmBz), is not expected to have any effect on demersal or pelagic fish in present in Bantry Bay. Similarly, a slight increase in biological oxygen demand (BOD) within the boundaries of the site will have no impact.

6.6 General Environmental Effects

The establishment of a fish farm at Shot Head will result in a number of changes to the seabed environment and water column adjacent to the site. These impacts arise from organic farm discharges comprising faecal material and uneaten waste feed, an unavoidable consequence of farmed fish in open cage systems. The production cycle of

salmonid culture also typically requires the sporadic use and discharge of pesticides for disease control purposes, notably Slice®.

Nutrients

Nitrogen and phosphorus are the principal limiting nutrients for marine primary producers (i.e. phytoplankton) and will be discharged from the proposed fish farm site resulting in waterborne increases of these nutrients within and close to the licence area. Ambient levels of nitrogen and phosphorous reach a natural maximum in January of around 125 µg/l and 23.4 µg/l, respectively. Increases in nitrogen and phosphorous during the spring period results in a natural increase in the growth rates of phytoplankton.

Worst-case scenario hydrological modelling based on a Mean Allowable Biomass (MAB) of 2800 tonnes (RPS, 2015) suggests nitrogen and phosphorous levels within the site boundary will increase to 165 µg/l and 43.4 µg/l respectively. These nutrient increases will be expected to lead to enhanced phytoplankton growth within the site boundary. However, as these nutrient increases are predicted to remain below the Environmental Quality Standard (EQS) for nitrogen (170µg/l), any rise in primary production within the site is not expected to incur significant environmental effects. In coastal waters, it is nitrogen, rather than phosphorous, that limits primary production, consequently an EQS for phosphorous is not applied.

Organic settleable solids and biological oxygen demand (BOD)

Organic settleable solids are discharged from open cage farm systems. The effects are twofold: 1) an ecological and physical impact on the seabed arising from settling waste feed and faecal material and, 2) changes to oxygen saturation of the water column resulting from an increased BOD.

A maximum annual organic settleable solids accumulation of 13 mm per annum is predicted to occur directly under the cages, according to hydrological modelling (RPS, 2015). The resulting accumulation of organic matter will smother the seabed and induce anoxic conditions in the substrate of the affected area. The extent of seabed impacts and effects on the benthos are discussed in Section 6.5.

As a result of the assimilation of suspended organic particulate matter in the water column, the ambient oxygen concentration of 8 – 10 mg/l is predicted to decrease slightly due to an increased BOD. Hydrological modelling (RPS, 2015) predicts the BOD to remain below 2 mg/l within the boundaries of the site. This is considered to be below levels expected to result in significant ecological effects.

Pesticides and other chemotheraputants

The periodic use of chemotheraputants for the control of sea lice during the culture of salmonids will result in elevated levels of toxic contaminants in the licence area. To

counteract issues with chemotheraputant resistance and to maximise treatment efficacy, a battery of dietary or waterborne compounds are employed for the control of sea lice. Waterborne treatments include hydrogen peroxide and the pesticide deltamethrin (Alphamax®). Both of these treatments are used within the confines of a well boat. After use, the treatment seawater containing the chemotheraputants is discharged at a location remote from the site of application to avoid local contamination. Emamectin benzoate (EmBz) (Slice®) is a dietary treatment, typically used over seven consecutive days. EmBz is discharged into the surrounding environment *via* waste feed and feacal material, where it enters both the water column and the sediment, where it is then assimilated by biota or adsorbed to sedimentary particles. The EQS for EmBz in the water column is 0.22 ng/l measured within a distance of 100 meters from the cage site 24 hours post treatment. The use of EmBz is expected to be minimal, but during its use hydrological analysis (RPS, 2015) indicates that the residual current flow velocity at Shot Head is low, which may cause EmBz levels to breach the EQS within the specified 24 hours post treatment period. This will be a temporary exceedance with the concentration declining to below the EQS threshold 36 hours after treatment as the chemical is quickly dispersed beyond the site boundary.

6.7 Effect on man-made heritage

The proposed aquaculture site will not significantly impact on known man-made heritage, either terrestrial or marine, in the area.

6.8 Section 61 Assessment Conclusions

Site Suitability

The site under appeal *is* considered to be suitable for the intended purpose for the following reasons:

1. The proposed fish farm is not within a designated conservation area and will have no impact on adjacent *Natura* 2000 sites and their qualifying interests.
2. On the basis of modern modelling techniques, the site is hydrologically isolated from adjacent main rivers and other fish farms and will therefore present low sea lice infestation and pollution risk.
3. The site bathymetry and water exchange regime is favourable for anchored cages and is therefore suitable for salmonid culture.
4. The proposed fish farm is not close to any national monuments and will have no impact on any marine archaeological sites.
5. The location of the site below a cliff and seaward of raised land will completely obscure the farm from established tourist routes.
6. The farm site is not within sight of an established public footpath and the use of the adjacent land by recreational visitors is infrequent.
7. The proposed fish farm is likely to be only partially visible to only one or two domestic dwellings.

8. There are unremarkable and locally common benthic communities within the expected footprint of the site, with no concerns for rare or vulnerable species.
9. The site will pose no navigational issues for seagoing vessels in Bantry Bay, beyond the placing of navigational buoys.
10. The site is serviceable from an existing shore base, requiring only occasional access from existing local facilities.

The site under appeal may not be considered to be suitable for the intended purpose for the following reasons, and further clarification has been sought under Section 47 (see Section 10.3 of this report) in relation to these matters.

1. The location of the proposed farm site is exposed to prevailing winds with a considerable fetch and there are associated concerns in respect of cage durability and safety in the event of an incident.
2. Marine Institute information suggests that a potentially commercially harvestable population of *Nephrops may* be present within the licence area.
3. The installation of fish cages may lead to the partial loss of a recognised shore angling site.
4. The fish cages will have a minor negative visual and navigational impact to recreational boat users entering and leaving the Trafrask embayment and others transiting close to the northern coastline of Bantry Bay.
5. The mouth of the small Dromagowlane River lies 1.2 km to the north, with a sea travel distance of approximately 2.5 km and has been confirmed as supporting breeding salmonid populations.
6. The Dromagowlane/Trafrask River system may support a freshwater pearl mussel population, which could be at risk of collapse if the viability of their primary salmonid dispersal hosts is threatened.
7. The locally low residual water current will lead to a retention and slow dispersal of pesticide treatments, causing a breach of the EQS for EmBz (at a stock biomass achieved in month seven), a key treatment for sea lice.

Note, however, that items 1, 2, 3 and 4 in the light of further consideration, including under Section 47, were subsequently assessed as either of minor concern, or, in the case of the cage specification issue, beyond the remit of this report.

Other Uses

The proposed development has a significant/non-significant adverse/ positive impact on the possible other uses or users of the area for the following reasons:

1. Deposition from the proposed fish farm is likely to have a significant adverse impact on part of a potentially exploitable prawn (*Nephrops*) ground.
2. The fish farm cages will present a non-significant adverse visual and navigational impact on pleasure craft navigating the northern shore of Inner Bantry Bay.

3. The installation of the farm *may* have a non-significant adverse impact on the availability of a single local angling site.

Statutory Status

There are no known impacts on the statutory status of the area.

Economic effects

There is a significant / non-significant positive/adverse effect on the economy of the area for the following reasons:

1. The proposed fish farm will have a significant positive effect through the provision of local employment (between five and eight jobs over four years).
2. The presence of a fish farm at Shot Head *may* have a non-significant adverse impact on pleasure boat activity in the immediate vicinity, with a resulting effect on the use of slipway and mooring facilities in the Trafrask embayment.
3. The location of the fish farm will force small working vessels to deviate southwards when attempting to use the northern shoreline for shelter from high wind which may incur a non-significant impact to fuel costs.

Ecological Effects

There is (or could be) a significant/non-significant positive/adverse effect on the natural habitats, wild fisheries and fauna and flora of the area as a result of the proposed operation for the following reasons:

1. There will be a significant, but localised, adverse impact on the benthic community, including shellfish such as *N. norvegicus*, beneath the proposed fish cages.
2. There will be a non-significant adverse impact on wild salmonid populations due to the increase in farmed salmon stock promoting an increase in sea lice in the Bay.
3. There could be a significant adverse impact on salmonids associated with the Dromagowlane River.
4. There could be a significant adverse impact on freshwater pearl mussel populations associated with the Dromagowlane River.
5. There will be periodic non-significant and transitory adverse effects on the water column habitat communities close to the farm site during the use of Slice®.

General Environmental Effects

There will be no general environmental effects from the proposed fish farm beyond the localised impacts of deposition of organic material and the transitory effects of discharges after pesticide treatments.

Man-made Heritage

There will be no impact on sites of historical or archaeological interest, either marine or terrestrial, in the area.

6.9 Confirmation re Section 50 Notices

There are no pertinent matters which arise in the Section 61 assessment which the Board ought to take into account which have not been raised in the appeal documents and it is not necessary to give notice in writing to any parties in accordance with section 50 (2) of the 1997 Act.

7.0 Screening for Environmental Impact Assessment

An *ad hoc* pre-screening assessment was carried out according to various documents in the Ministerial file. As stated in the Ministerial file this project is an Annex II project, i.e. the granting of a licence for the proposed fish farm would initially qualify under Annex II-1(f) of Council Directive 2014/52/EU. As outlined in S.I. 468 of 2012:

"*3. (1) The Board shall, as part of its consideration of an appeal, in accordance with paragraph (2), ensure that before a decision is made aquaculture likely to have significant effects on the environment by virtue, inter alia, of its nature, size or location is subject to an environmental impact assessment.*

(2) An environmental impact assessment shall be carried out by the Board in respect of an appeal of-

> *(a) aquaculture of a class specified in Regulation 5(1)(i) and (ii) of the Application Regulations, or*
>
> *(b) aquaculture of a class specified in Annex II of the Council Directive which the Board determines would be likely to have significant effects on the environment.*"

The Technical Advisor is of the view that the proposed aquaculture will not have significant effects on the environment by virtue of *inter alia*, its nature, size of location. As a result it should not be subject to an environmental impact assessment in accordance with S.I. 468 of 2012.

8.0 Screening for Appropriate Assessment

Screening was undertaken and a detailed evaluation of *Natura* interests was set out in the EIA document and is further considered in separate environmental impact assessment submissions by DAFM and the Marine Institute. The proposed aquaculture site does not fall within a *Natura* 2000 site and all supporting scientific knowledge indicates that the proposed fish farm is highly unlikely to have any deleterious effect, either individually, or

in combination with other plans or projects, on the qualifying features of any of the designated sites within Bantry Bay or the surrounding area. See Section 5.4 for a detailed evaluation of the adjacent statutory nature conservation interests.

9.0 Technical Advisor's Evaluation of the Substantive Issues in Respect of Appeal and Submissions/Observations Received

A detailed evaluation of the substantive appeals and submissions has been undertaken, with each categorised within one of fifteen issues of concern. The issues raised by the Appellants are collectively considered in the following sections.

9.1 Increased threat to wild salmon and sea trout from sea lice

Sea lice present potential impacts to both inshore open-caged farmed salmon and wild salmonid populations. Any potential risks from sea lice are relevant to both the proposed Shot Head site and wild salmonid populations in Bantry Bay and its catchment. Accordingly, the impacts and risks associated with sea lice were assessed in Section 5 of the EIS and Section 20 of the EIA. Lice control is typically necessary on any salmon farm for optimal production and stock health. This also ensures fish value and profits are not compromised by problems associated with lice infestation. As with any salmon farm operation of this type, the maintenance of high concentrations of fish in static cages holds the potential to act as a reservoir for lice that could infect wild salmonid populations. Conversely, wild salmonid populations may constitute a source of lice infection for farm outbreaks as a consequence of the exposure of the relatively large cage area to planktonic lice plumes. Dietary or waterborne anti-lice treatments and, where relevant, coordinated area management schemes may be used to mitigate the potential impacts of sea lice on both farmed and wild salmonids.

The case for farm derived sea lice impacts on wild salmonids

The potential impact of sea lice originating from salmon farms and infecting wild salmonid populations continues to be a highly controversial issue, with opposing views dividing those with either conservation or aquaculture industry interests. As outlined in the EIS (Section 5.2) the decline of wild salmon (*Salmo salar*) and sea trout (*Salmo trutta*) populations since the 1980s in European waters has often been blamed on the impacts of lice released from salmon farms. The cause of salmonid declines is, however, known to be multifactorial, with overfishing and degradation of habitat quality reported to be implicated. There have been several studies examining the effects of sea lice on wild salmonid populations and the associated risks posed by infections from lice on sea farms. The detailed mechanisms underlying sea lice interactions between open cage salmon farms and wild salmonids are far from clear, being largely hampered by limitations in the ability to apply robust scientific methodology to the problem. Consequently, further studies in this area are urgently required. Without a clearly-defined association between the presence of salmon farms and a damaging localised sea lice

infection event in wild populations, any assessment of sea lice risks must draw on data from all studies, including those undertaken in areas outside of Irish waters.

Sea lice biology

Sea lice have the capability to infect wild salmon and sea trout from open caged farmed salmon and *vice versa*. Two species of sea lice, *Caligus elongatus* and *Lepeophtheirus salmonis,* are naturally occurring parasites of both wild and farmed salmonid species. *C. elongatus* is a marine parasite of several marine fish species. The more euryhaline *L. salmonis* is a specific parasite of salmonids in brackish (25 ppt) to fully saline water (35 ppt) and presents the greatest risks and impacts to both farmed and wild salmon. Before encountering and attaching to their host, both lice species are planktonic, drifting with water currents. On attachment, infestation of individual fish may result in stress, physical damage of skin tissues, osmoregulatory challenge, reduced growth and condition factor, reduced disease resistance, and eventually death.

The first phases of the life cycle are the non-feeding and non-infective planktonic nauplius stages. Nauplius hatch from paired egg strings from gravid females which are released into the water column. Following the nauplius stages, larvae develop into the copepodid stages, which remain planktonic and non-feeding. Copepodid stages are infective but possess limited yolk supplies and thus must quickly find a host fish to survive. In Irish spring water temperatures, this phase is typically around 10 days' duration. Once copepodid lice attach to their host fish, they moult to the chalimus phase. Lice at chalimus stage are sessile remaining attached to the host fish. In the chalimus stage, feeding is restricted to the host skin around the point of attachment. This phase is followed by immature preadult phases and subsequent adult phases. Preadults and adults are mobile on their host fish and if detached can swim for short periods providing the possibility of infecting other fish.

Attached lice use rasping mouthparts to feed on host mucus, skin and underlying tissue including blood. Planktonic stages may last 1−2 months and infective stages are dispersed by drifting in water currents. Depending on the speed of local water currents, lice may drift tens of kilometres (Finstad. *et al*., 2011). Development rates are temperature-dependent and salmon lice can still develop into the infectious copepodid stage during colder winter months. While salmon lice are generally absent from sites of low salinity, the various life stages have differing salinity tolerances, which vary with water temperature. In laboratory tests at 12°C, copepodids do not develop at salinities lower than 30 ppt. Copepodids transferred to low salinity water, survive for less than 1 day in waters of salinity 10 ppt or less and between 2 – 8 days at salinities of 15−30 ppt.

Sea lice risk to wild salmonids

With increased infectivity and pathogenicity, *L. salmonis* is the more problematic of the two species, and capable of causing mortality in both wild and farmed salmonids. Sea louse infection of wild populations largely occurs in spring during the period in which

salmon and trout smolts migrate out to sea. In contrast to wild Atlantic salmon, which migrate to the open ocean, wild sea trout largely remain residents of sea lochs and estuaries and are consequently more exposed to sea lice infection (Thorstad *et al.*, 2015).

Mitigation measures

To mitigate against sea lice infestation of both farmed fish and wild fish, control measures involve targeted veterinary treatment regimens based on statutory lice monitoring, which may, if required, be controlled under coordinated bay management schemes, such as coordinated Local Management Schemes (CLAMS). CLAMS group salmon farm sites into those within overlapping tidal excursions. On this basis, Bantry Bay constitutes a 'Single Bay Area' containing the proposed Shot Head site, the MHI Roancarrig site and the Gearhies site operated by Fastnet Irish Seafood (see EIS Section 4.6. and Figure 79). To reduce the potential of lice infection from open cage salmon farms to wild salmonids, farms are best placed downstream (seaward) of salmon river estuaries and outflows.

Modern production strategies which reduce the risks associated with sea lice involve:

- the separation of generations on a single site;
- a minimum of one month's fallowing between cycles;
- early harvest of two sea-winter fish;
- mandatory lice monitoring, and
- where necessary, co-ordinated treatment based on lice trigger number levels.

The 'year-round' trigger level is two ovigerous lice per fish, which drops to 0.3 to 0.5 ovigerous lice per fish during the sensitive smolt migration through the months of March to May (DAFM, 2008).

Both waterborne and dietary veterinary treatments options are available for the control of lice. The frequency of treatments may be stipulated and restricted by the organic association under which MHI operate. The principal objective in lice treatment is to avoid the development of ovigerous female lice, since it is the hatching of nauplius I larvae from ovigerous females that eventually causes the outbreak of infestation events, both within and outwith a farm. A reduction in the numbers of ovigerous females can be achieved by killing lice at any stage of their development once they have settled onto host fish.

A rotation of treatments can minimise the risk associated with increasing resistance issues and the use of hydrogen peroxide is key in this strategy. Dietary treatments have an advantage in offering protection against lice for several days, as opposed to waterborne treatments that only act at the time of administration. The dietary treatment Slice® is based on the active ingredient Emamectin Benzoate (EMBz). Feed medicated with Slice® is typically supplied *via* the feed manufacturer and, depending on temperature, protects fish against lice for up to ten weeks. Hydrological analyses submitted by MHI (RPS,

2015) indicates that due to the low residual current velocity, the use of Slice® at standard concentrations may not be suitable for the Shot Site, as it may breech the 24 hour EQS of 0.22 ng/l waterborne EmBz within 100 m of the site (RPS, 2015) at a post-year 1 stock biomass.

Waterborne bath treatments include Alphamax® and Hydrogen Peroxide which are currently administered within the confines of well boats. The insecticide Alphamax® is based on the synthetic active ingredient pyrethroid deltamethrin. Hydrogen peroxide is a powerful oxidising agent which kills pre-adult and adult lice.

Vulnerability of wild salmonid populations in Bantry Bay

The Bantry Bay catchment contains salmonid populations that have exhibited similar declines to those observed in other European populations. The EIS describes the salmon rivers in proximity to the proposed Shot Head site that drain into Bantry Bay (Section 5.2.2. page 237). The Shot Head site is approximately 15 km downstream (in terms of residual current direction) of the Coomhola, Owvane, Glengarriff and Meelagh salmon rivers. The Adrigole river mouth lies 6-7 km upstream (seaward, towards the outer bay) from the proposed site. Although previously closed in 2006-7 due to low catch numbers, we note that, despite the presence of three fish farms in the bay, angling on Bantry Bay rivers was re-opened in 2011, operating on a catch and release basis.

The Dromagowlane River, referred to by Appellants, is situated upstream from the proposed site and was omitted from the EIS (Section 5.2.2. page 237) and not considered in the EIA (Section 20). This river is in relatively close proximity to the Shot Head site (approximately 2.5 km to the north). Salmonids have been confirmed as present in this small waterway (see Section 10.3) and its small size, and probable low availability of suitable redds for reproduction, would suggest that any salmonid population in this stream will be small presenting a minor infective risk in terms of lice to farmed fish. Conversely, it is recognised that any risk to this population from lice originating from the Shot Head site would impact a very small proportion of the salmonid population in Bantry Bay, but must nonetheless be taken under consideration as a possible adverse impact.

Assessment of the risk of lice transfer to wild salmonids in Bantry Bay

The additional hydrological modelling undertaken by RPS, together with the original hydrological survey results presented in the EIS, provide data on which the potential for sea lice transfer from the Shot Head site to nearby salmonid rivers may be assessed. The distance and directionality of larval salmon lice transport from their release source depend upon multiple variables, including their development rate, water temperature, currents and wind-driven circulation. The EIS hydrological survey describes a westerly (moving out of the Bay) water current at the Shot Head site of a velocity of at least 1.5 to 2.5 cm sec^{-1}, the equivalent of approximately 2 km per day (Section 2.3.2, page 58). The EIS (Section 2.3.2, page 58) states:

"*These data suggest that there can be considerable water movement to aid the dispersion and dilution of solutes from the Shot Head site.*"

These residual water flows measured at the Shot Head site (interpreted with the caveat that the data represent a snap-shot in time) would be expected to disperse planktonic sea lice larvae similar distances. Lice are capable of surviving approximately 10 days in spring temperatures. However, when taking the decreasing survival of non-feeding planktonic lice stages over this period into consideration, the numbers of infective copepodids lice that may reach the area around the Adrigole River mouth – approximately 6 km from the proposed Shot site – are expected to be relatively small and similar to background numbers present in the Bay. Higher numbers of infective lice may be expected to reach the Dromagowlane River 2.5 km away and have the potential to be a source of infection to any salmonids that may be present in this waterway. These findings are similar to the findings of the RPS hydrological modelling (based on a 14-day survival and assuming a release of 1 louse per fish) (RPS, 2015), which shows adequate hydrological distance between all sites and significant salmonid rivers in Bantry Bay.

The rate and direction of lice dispersal is specific to the hydrological conditions of the farm area, which must be considered when interpreting scientific studies across a wide variety of hydrological conditions. The consensus from the scientific literature is that lice may be dispersed up to 30 km (Salama *et al.* 2013), which coincides with an increased lice number on wild sea trout within 30 km of fish farm sites (Thorstad *et al.* 2015). Whilst these studies are informative on the potential range of lice dispersal, the hydrological conditions of Bantry Bay are characterised by relatively low residual currents (RPS, 2015) and will differ from the conditions of other regions. Based on available data relevant to Bantry Bay, we conclude that the positioning of the proposed Shot Head site presents a low risk of transfer of farm borne lice to the overwhelming majority of wild populations in the Bantry Bay catchment, but does present a risk to a population in the Dromagowlane River.

Evidence for the impact of salmon farms on wild populations via *sea lice*

The EIA assessment for the risks from farm-derived sea lice on wild populations (EIA section 20) presented evidence from one study by Jackson *et al.* (2013), which demonstrated a lack of effect of sea lice on wild salmonid populations in Ireland. Since its publication, the analytical methods used by Jackson *et al*. (2013) have been questioned. A re-analysis of these data has since, however, been undertaken, with the results suggesting that there may indeed be a potential risk from lice infection of fish farms on wild salmonid populations (Krkosek *et al.*, 2013). Numerous other studies have been conducted by the international scientific community, assessing multiple locations where salmon farms have been operating. Several literature reviews have examined the evidence relating to the risks that farmed sea lice pose to wild salmonid populations (Thorstad *et al.* 2015, Gargan *et al.* 2012, Torrissen *et al.*, 2013). We acknowledge that the wider body of scientific literature may not have been fully considered when

undertaking the assessment of the potential impact of the Shot Head site on wild salmon populations in Bantry Bay. We reiterate, however, that local hydrographical conditions are key to understanding the specific risks to any particular water body.

Of particular importance is the current situation, where monitoring indicates that sea lice levels do not currently present a significant problem in the production of fish in south-west Ireland, including Bantry Bay. Lice have proven problematic in other European waters, but Bantry Bay has experienced few issues since 2008. It is, however important to note that in 2006 and 2007, lice frequently exceeded trigger levels (DAFM, 2008), providing some scope for believing that a latent lice problem may yet remain in Bantry Bay. Nonetheless, since 2008 there has been a low requirement for lice treatments in Bantry Bay. Slice® has only been used on three occasions (twice in 2008 and once in 2010 on the Roncarraig site) and lice have been consistently below trigger levels (including within the susceptible spring months) across Bantry Bay since 2008.

We suggest, however, that the effect of lice on the wild Bantry Bay salmonid population should also be considered alongside the potential impacts from the 2014 salmon escape in Bantry Bay (outlined in the following Section 9.2), because of the known relationship between escapee fish and the augmentation or enhancement of natural infections in wild stocks.

Cumulative impacts and production strategy

The cumulative impacts of the Shot Head site have not been specifically considered in the EIA or EIS. The addition of a farm site in Bantry Bay would be expected to increase the total number of lice present in Bantry Bay. Coordinated Local Area Managements Schemes (CLAMS) and Single Bay Management (SBM) are specifically aimed at improving lice management and treatment efficacy and are discussed in the EIA (Section 20).

MHI indicate (EIS Section 1.3) that the reasoning behind the extra site in Bantry Bay is to achieve annual harvesting by coordinated asynchronous stocking between Shot Head and Roancarrig sites (Section 3.2.1, page 148), stating:

"*Alternating site stocking, to include fallowing, requires at least two sites of similar size in each suitable bay. If the proposed Shot Head site is licensed, this is the strategy that MHI will use in Bantry Bay, in the first instance*".

MHI describes the benefits of both synchronous and asynchronous strategies in the EIS, and has chosen to pursue the asynchronous methodology. The EIS (Section 5.1, page 220 and Section 3.2.2. page 149) describes the advantages of CLAMS and SBM, and includes them as mitigation measures that will be undertaken (EIS section 7, page 285). Despite the advantages, the EIS observes that CLAMS has yet to be established in Bantry Bay (EIS Section 5.12, page 220). We note that asynchronous bay production is not in line with best practice advocated in CLAMS. CLAMS includes a strategic control of sea lice

infestations by the establishment of synchronised lice treatments within a single bay, and whole bay fallow periods to break lice cycles. DAFM guidance (DAFM, 2015) states:

"*Efforts should be intensified to revitalise the single bay management approach and make it central to national policy for sea lice management*"

Although the RPS modelling report predicts adequate hydrological distance between sites, an elevated loading of ambient lice in the Bay associated with the increased number of fish may be expected. With the two currently operating production sites, more rigorous single bay management measures may not be necessary at present. The incidence of future lice issues or disease outbreaks is, however, difficult to predict, but will almost certainly present greater management challenges. Future conditions in Bantry Bay may therefore benefit from the establishment of non-statutory CLAMS and the adoption of synchronised bay production and lice treatments. Indeed, the EIS recognises the benefit of synchronous bay production (EIS Section 3.2.2, page 149), stating:

"*An alternative strategy, known as Synchronous Stocking, is more in line with Single Bay Management, an aspiration adopted in Ireland some years ago. A similar strategy is used in Scotland, where Area Management Agreements have been established. The strategy requires cooperation between producers, where there is more than one producer in a bay. There are two producers in Bantry Bay (see Section 2.1.4). Synchronous Stocking has three main objectives:*

- *Fish of only one generation can be grown in one bay at any time.*
- *Producers share information on fish health status. Required veterinary treatments synchronised between producers if necessary.*
- *Stocking, harvesting and fallowing of all sites synchronised between producers, with the further option of Whole Bay Rotation, by which entire bays can be fallowed for extended periods, if needed*"

Lice control is assessed in the EIS (EIS Section 5, page 225). The EIA assessment is based on sea lice numbers from statutory monitoring of sea lice between 2008 and 2010 at the MHI Roancarrig site (EIA Section 20). This is a snapshot of a relatively short monitoring period, demonstrating that sea lice were well controlled and remained below trigger levels (EIS Section 5.1.2. page 225, table 27). The latest lice data (supplied to the Marine Institute) from statutory monitoring of the existing farm sites in Bantry Bay indicates that lice are still well managed, currently requiring few treatments. Since the publication of the EIA, treatment trigger levels have not been exceeded within the whole Bay, indicating a low infestation risk to, and from, farmed fish in Bantry Bay.

Although since 2008 a low historical incidence of lice is reported, one must avoid the dangers of complacency and consider the increase in fish production that the addition of the Shot site represents. The Gearhies site is licensed for an average production of 500 tonnes per annum (PA) over a two-year cycle (EIS Section 4.6, page 194) A much larger production is projected for the rotation programme between the MHI Roncarraig and

Shot Head sites, which together will produce an average of 3,500 tonnes PA (EIS Section 3.2, page 148) over the two-year cycles. The Roncarraig site and Gearhies sites currently produce a combined annual average of 2,250 tonnes in Bantry Bay. The addition of the Shot Head site will result in a combined average total annual production of 4,000 tonnes in Bantry Bay, a 43.75% increase in tonnage produced.

In conclusion, we acknowledge that the water quality modelling and hydrological surveys indicate that there is sufficient hydrographical distance between rivers, existing farm sites, and the proposed Shot Head site to prevent lice cross-infection. We also note that lice numbers in Bantry Bay have been within trigger levels since 2008, but had been problematic prior to then. This information suggests that the lice issue constitutes a manageable risk to both farmed and wild salmon within the Bantry Bay catchment. We would also, however, emphasise that although the best available modelling tools have been utilised for this analysis, it is important to recognise that this provides a *predicted* scenario based on a necessarily limited set of empirical variables (albeit at the "worst-case" end of the spectrum) which may or may not fully represent the full range of hydrological conditions present within the study area.

In addition, we are concerned that there has been a lack of recognition of the increase in relative scale of the salmon stock that will be maintained in Bantry Bay when the Shot Head site becomes operational. This significant increase in fish stock in Bantry Bay can only be expected to increase average lice numbers in the Bay and therefore the subsequent fish health risks associated with lice. In our view, this strengthens the case for considering the adoption of a CLAMS and Single Bay Management strategy, which would include the implementation of a synchronous *entire-bay* production regime.

9.2 Threat to wild salmon from escaped farm fish

Escaped farmed salmon constitute a number of potential risks to their wild counterparts. There is a substantial body of scientific literature and associated data on this subject, with conclusions ranging between neutral or negative effects for wild populations. The impacts of escaped farmed salmon can be significant where they achieve proportionally large numbers in comparison to the population size of wild conspecifics. Farmed escapee fish can compete with wild salmon for resources, may breed with wild counterparts resulting in reduced genetic fitness, and constitute a disease and parasite transfer risk. The prevention of escapes and approaches to reduce impacts are of fundamental importance to both the interests of the aquaculture industry and the conservation of declining wild salmonid stocks.

Incidents of fish escapes in Ireland

Open cage farming activities carry an inherent risk of fish escapes and the Irish salmon farming industry is no exception. Escapes from fish farms either occur from marine net pens as repeated "trickle" losses of relatively small numbers of fish, or as large-scale episodic events. The reporting of escapes from fish farms has been required by law in

Ireland since 1996 and records show that most losses from sea cages are due to large episodic events such as storm damage. Official statistics from Ireland indicate that approximately 415,000 salmon were reported to have escaped from salmon farms in coastal waters within the period 1996 to 2004, with an annual range of 0-160,000 fish (Walker *et al.*, 2006). Despite the requirement for statutory reporting, the number of escapes since 2004 does not appear to have been made publicly available. In February 2014 a notable escape of 230,000 salmon farmed fish occurred from the Grerahies salmon farm in Bantry Bay.

Distribution of escapee fish in the wild

The range of travel, dispersion and viability of escaped farmed salmon in the wild depends on the lifestage and time of the year at release. Salmon smolts tend to return to the area of release and enter nearby rivers for spawning. In contrast, salmon that escape as pre-adults appear to have a weak homing instinct and show a low propensity to return to the release area for spawning. Many escapee fish move with currents and will enter any convenient river when they are ready to spawn. Escaped salmon are often recorded within 500 km of the escape site, but have been recorded up to 2,000 to 4,500 km from the escape or release site.

Ecological competition between farmed escapees and wild conspecifics

Farmed salmon differ in both morphology and physical condition from wild salmon. The different traits of farmed salmon are likely to affect their behavior, competitive ability, and spawning success relative to wild salmon. Traits affecting the reproductive capacity of salmon are both genetic and environmental in origin, with those of wild salmon depending on natural selection arising from their environment, as opposed to those of farmed fish, which develop under selective breeding within a captive environment.

Escaped farmed salmon are now found on the Atlantic feeding grounds of wild salmon and consume similar food resources. It is unlikely that availability of food in the Atlantic Ocean limits Atlantic salmon production. Consequently, food competition between wild and escaped salmon in the open ocean is unlikely to have a significant impact on populations.

In fresh water riverine environments, escapee salmon can be present at spawning grounds during the mating period and may attain high numbers (Walker *et al*., 2006). Farmed escapees can spawn successfully in both native and non-native rivers, but due to their reduced genetic and environmental fitness, the spawning success of farmed salmon is lower than that of wild salmon. Following any successful breeding, the behavioral and life-history characteristics of farm salmon and ‘hybrid’ (the resulting progeny from wild fish breeding with an escapee) offspring will influence their performance and confer effects on native fish. In fresh water, the offspring of escapee salmon and hybrids can be expected to interact and compete directly with wild salmon for food, habitat and territories. In the freshwater environment, invasions of escaped farmed salmon are known

to have the capacity to impact negatively on the productivity of wild salmon populations through juvenile resource competition and competitive displacement (Thorstad *et al.,* 2008).

Genetic impacts of inter-breeding

The homing instinct of salmon to breed in geographically and ecologically distinct rivers drives adaptation to a particular aquatic locality. This promotes genetic isolation of wild Atlantic salmon populations with little genetic interaction between populations from different catchments. Farmed salmon production is largely based on a small number of breeding strains selected for traits advantageous to salmon production. This contrasts with the traits acquired in wild salmon, driven by natural selection in a particular river. Farmed strains are therefore genetically distinct from wild populations. Differences between wild and farmed salmon due to domestication and trait selection are likely to be exhibited in respect of growth rate, body size, survival, delayed maturity, stress tolerance, temperature tolerance, disease resistance, flesh quality, and egg production. As a result, unintentional correlated changes may occur for fitness-related traits including survival, deformity, spawning behavior and success, spawning time, morphology, fecundity and egg viability, aggression, risk-taking behavior, sea water adaptation and growth hormone production.

Hybridisation between farmed and wild salmon, and gene flow from farmed to wild salmon through backcrossing of hybrids in subsequent generations, can cause; 1) a change in the level of genetic variability, and 2) changes in the frequency and type of alleles present. The hybridisation of farmed with wild salmon therefore has the potential to alter the genetic integrity of native populations, thus reducing local adaptation and negatively affecting population viability and character. Several studies utilising molecular markers have shown that escaped farmed salmon which have bred in the wild have indeed changed the genetic composition of wild populations (see review by Thorstad.*et al.,* 2008). As continued salmon escapes occur, the genetic identity of wild stocks will become less distinguishable from that of farmed salmon. Consequently, a future difficulty may arise in genetically differentiating wild and farmed salmon.

Transfer of viral and bacterial of diseases

The nature of pathogen exchange between farmed and wild Atlantic salmon is complex. Many factors influence the life and survival of wild salmon, which creates a difficulty in accurately assessing disease transfer between farmed and wild salmon. Due to high host density, the farm environment may promote conditions for disease outbreaks more readily than for wild populations. The potential for transfer of pathogens between farmed and wild salmon is bidirectional. The risk of any disease transfer from wild to farmed salmon is currently uncertain (Johansen *et al.,* 2011). With current advances in vaccine development, farm practice, and regulation, fungal, bacterial and viral fish diseases are, for the most part, well managed in the farm environment. It therefore follows that the risk of transfer to wild fish is also expected to be low.

Assessment of fish escape and potential impacts to wild salmon in Bantry Bay: Risk of fish escape

A full disclosure of the latest fish escapes in Ireland was not included in the assessment for the potential of fish escapes, or supplied in any of the supporting documents for this licence application, but the EIA (Section 19.1) states:

"Given the small size of the salmon stocks in Bantry Bay rivers, and other areas along the possible migration or dispersal route of escaped farmed fish, mitigation of potential interactions with escaped farmed fish is essential".

Due to well established SOPs regarding fish transfer, net maintenance and site inspections (EIS Section 8.4.2, page 291) and the low fish numbers involved, the risk and impact of 'trickle' escapes from modern farms can be regarded as low or negligible. Recent data show escapes from day to day farming procedures are now an unusual occurrence. Major fish escapes are associated with net biting, predator interference, unknown causes of net holes, and storms (Jackson *et al*., 2014).

The proposed stocking levels for the Shot Head site are stated by MHI as maximum initial number of 836,000 smolts and maximum allowable biomass (MAB) of 2,800 tonnes at the peak production (Notice of Appeal, Conditions within Schedule 4 of licence reference T5/555A, page 48). A major escape event from a farm of this size would present a considerable risk to wild salmon population. Unlike 'trickle' escapes, the risk and impact of any large episodic escape is of considerable importance in the assessment of potential environmental impacts. This was demonstrated in a European context by the direct consequences of an escape event in Donegal Ireland, where it was found that an average of 7% of wild salmon had maternal parentage of farmed origin up to three years post escape (Thorstad *et al*., 2008). These data demonstrate the potential for interaction between farmed escapee fish and wild salmon following a significant escape event. This is particularly relevant to the 2014 Bantry Bay escape discussed in the following paragraph. As the escaped fish were unaccounted for, there is a significant possibility that the wild Bantry Bay populations may carry a genetic consequence of that escape event, which will now need to be taken into consideration.

The EIA acknowledged the recent fish escape in Bantry Bay in 2014 (EIA Section 19.1, page 44), observing:

"There was a fish loss at a salmon farm Bantry Bay in early 2014 due to extreme and prolonged storm conditions but it was not possible to establish any fish actually escaped as a result of this event"

This escape was confirmed by Minister Coveney, who stated that on 1st Feb 2014, 230,000 fish had escaped the Grerahies farm due to severe and prolonged storms. It is stressed that this was not a farm operated by MHI and the cage systems anticipated to be

installed under the current licence application are expected to be of a more modern and robust design. Reports indicate that 250,000 fish were present prior to the storm and 20,000 remained after the event. Almost two weeks later, on the 13th March 2014, no trace of any of the fish was found by divers or persons in the vicinity of the incident area. It is recognised that this incident comes at a particularly unfortunate time for the MHI Shot Head site application.

While we acknowledge that the cages involved in the 2014 Grerahies fish escape were of an older design than those proposed for the Shot Head site. The Shot Head site, being on the north shore of the Bay, is, however, more exposed to prevailing weather and waves than the Grerahies site, which is located on the more sheltered southerly side of the Bay.

It is our opinion that the EIA undervalues the knowledge to be gained from this escape, in particular with respect to the genetic and sea lice impacts it may have had on the wild salmon population of the Bantry Bay catchment. Unfortunately, the scale of the escape event was not disclosed in the EIA. This is of importance as it demonstrates the *possible* magnitude of fish escapes associated with open cage farming and the difficulty in recovering and accounting for escapee fish. To date, this escape event constitutes the largest in Ireland's history.

Contrary to the statement in the EIA, the escape of these fish is not in question. Some 230,000 fish were absent from the cages following the storm. What is unknown is the subsequent survival of the fish following the breach. No fish were found by divers or persons close to the site in the weeks that followed, which is unsurprising due to the difficulty of working at sea in stormy conditions. It is plausible that these fish may, for reasons unknown, have died close to the farm site after escape, but it is also equally possible that the escaped fish survived and remain at large in the open marine environment. This event demonstrates, 1) the clear potential risk of escapes in Bantry Bay due to storm damage, 2) the magnitude of escapes that are possible, 3) the difficulties associated with assessing the scale of the impact due to inclement weather conditions during prolonged periods of stormy weather, and 4) the difficulty in accounting for, or recovering, escapee fish.

The EIA states:

"Efficient monitoring in freshwater for escapees, following large-scale escape events, and effective mitigation measures (e.g. removal of escapees from freshwater, where possible and practical) will assist in the ongoing maintenance of the status of the local wild salmon stocks".

This is covered by SOP 25561, EIS Section 2 Appendix - Emergency plan for fish escapes (page 168). In reality, any attempt to recover escapee fish is likely to result in a very low level of success. It has been previously reported (Thorstad *et al*. 2008) that less than 3% of escaped salmon have been recaptured through organised fishing after large escape episodes. Depending on age, farmed salmon, particularly older fish, may be

identified morphometrically and recovered through freshwater angling. However, this is labour intensive and recoverable numbers may be very low in comparison to total escape numbers (Thorstad *et al*. 2008).

Threat of escape resulting from seal predation

Bantry Bay contains several seal haul-out sites, including the largest haul-out location for common seals in south-west Ireland at Glengarriff Harbour (EIS Vol. 1, Section 2.1.2, page 32), which is approximately 9 km from the site. Frequent visits from seals may be expected to occur at the Shot Head site. However, seal predation on a farm is not necessarily related to haul-out site proximity (Northridge *et al* 2013). Seals pose a particular risk with regard to escapes, as predator interference and associated net biting, resulting in a net breach, make up 47% of reported escapes (Jackson *et al.*, 2015, Northridge *et al.*, 2013). In the EIA (Vol. 1, Section 3.3.2, page 152), it is stated that seal nets or seal scarers may be employed if required. From the EIS it is difficult to determine the anticipated or predicted risk of nuisance from seals and the effectiveness and impact of seal control by anti-predator nets, seal scarers, or licensed shooting of seals. Anti-predator nets are not commonly used in European farms because of several recognised disadvantages, including reduced water flow and impacts on marine life, particularly bird entanglement (Northridge *et al* 2013). Due to the ever-present risk of fish escapes, it would be prudent to establish whether this is an issue of concern facing existing operations in the area, and, if so, whether current measures are considered effective. Accordingly, a statement on the current impact of seals at the Roncarraig Site and effectiveness of control measures would enable a more robust assessment of the risk of seal damage to nets.

Cage specifications and site conditions

The most important mitigation measure against fish escapes is the installation of the correctly specified equipment for a given site. The EIS has made a thorough and, in our view, satisfactory assessment of the wave climate, and meteorological conditions at the Shot Head site (EIA Vol. 1, Section 2.2 – 2.4). Section 2.1 of the EIA assesses the risks based on the climatic and hydrographical conditions predicted at the Shot Head site. The EIA bases its assessment of risk on a 1-in-50 year extreme event for the Shot Head site, stating:

"The wave height prediction given for 1:50 year storm from 240^{o} direction at the SW Corner of the site is given as 5.549 m, with a wave period of 15.92 seconds (EIS document Table 4, p81). By comparison, however, a licensed site at Clare Island, Co. Mayo, has 1:50 year return period waves of in excess of 6 m (up to 6.3 m) - ref. RPS Report Detailed Assessment of Wave Climate at the fish farming sites off Clare Island, Clew Bay, West Coast, Ireland, Dec 2010 (IBE0491/AKB/Clew Bay)".

Whilst the Shot Head site is not the most exposed fish farm site in Ireland in terms of wave height, the EIS does not provide any details in respect of the capacity of the

proposed farm installation to withstand the predicted conditions, which, we would argue, is relevant to the granting of any licence. The robustness and resilience of the floating structures and the reliability of the mooring system in storm conditions are key elements in preventing fish escapes together with incidental environmental or vessel damage from drifting cages and other farm debris. The EIA states that the Department's Marine Engineering Division is to introduce a Protocol for the Structural Design of Marine Finfish Farms, on which the installation will be based. This is also stated in EIS (Vol. 1 Section 3.3.2, page 152):

"It is understood that, under a recently introduced scheme, the final specifications for the cage system proposed for the Shot Head site will have to be submitted to the Engineering Section of the Aquaculture and Foreshore Management Division of the newly named Department of Agriculture Marine and Food for certification prior to installation. Thus precise specification is not a matter for this document. Design and certification of specifications will take full account of the ambient operating conditions for the installation, in particular currents and wave climate described herein".

Without the actual installation specifications being disclosed, we are unable to comment further on either the installation's structural suitability for the location, or its ability to withstand a weather event of a particular magnitude. It is recommended and anticipated that these particulars will be submitted for expert consideration prior to the granting of a licence.

Assessment of disease transfer and mitigation measures

The risk of the transfer of disease is outlined in the EIS (Vol.1, Section 5.2.3). Diseases may be contracted from local wild stocks, stocks on other farms within the same area or bay, or movements of farmed fish from other regions. The movement of fish and monitoring of notifiable fish diseases, including the Infectious Salmonid Anemia (ISA) virus in farmed stock is strictly regulated and enforced. As such, the introduction of diseases from farmed fish from other regions is minimised. Although the same diseases may exist in both wild and farmed salmonid populations, there are few reliable data sets on the distribution of fish pathogens in wild populations, and a knowledge of interactions with wild reservoirs is thus limited (Johansen, *et al*. 2011).

Robust fish health and reduction of fish stressors are key to the reduction of fish diseases on fish farms. With modern farming practice and state of the art functional feeds, fish health is optimal on modern farms and thus disease outbreaks occur infrequently. As with most producers, MHI vaccinate smolts to protect against pancreas disease (PD), furunculosis and infectious pancreatic necrosis (IPN). PD is one of the most costly diseases affecting the salmon industry and is known to compromise the efficacy of dietary lice treatments by preventing affected fish from feeding. Statutory regulations stipulate the recording of weekly mortality so any increase in disease occurrence is rapidly identified, which with effective veterinary supervision, results in the successful control of disease outbreaks on salmon farms. The adoption of single generation

production and annual fallowing on the Shot Head site would further reduce the risk of disease outbreaks.

Reliable evidence for the transfer of fish diseases from farmed to wild salmon is limited. In any case, bacterial, viral and fungal fish diseases are for the most part well managed in open cage Atlantic salmon farms. The fish at the proposed Shot Head site are expected to be of a high health status and quality and are therefore at low risk of disease. Accordingly, we conclude that the proposed Shot Head site presents a negligible risk for the transfer of fish diseases to wild stocks *via* escapes into Bantry Bay.

We do, however, have some concerns over the exposed nature of the site and its close proximity to the equally exposed steep and vertical rocky shores. The greatest risk of escapes is either from large episodic events associated with holes in nets caused by predators, or as a result of storm events. While we have no doubt that MHI will adhere to strict inspection and maintenance regimes, the specifications of the farm cages and their ability to withstand the expected conditions are not supplied in the EIS, preventing any objective assessment of installation's suitability for the potentially challenging location and leaving us unable to evaluate the risk of fish escapes from the Shot Head site. We accept that this element will therefore fall within the jurisdiction of, and require approval from, the DAFM Chief Engineer.

9.3 Insufficient carrying capacity to support additional aquaculture

For the purposes of this report we have assessed the carrying capacity of Bantry Bay in the context of the following factors, which reflect Appellant concerns and are not mutually exclusive:

1) Effects on wild salmonids *via* disease, lice and escapes (see Sections 9.1and 9.2)
2) The dispersion and breakdown of chemical, nutrient and biological farm discharges (see Section 9.5)
3) Removal of enriching nutrients from the Bay (see section 9.6)

All of the available data have been considered in our assessment of the combined effects of multiple salmon farms in Bantry Bay. These data, based on a "worst-case" scenario incorporating a regime of *synchronous* bay production would result in maximum theoretical discharges at peak biomass. On the basis of information submitted, it is our view that the combined chemical, biological and nutrient releases from the Shot Head and other fish farm sites will exert no adverse effects on other aquaculture sites, including shellfish sites which are particularly vulnerable to insecticides and toxic algal blooms. Effects on the sea bed arising from discharge of faeces and uneaten feed will remain localised to the sea bed within close proximity to the Shot Head site boundaries.

Future incidence of disease in fish in Bantry Bay cannot be predicted with any degree of certainty. However, due to the current satisfactory health status of farmed fish, indicating currently effective disease management, a cumulative intensification of any disease

spread to wild stocks in Bantry Bay is not expected. There may, however, be a cumulative impact regarding lice loading in the bay, the details of which are discussed in section 9.1.

It is our view that the carrying capacity of Bantry Bay is not expected to be exceeded by the addition of the proposed Shot Head site. Chemical release, excluding the use of Slice®, will remain within established EQSs having negligible toxicity at discharged concentrations. Similarly, due to rapid dilution, the impacts of nutrient discharges will be negligible. No significant risk of increased fish diseases within the bay is expected.

9.4 Site suitability: weather vulnerability

In their justification for the Shot Head location, MHI builds a case based on the presence of aquaculture installations in Irish locations more exposed to wave action. This does not in itself provide evidence of the ability of the proposed installation to withstand the particular conditions at the of Shot Head site, which we feel does warrant a level of concern (See section 9.2).

9.5 Toxic chemical discharges

A variety of chemicals are used and discharged in the biennial-open cage production of salmon. Discharged compounds including pesticides, may have environmental impacts, some of which can affect marine invertebrates and impact on associated fisheries. The majority of the compounds used in open-cage salmon production are insecticides adapted for the control of all stages of sea lice infection. Administration of these insecticides is both dietary and waterborne, and as a consequence of their toxicity, their discharge into the environment is required to remain within established environmental quality standards (EQS).

Emamectin benzoate (Slice®)

Of all the insecticides used, emamectin benzoate (EmBz) and its desmethyl metabolite AB1, pose the greatest risk to the marine environment. The environmental risks associated with this compound are mainly due to its dietary route of administration and subsequent propensity to accumulate and exert effects in sediments. The accumulation of EmBz in the sediments does, however, reduce its mobility in the marine environment. EmBz is made by Merck & Co. and sold under the trade name Slice®. Due to its toxicity to invertebrates, EmBz presents a particular risk to the invertebrate meiofauna[2], including the ecologically important Copepoda[3], together with the larger macrofauna including crustaceans of commercial value.

[2] Microscopic animals with maximum body dimensions of between 45 µm and 1 mm, often achieving very high abundance in the water column and in marine sediments where communities are frequently dominated by species of nematodes and crustaceans.
[3] Sub-class of microscopic crustaceans to which sea lice also belong.

The solubility of EmBz in seawater is low (5.5 mg/l) and whilst EmBz can be detected in the water column during and shortly after treatments, most enters the marine sediments either directly from waste feed, and indirectly *via* faeces during the treatment period, and 3-4 months thereafter. EmBz has a high potential to be adsorbed and bound to sediments. In anaerobic sediments it has a relatively long half-life of 175 days.

EmBz is an in-feed treatment which is effective against all parasitic lice stages. Its advantages to the industry are its ease of use, prolonged protection against lice infection and the relatively short withdrawal period required prior to harvest. Feeds medicated with EmBz are supplied under veterinary prescription by the feed manufacturers to typically deliver a dose of 50µg EmBz per kg fish per day for seven consecutive days. EmBz disrupts fundamental physiological processes, most notably neurotransmission. Following administration, EmBz is immediately and readily assimilated with less than 10% excretion. It provides fish protection against lice for ten or more weeks, depending on water temperature.

Deltamethrin

Deltamethrin is manufactured by Pharmaq Ltd. under the name Alphamax®. Its active ingredient is a synthetic pyrethroid. Pyrethroids are insecticides that act on sodium channels in neural transmission pathways. Deltamethrin has a very low water solubility (<2 µg/l) thus to aid its solubility for water bath treatments, AlphaMax® is used as an emulsified concentrate containing 1% deltamethrin. It is effective against all attached stages of sea lice. Deltamethrin can accumulate in marine sediments where it is estimated to have a half-life of approximately 140 days. Its assimilation into the sediments does reduce its mobility in the marine environment. Treatment dosage and time is 0.2ml Alphamax® (=2µg Deltamethrin) per m^3 seawater for 40-45 minutes (EIS Vol. 3, SOP 29142 [002] Appendix 3.3).

Hydrogen peroxide

Hydrogen peroxide is a powerful oxidising agent which kills pre-adult and adult lice by inducing the formation of gas bubbles on and within the target organism. Hydrogen peroxide is used as bath treatment in rotation with the other available treatments (EIS Vol. 3, SOP 22961 [001] Appendix 3.3). The dose used is 1500 ppm for 12 to 15 minutes, starting once the full dose of the treatment has been released. Hydrogen peroxide rapidly breaks down to oxygen and water in the water column and consequently has no significant environmental impact.

Environmental Quality Standards

EmBz and deltamethrin are both considered as Dangerous Substances under Directive 2006/11/EC. Consequently, Environmental Quality Standards (EQS) have been set in accordance with the European Communities (Control of Dangerous Substances in

Aquaculture) Regulations 2008 (SI 466 of 2008), which was introduced for the purpose of giving effect to the Dangerous Substances Directive (2006/11/EC), Habitats Directive (92/43/EEC) and Water Framework Directive (2000/60/EC). The former Directive relates to the discharge of dangerous substances to the marine environment including from aquaculture activities. The established EQS for EmBz and deltamethrin are 0.22 ng/l and 2 ng/l, respectively, 100 meters from the cage site 24 hours post treatment.

Risk associated with the use of veterinary treatment agents

Lice levels in Bantry Bay have been consistently below trigger levels since 2008 (EIA Section 16.4 and supplied Marine Institute data) and Slice® treatments have only been required on three occasions in Bantry Bay in the same period (RPS, 2015). Questions regarding increasing treatment resistance do, however, remain and it is therefore difficult to predict the requirement for lice treatments at the proposed Shot Head site. The possibility of the increasing resistance to these treatments, as reported across all salmon producing countries, should consequently be taken into consideration.

The introduction of the additional salmon stock to Shot Head will constitute an increased lice loading to Bantry Bay. The introduction or maintenance of Single Bay Management strategies and associated coordinated lice treatments may be expected to mitigate any risks of increased lice levels and therefore the frequency of treatments required in Bantry Bay as a whole. As a consequence of the adequate hydrographic distance between sites (RPS, 2015), the likelihood of a requirement for more frequent treatments based on an anticipated increased number of lice in the Bay as whole is considered to be low. To be certain of mitigating any risk associated with an additional site in Bantry Bay, the establishment of coordinated lice treatments would be expected to contribute to the reduction in chemical waste streams and diminish any potential impacts of pesticide discharge.

Assessment of effects to native fauna including commercial shellfish.

By virtue of their mode of action, both EmBz and deltamethrin are toxic to invertebrates and as a result are a cause for concern by several Appellants, particularly in relation to impacts on shellfish industries in Bantry Bay. The toxicity of EmBz and deltamethrin contaminated sediments have been demonstrated in laboratory conditions for the spot prawn (*Pandalus platyceros*) (Veldohen *et al.*, 2012), marine amphipods (Tucca *et al*., 2014) and copepods (Willis and Ling, 2003). Studies in the field have, however, failed to detect any significant ecotoxicological effects. A study at Loch Sunart on the Scottish west coast, which contains one fish farm, showed that basin-wide concentrations of EmBz were several orders of magnitude lower than the dose that would induce acute toxicity in copepod zooplankton (Willis *et al* 2005) and below the EQS threshold of 2 ng/l at a distance of 100 m from the cage site. Similar findings have been reported by other studies (Van Geest *et al.*, 2014; Kuo *et al*., 2010; Willis and Ling, 2003).

Whilst the use EmBz may not be regularly required in Bantry Bay due to low lice numbers, modelling of its dispersion in the water column and sediments suggest its use would exceed the EQS within a 24 hour period after use at some point during the growing period. (RPS, 2015). The EQS for waterborne EmBz would however be met 36 hours post treatment. Modelling of deltamethrin dispersion suggests the EQS would be met for this compound 24 hours post treatment. As deltamethrin is administered in the confines of a well boat, it is assumed that discharges of this compound may not necessarily occur within the vicinity of the proposed Shot Head site. There is, however, no indication in the EIS of the location of well boat discharges for either hydrogen peroxide or deltamethrin, with the EIS only referring to the generic Standard Operating Procedure (SOP) sheets for treatment methodologies. This was therefore the subject of a Section 47 request addressed to the Applicant (see Section 10.3).

There is a lack of any assessment for the cumulative impact of discharge streams in the EIA but deltamethrin and Slice® dispersal has been evaluated by the RPS hydrographic modelling report, which is based on a 'worst-case' scenario of fully synchronised fish production throughout the Bay. Taking the use of well boats into account, together with an accepted adequate separation between sites, resulting in no discernable basin-wide environmental effects, significant cumulative impacts are not expected from pesticide discharges.

In conclusion, the available evidence indicates that both emamectin benzoate and deltamethrin will not breach accepted basin-wide toxicity threshold concentrations away from fish cages. Risks will be further reduced by the use of well boat treatments for deltamethrin and the predicted infrequent use of EmBz. There are no concerns regarding the toxicity of hydrogen peroxide. Waste discharges associated with the proposed Shot Head site are not therefore expected to have a significant impact on the marine environment or on the shellfish industries in Bantry Bay.

9.6 Nutrient and settleable solid discharges

The day-to-day operation of a salmon farm results in the unavoidable production of nutrient and biological particulate discharges, which affect the environment into which they are released. These include, nitrogen (N), phosphorous (P), and organic material arising from faeces and uneaten feed. The latter results in changes to water oxygen levels, due to the oxidisation of biological material, referred to as biological oxygen demand (BOD). Large increases in BOD may lead to anoxic conditions and subsequent ecological impacts.

Nutrient discharges are regulated through the application of well-established environmental quality standards (EQS) established for selected nutrients or chemicals. SI 272 2009, the European Communities Environmental Objectives (Surface Waters) Regulations 2009 is the main national legislative instrument transposing the European Water Framework Directive 2000/60/EC into Irish law. EQSs define safe limits of

nutrients or chemicals in the marine environment. In terms of aquaculture, EQSs are designed to ensure:

- Protection of the consumer (ensuring that edible aquatic species may be eaten safely by man and other animals);
- Protection of aquatic life including plants and animals of commercial or conservation importance;
- Protection of the aesthetic quality and recreational value of the water body;
- Safeguarding of water quality for industrial use.

Both nitrogen and phosphorus are limiting nutrients for primary production in the marine environment, particularly of phytoplankton. Seasonal increases of these nutrients normally drive algal blooms. Anthropogenic sources of nitrogen and phosphorous can increase the magnitude or frequency of algal blooms in the aquatic environment. Algal blooms can reach a magnitude where they become harmful to the environment, often affecting wild or cultivated shellfish. High densities of algae may cause toxic effects to shellfish, may result in anoxic conditions during the decay process, or may physically clog the gills of filter feeding organisms. These impacts can result in mass mortalities in shellfish (Sumway, 1990). In addition, harmful algal blooms, such as those caused by dinoflagellate algae, can transfer toxins to shellfish rendering them dangerous to humans. Substantial economic losses may be suffered when elevated toxin levels lead to the closure of the shellfish fisheries or prevents the harvesting of cultivated shellfish.

Ambient nitrogen and phosphorous concentrations are at their highest in the marine environment during the late winter and early spring (December to March). The discharge of nitrogen and phosphorous from fish farms are highest in the winter of the second year of salmon production, peaking in January. Modelling has been undertaken for Bantry Bay during this period. Roancarrig and Gearhies salmon farm sites have been operating for a considerable number of years, so it is therefore likely that any recent assessment of concentration of ambient nutrients in Bantry Bay will include contributions from these sites.

Nitrogen

Inorganic nitrogen (N) is the first rate limiting nutrient for plant growth in the marine environment, in particular for phytoplankton. Significant increases of soluble nitrogen are associated with eutrophication and algal blooms, which occur naturally in the nutrient-rich seawater in the spring and to a lesser extent in the late summer. Nitrogen from a fish farm is released from the metabolism of feed, which results in the excretion of soluble nitrogen, primarily as ammonia released in urine and through the gills. Nitrogen is also discharged as a component of indigestible feed components excreted *via* the faeces. Nitrogen waste is also released from uneaten feed, which comprises approximately 3% of the feed portion. Nitrogen discharges from a salmon farm constitute both insoluble settleable and soluble fractions. Insoluble nitrogen is assimilated into sediments, whereas

soluble nitrogen is biologically available in the water column and may be utilised by phytoplankton. The RPS Hydrographic modelling report (RPS, 2015) uses a worst-case scenario of total soluble and insoluble nitrogen for modelling monthly release from the proposed site. Additionally, no nitrogen decay is modelled. In reality nitrogen levels are decreased by assimilation into sediments and primary production. The under SI 272, the quality standard for nitrogen is a maximum ambient nitrogen concentration in seawater of 0.17mg/l (170µg/l)[4].

According to the RPS hydrographic modelling report:

"*Typically, the N concentration elevation at the Shot Head site itself lies between 10µg/l to 40µg/l and falls 10-fold within 1km of the site in both ebb and flood conditions. It is notable that the typical combined-site plumes do not appear to augment each other and that, once beyond the immediate influence of the sites, the N elevation in open waters is generally below 20µg/l which is well within the range of fluctuation in background levels*".

The maximum ambient N concentrations in Bantry Bay occur between January and March reaching a maximum of 125 µg/l. The worst-case scenario adds a maximum of 40 µg/l within 1 km of the farm site, which amounts to a maximum of 165 µg/l within 1 km of the farm site. This represents the maximum localised nitrogen release. It is modelled from a worst-case synchronised bay production scenario during 22 days in the most susceptible month (January) within 1 km of the farm and is below the EQS. When nitrogen discharge is considered from all sites in the Bantry Bay we are in agreement with the RPS model which finds that:

"*Even in the worst case, there is no significant elevation of N concentration towards the head of the bay, where N concentration can be expected to remain within its existing seasonal ambient concentration range*."

Modelled nitrogen plumes demonstrate a rapid dilution of discharged nitrogen from all the combined sites, to between 0.4 and 0.2g/µl, both upstream and downstream of the area occupied by the sites.

Phosphorus

Phosphorus (P) is a secondary indicator of water quality and also constitutes a micronutrient for primary production in the marine environment. Phosphorous is present in the diet of both farmed and wild fish. After ingestion, it is metabolised and partitioned into an assimilated fraction and an excreted fraction. Approximately 49% of phosphorus within the feed is taken up by the fish. A soluble portion is excreted directly into the water column *via* the gills and a remaining portion of indigestible phosphorus is excreted

[4] Note the error in the RPS modelling report; 0.17mg/l does not equal 170µg/ml.

via the faeces. A further small quantity of phosphorus enters the environment from the 3% of uneaten (waste) feed.

As with nitrogen, the total phosphorus waste load is partitioned into an insoluble settleable form in faeces and waste feed, and a biologically available soluble fraction. In the RPS modelling report (RPS, 2015) a worst-case scenario of the *total* phosphorus waste is assumed to be in solution. The projected loadings for total, settleable and soluble phosphorus are given for all existing and currently proposed Bantry Bay sites.

If the nitrogen standard is met, the phosphorus standard, which is more liberal, will also generally be met. As nitrogen and phosphorus have a common source, a phosphorus EQS is rarely applied. This may explain why there is no phosphorus standard in SI 272. For the purpose of this assessment the OSPAR Convention (The Convention for the Protection of the Marine Environment of the North-East Atlantic) EQS standard for total phosphorus, of 119 µg/l utilised by the Scottish Environmental Protection Agency (SEPA) may be applied.

The maximum ambient P concentrations in Bantry Bay occur between January and March reaching a maximum of 23.4 µg/l. The worst-case scenario, based on a synchronous bay production strategy, adds a maximum 20 µg/l within 1 km of the farm site, amounting to 43.4 µg/l within 1 km of the farm site. This maximum localised phosphorous release, modelled from a worst-case scenario during 22 days in the most susceptible month (January) within 1 km of the farm, is well below the SEPA EQS. After including the phosphorus discharge from all sites in Bantry Bay, the RPS model concludes that:

"*All Phosphorus plumes modelled demonstrate a rapid dilution of the Phosphorus discharged from the sites, to less than 0.2g/µl, both upstream and downstream of the area occupied by the sites*".

The results of the comprehensive modelling conducted by RPS indicate that, even under worst-case scenarios covering a 22 day period, nitrogen and phosphorous do not exceed EQSs in close proximity to the proposed farm site (1 km) and are rapidly dispersed to ambient levels. Whilst we fully accept that modelling is a predictive tool with inherent limitations, the model used is amongst the best currently available and has been successfully used for a range of other civil and governmental applications. We would also accept that this analysis has incorporated a considerably conservative margin through their selection of "worst case" options.

<u>It is therefore concluded that nitrogen and phosphorous from the proposed fish farm site will not constitute a significant additional nutrient burden to the Bay, will not stimulate algal blooms or enhance naturally occurring blooms and therefore presents no risk to wild or cultivated shellfish.</u>

Biological settleable solids

Biological settleable solids discharged from fish farm sites are readily biodegradable and comprise two sources; uneaten (waste) feed and faecal material.

A modelling approach was used which incorporated particle tracking to establish the fate of settleable solids (see section 4.1 of RPS, 2015). A period of 22 days was simulated to cover all tidal conditions, with a worst-case scenario adopted. This included a conservative estimate for the discharge of solids. In reality, released settleable solids in the natural environment are naturally gradually biologically decomposed or assimilated by epifauna and infauna.

The amount of faeces discharged by a salmon farm site is dependent on the biomass of the stock held and the Feed Conversion Rate (FCR), which itself is dependent on many factors, including the mean fish weight, amount of feed supplied, the feed formulation and digestibility, and sea temperature. Of the feed supplied, an estimated 97% is consumed by the fish, whilst the remaining 3% is uneaten and the waste is discharged directly to the environment.

Particulates of both these components may be dispersed to variable distances, and may, or may not settle to the seabed depending on their settlement velocities and the current regime to which they are subjected. Particulate biological material has the potential to impact on benthic communities in the vicinity of the proposed site, the severity of which will depend in the extent of settlement and the degree of dispersion.

The SEPA uses a standard methodology, incorporating the Infaunal Trophic Index (ITI) to calculate the effects of settled solids on benthic community structure over a period of one year. The basis of ITI calculation is the classification of the organisms found in the seabed in terms of their population density and feeding (trophic) groups into which they fall. ITI values and habitat status are as follows:

- <30: a degraded benthic community, a result of high impact.
- Between 30 and 60: an altered benthic community
- >60: an unaltered benthic community / absence of impact

Organic loading and the consequent degradation of the benthic habitat in the immediate locality of the farm site is regarded as acceptable by the regulatory authorities. A biological EQS is applied by the SEPA defining an Allowable Zone of Effect (AZE), bounding an area of an ITI < 30. To accommodate for the variation of bathymetry and tidal currents across specific sites, the shape of the AZE is defined by the SEPA's EQS's as either a 'near-field' or a 'far-field' AZE. A near-field AZE is the equivalent to an area bounded by a line 25 m from the pen footprint, and a far-field AZE is the equivalent to an area bounded by a line 100 m from the pen footprint.

Results from the modelling, incorporating current speed profiles established across the Shot Head site, which influences the settling rate of particles, indicate that particulates will settle throughout much of the tidal cycle and that any re-suspension of settled material would be unlikely. The model also indicates that there will be no overlap in solids sedimentation between other sites. As with other 'low current' farm sites, the maximum worse-case production of particulate settleable solids over one year of production remains localised to the sea bed under the fish cages, accumulating at a slow rate of <12 mm/yr. The low 10 kg/m^3 stocking density within large 126 m diameter pens required by the adoption of the organic production standard, results in a lower accumulation of sediments. An allowable ITI of >30 is modelled to closely lie within a far-field AZE. Due to the low residual currents of the site, even during times of wind or wave agitation, particles will not remain in suspension for a sustained period. Consequently, distribution of suspended solids will be limited to the vicinity of the site boundary reaching ambient levels thereafter. It must be noted that the modelling of particulate accumulation and settlement was based on MHI's original application of 12 cages. MHI has since submitted an appeal submission requesting 16 production cages with two spare for freshwater treatments for amoebic gill disease (AGD). This will extend the area of seabed affected by discharged biological settleable solids. This represents a spatial extension of the original plans and may therefore require further assessment.

Based on a 12 cage installation, these data indicate that biological particulate solids arising from waste feed and fish faeces will only result in a significant accumulation directly beneath the cages and will cause an allowable ITI of <30 within a far-field AZE. Resuspension rates are low, resulting in suspended solids quickly reaching ambient levels outwith the perimeter of the site. We therefore conclude that effects of discharged particulate solids will be localised to the site and will result in little or no impact on the seabed and water column beyond the licence area. As all modelling was based on a MAB of 2800 tonnes, the amount of discharged particulates will remain similar for a 14 or 16 cage site. However, as the impact of particulates on the sea bed is directly related to the size of the site, the installation of an additional 6 cages was the subject of a Section 47 request to the Applicant (see Section 10.3).

Biological oxygen demand (BOD)

Biological Oxygen Demand (BOD) is the amount of oxygen used (mainly by bacteria) to assimilate organic waste, after which oxygen demand ceases. BOD emanating from salmon farms is mainly attributed to particulate organic wastes (i.e. containing carbon and nitrogen) discharged from the stock.

BOD in the surrounding environment is calculated from the contribution of a total nitrogen and carbon input derived from farm feed specifications and nutrient content. The RPS modelling report (RPS, 2015) assumed a worst-case scenario for BOD. BOD arising from farm discharge normally includes a component that settles to the sea bed. However, modelling assumed that 100% of discharges contributed to BOD remained in the water

column. The model also assumed that BOD remained constant despite the normal BOD decrease over time as organic waste is assimilated. BOD was simulated for 22 days to allow for full plume development within the full range of tidal conditions.

Due to the open nature of marine systems and relatively high water exchange, neither the EU nor the SEPA standards apply an EQS for BOD in coastal waters. However, for the purposes of this study, transitional and inland water BOD values were assessed to give a context to the BOD arising from the proposed farming activities. The EU standards for transitional waters set an EQS value for BOD of 4 mg/l on a 95 percentile basis, (i.e. may be exceeded on occasion provided that this does not constitute more than 5% of the time). The UK Environment Agency (EA) /SEPA standards provide guidance values for inland waters; these are 3 mg/l and 6 mg/l where the latter may be applied in areas where less sensitive receptors are located. These are also applied on a 95% percentile basis. Dissolved oxygen (DO) saturation background values, which include the effects of the operational farm discharges, range between 8 and 10 mg/l.

In all cases, while also considering the contribution from all other sites, the BOD remains below 2 mg/l, even close (within 1 km) to its sources. This is well within the Environmental Quality Standards used for freshwater and transitional systems. We acknowledge that the modelling results provided by RPS presents a worst-case simulation and are therefore inclined to accept that the BOD associated with the Shot Head site will not have significant impact in the Bay.

9.7 Impacts on farmed shellfish

Potential impacts which may affect farmed shellfish include;

- Increased algal blooms, including harmful algal blooms (HABs) by *dinoflagellate* species.
- Eutrophication
- Increased BOD
- Toxicity arising from pesticide discharge

All these impacts have been discussed in preceding sections. See sections; 9.5 and 9.6.

In summary, in worst-case scenarios invoking synchronous bay production, the release and dispersal of nitrogen and phosphorous will not breach EQSs. As a consequence, no increase in the frequency of algal blooms or HABs is expected. Similarly, with the exceptions of EmBz which is not expected to be used frequently, discharges of pesticides will not exceed EQSs. Pesticide treatments, with the exception of EmBz will in any case be contained within a well boat. We are thus in agreement that there will not be a significant additional risk to cultivated shellfish in Bantry Bay.

9.8 Impacts on benthic/pelagic habitats and species

9.8.1 Marine mammals

Cetaceans
Bantry Bay receives a small number of cetacean visitors throughout the year, but it is widely accepted that the entire Bay area holds no particular breeding or foraging significance for the seven species that have been recorded as repeat visitors. While fish farm nets do constitute an entanglement risk to cetaceans, this is expected to be an extremely rare event.

It is anticipated that whales and dolphins will continue to pass by the site while the farm is in operation, possibly in pursuit of pelagic fish prey and may be forced to deviate slightly to avoid the farm cages or in response to service vessel movements.

The impact on the occasional cetacean visitors is, however, expected to be negligible and highly unlikely to lead to a reduction in the number of whales, dolphins and porpoises observed in the Bay.

Seals
As indicated in section Section 5.4, both grey and harbour seals are present in Bantry Bay, with harbour seal receiving additional protection as a qualifying feature for the Glengarriff Harbour and Woodland SAC, which is greater than 9 km from Shot Head. The closest known haul-out sites for harbour seal, are Garinish West, approximately 4.7 km to the east and Orthon's Island, approximately 4 km to the north-west (Roycroft *et al.*, 2007). These distances are beyond the range over which general fish farm activity or associated vessel traffic would be expected to have a disturbance effect.

Moreover, the EIA observes that current aquaculture activity, either alone or in combination with other human activity appears to have had no effect on seal numbers in Bantry Bay, which are thought to be either increasing or have remained stable.

Seals are, however, known to deliberately interact with fish farms, sometimes causing damage to cage netting. This is discussed further in Section 9.2.

As suggested in Section 9.2., it would be advantageous to establish whether seal damage has been an issue with the farms already operating in Bantry Bay, as this may provide some insight in any possible future requirement for deterrent devices.

Otter
The presence of otters has been recorded along the shoreline close to the licence area.

Given that the marine activity of otters is generally confined to the shore and adjacent shallow waters, we anticipate that disturbance from the fish farm will be insignificant, falling well below that of existing agriculture and occasional recreational walker activity.

9.8.2 Birds

The proposed site is not within any designated conservation area with a bird interest and it is some distance away from established SPAs (see Table 5.2, Section 5.4). Section 5.3.3 of the EIS provides a comprehensive and accurate evaluation of the importance of Bantry Bay to bird populations and the wider conservation significance. It is acknowledged that fish farms are intrinsically attractive to some seabird species, in particular cormorant, and that measures need to be put in place to prevent predation on fish stock. This will be in the form of protective netting which may occasionally lead to entanglement and death of individual seabirds. MHI indicate that their current protective net arrangement at the existing Roancarrig site has been successful in protecting stock without causing significant seabird mortalities.

Taking the use of protective netting into consideration, we conclude that the operation of a fish farm at Shot Head will have no effect at all on terrestrial bird species and will have a minimal-to-no impact on local seabird populations.

9.8.3 Benthic impacts

The results of a survey of the benthos within the licence area indicates an unremarkable seabed type with the observed marine communities constituting commonly-recorded species at a normal abundance and diversity for north-east Atlantic temperate waters (with the exception of a possible presence of *Phallusia mammillata* - see below).

The seabed within the proposed Shot Head site is sand with a varying mixture of gravel and silt. In addition, there is an area of coarse gravel, corresponding to the most exposed part of the site.. All substrates were well-oxygenated up to a depth of 7 - 8 cm indicating clean and healthy habitat. A single rocky outcrop is present in the vicinity of the centre of the site.

Observed epibenthos was sparse and restricted to a small number of taxa, while the infaunal samples were well populated with benthic infauna, with 300-500 specimens recorded in all samples. Infaunal trophic indices (ITI) were high, suggesting a natural community profile, unmodified by anthropogenic disturbance.

Species of economic importance were limited in number within the site area. The species of greatest abundance was the Dublin Bay prawn, (*Nephrops norvegicus*), but based on the number of burrows found it was thought unlikely that this species is present in exploitable quantities (we note, however, that this has since been questioned in a MI submission). Shrimp (*Palaemon serratus, Crangon crangon*) are known to be commercially targeted in the site area but only one example was seen in extensive ROV surveys. No scallop (*Pectinidae*) were seen and there was no evidence of trawl tracks on the seabed.

The assessment of the deposition and impact of settleable waste material (RPS, 2015) indicates that there is relatively low residual water movement in the area where the cages will be placed, resulting in a highly depositional environment. The modelling predicts a worst-case accumulation of particulate waste amounting to 13 mm directly underneath the cages, but quickly becoming negligible only a short distance from the installation. The EIA provides some further insight into the real-world effects, supplying an overview of the results of the monitoring at the Roancarrig site, which appears to exhibit some similarities in terms of benthic substrate. At this site degradation of the seabed has been observed, with the occurrence of bacterial mats, indicative of localised anoxic conditions, but the impacts have been confined to a small area beneath the cages and have remained within "an allowable zone of impact".

We have no reason to believe that the proposed Shot Head site will suffer any greater impact than the Roancarrig site. It is likely that the sedimentary communities and those associated with the small rocky reef directly below the cages will be modified or degraded by settling organic waste. We would expect, though, that the zone of impact would be highly localised, with the surrounding benthic communities exhibiting no discernible impact 50-100 m outside of the licence area. We, however, recommend that the practice of undertaking an annual benthic survey to quantify any undesirable effects be extended to the Shot Head site as a licence condition. A question does remain over the presence of *Nephrops norvegicus* and whether the density of this species in the licence area is significant in terms of a future fishery interest.

Concerns have also been expressed in respect of chemical treatments and their impacts on benthic crustacean, such as crabs and lobsters. This is dealt with in detail in Section 9.5.

Phallusia mammillata

During a survey undertaken by Emblow *et al.* (1994) high densities of the sea squirt *Phallusia mammillata*, a southern species not recorded from any other Irish locations outside of Bantry Bay were frequently observed. Some Appellants have expressed concern that the proposed fish farm represents a threat to the continued presence of this species in the Bay. The survey, undertaken in the summer of 1993, noted that *P. mammillata* was common and widespread throughout Bantry Bay, required no specific conservation measures and may represent a relict species, or simply a relatively recent introduction. Emblow *et al.* (1994) also observed that *P. mammillata* occurred at greatest densities in sublittoral locations of less than 20 m depth and where there was low exposure to wave action.

The licence area at Shot Head, being exposed and predominantly sedimentary with a small area of low-lying rock, may support the establishment of *P. mammillata* and at least one possible specimen was recorded during the benthic survey described in the EIS. Given the dominance of soft substrates, it is likely that the licence area at Shot Head is probably not a particularly favourable location for this species.

In view of the wide distribution and high abundance of this species elsewhere in the Bay, as described in previous surveys, we believe that there is no risk to the continued presence of this species in Bantry Bay from the proposed fish farm.

Maerl

Shallow rocky reef throughout the North Atlantic is commonly colonised by various species of encrusting calcareous red algae. In certain, but not fully understood, hydrological conditions these and other closely-related species will adopt a free-living branched morphology, sometimes aggregating to form dense beds resembling coral reefs, while overlaying and consolidating the local finer sediment. These calcareous aggregations are referred to as "maerl beds". The morphological complexity of these beds attract many species, substantially elevating the biodiversity of the area. Because they are technically plants and are therefore reliant on photosynthesis to survive and grow, maerl beds tend to flourish in relatively shallow and clear water. Changes in water turbidity and physical damage from trawls or dredges constitute the main threat to maerl beds, which can become degraded and eventually die over relatively short periods of time, leaving calcareous deposits that are sometimes harvested for use as soil conditioners as occurs off Lonehort Point, to the east of Bere Island.

In some cases, the threatened status of maerl beds is reflected in their selection as a sub-feature of interest in some Special Areas of Conservation. Maerl bed is also a habitat of concern on the OSPAR list of Threatened and Declining habitats and Species.

Maerl beds are known to occur in Bantry Bay, with at least three reports providing varying levels of detail of occurrence and status (Emblow *et al.*, 1994; BioMar, 1994; De Grave and Whitaker, 1999; De Grave *et al.*, 2000).

The depositional environment below fish farms would threaten and probably destroy any maerl beds within the immediate vicinity and some appeals in respect of the Shot Head licence site has expressed concern that this is indeed a possible issue.

The results of the benthic survey presented in the EIS (EIS Section 2.10) strongly suggest that the moderately deep and muddy substrate within the licence area is not an environment that would support a maerl bed.

To further determine whether the site holds the potential to impact on any marl beds within the vicinity we examined the available literature for the location of known or suspected maerl beds. The results ordered by distance from Shot Head are shown in Table 9.1. The nearest known *possible* maerl bed site is to the south-east, just off Gerahies. The original record for this site is vague and a subsequent survey has only recovered circumstantial evidence for the presence of a bed.

The distance to the possible maerl bed close to Gerahies and at all other locations, tentative or confirmed, are however, well beyond the distance over which deposition or

other seabed disturbance from the proposed fish farm would exert an impact and we therefore believe that the farm presents no risk to maerl beds in Bantry Bay.

Table 9.1. The location of reported maerl beds or observations of evidence of maerl. Locations are ordered by estimated distance from the Shot Head licence area.

Location	Estimated Distance from Shot Head Licence Site	Report reference	Notes
Gerahies	5.3 km	De Grave and Whitaker (1999)	Historical report.
Gerahies	5.3 km	De Grave *et al.* (2000)	Patchy areas of maerl-bearing material
Roancarrig	5.9 km	De Grave *et al.* (2000)	Grab samples recovered with small amounts of maerl
SW of Whiddy Island	>7.5 km	De Grave and Whitaker (1999)	Historical report, location uncertain.
W of Lonehort Point	8.0 km	De Grave and Whitaker (1999)	Historical report.
E of Bank Harbour	8.4 km	De Grave and Whitaker (1999)	Historical report.
NE of Lonehort Point	8.7 km	BioMar http://www.habitas.org.uk/marinelife/site.asp?item=9	Confirmed observation of bed
Glengarrif Harbour	>10 km	De Grave and Whitaker (1999)	Historical report, location uncertain.
Colt Rock	17.8 km	De Grave and Whitaker (1999)	Historical report
SW of Yellow Rocks	11.2 km	BioMar (http://www.habitas.org.uk/marinelife/site.asp?item=3)	Maerl gravel. Some live maerl

Freshwater pearl mussel

The freshwater pearl mussel, *Margaritifera margaritifera*, is a bivalve mollusc that is found in clean, fast-flowing rivers or sometimes in lakes. The larval stage of freshwater pearl mussel is released into open water between July and September and a proportion of

them are inhaled by passing salmonids, which acts as a temporary host and dispersal vector until they develop into small mussels and eventually drop off and settle onto the river bed.

This species is considered to be endangered because of a steep population decline in Ireland and throughout Europe, which is thought to be due to increasing siltation of rivers together with elevated organic loading. It is a scheduled species under the 1976 Wildlife Act (Statutory Instrument No. 112, 1990) and is also an Annex II and IV species under the Habitats Directive, but it is not a qualifying feature of any of the Bantry Bay associated SACs. During the production of the EIS freshwater pearl mussel would have been known to occur in at least one river flowing into the Bantry Bay catchment, having been observed around the Glengarriff area, but the main conservation interest for this species is associated with the northward flowing rivers, entering Kenmare Bay.

At least one Appellant has, however, indicated that *M. margaritifera* has been observed in the Dromagowlane River which discharges into the head of the Trafrask embayment behind the Shot Head peninsula, approximately 1.2 km to the north of the northern boundary of the licence area.

We were unable to obtain any published literature or survey records that would substantiate the presence of a *M. margaritifera* population in the Dromagowlane River. Assuming that freshwater pearl mussel is present in this small river or its tributaries, it is, however, highly unlikely to be under threat from direct disturbance or effluent discharges from the proposed fish farm. We believe that some concerns remain, though, in respect of this species' dependence on a viable salmonid population for its continued larval dispersal and recruitment within the Dromagowlane River. Given the level of statutory protection attributed to this species, it was considered prudent to seek further clarification on its present status and potential vulnerabilities within the immediate vicinity of the Shot Head proposed licence area. This was duly sought under the provision set out in Section 47 of the Fisheries (Amendment) Act 1997 and is discussed further in Section 10.3.

9.9 Impact on tourism

The proposed Shot Head site is overlooked by exposed moderately high rocky cliff to the east, which rapidly decreases in height towards the west, eventually grading to a sloping rocky shore overlooking the western extremity of the licence area. Access can be gained by un-signposted single track roads running off the R572 which mostly service domestic dwellings, one terminating at houses adjacent to the cliffs on the east side, another at a small parking area (possibly for agricultural purposes) on the north side of the Shot Head promontory. There are no locations adjacent to the shore overlooking the site that are signposted or are marked in any way as recognised tourist sites or walkways.

This part of the coastline is about 1.5 km from the R572, which constitutes a section of the Wild Atlantic Way running down the northern side of Bantry Bay. The entire section

of the coast enclosing the proposed site is, however, not visible at all from the main road, or indeed any of the minor roads on this side of the Bay.

A site inspection confirmed that there were no established tourist paths along the cliffs overlooking the proposed farm site, although tracks indicative of some occasional walking activity were observed. The vertical cliffs to the east are accessible through a gated vehicle track, but are not fenced and would therefore present a significant hazard to incidental visitors and sightseers, particularly in strong wind conditions.

The fish farm cages would be visible from sections of the Wild Atlantic Way road on the southern shore (some 4.5 km away at its closest point), but a site visit on a sunny day in good visibility indicates that it would probably constitute a very small visual feature that might easily be missed by a casual observer.

There is a small slipway and some moorings in the small embayment directly to the north (or behind) the Shot Head peninsula, but, again, the presence of cliffs and raised rocky shores ensures that the fish farm site would not be visible from any part of this embayment. Tourist vessels would however encounter the cages on leaving the shelter of the inlet and turning east towards inner Bantry Bay.

All of the coastal sites signposted for tourist purposes along the northern side of Bantry Bay are of a substantial distance from the proposed site and it therefore difficult to envisage any obvious negative impacts on tourist interests. It is also noted that visitors to the popular tourist town of Glenngariff are already exposed to a significant level of aquaculture industry activity with no apparent adverse impacts.

The proposed fish farm may present a minor navigational inconvenience for marine pleasure craft (e.g. yachts and kayaks), but, beyond that, no effects on local tourism are expected in respect of the Shot Head licence application.

9.10 Impact on Angling

Shot Head constitutes one of around 18 documented shore angling locations within Bantry Bay. It is listed as being a favoured location for mackerel, pollack and wrasse. It is possible that the small area of rocky seabed detected within the proposed licence area is the source of attraction for these species, perhaps drawn to potential food items associated with the hard substrata or increased seabed complexity. The impact on the angling prospects at this location very much depends on precisely where the activity takes place and the nature of that activity. Shore fishing will still be unobstructed along the full extent of the Shot Head peninsula extending to the west of the licence area, as this would be a considerable distance from the farm site. It would also seem likely that the farm cage and navigational buoy distance from shore would be such that they would not interfere with shore casting at any point along the coastline.

In taking a worst-case view that the licence area lies directly over an established inshore angling site and accepting the predicted level of organic deposition on the seabed, we can only conclude that the site would cease to be a viable angling location for the duration of the licence period, but would probably regain its attraction to fish soon after the farming operation has been removed.

In this respect, there may be a very minor impact on angling activity, depending on where angling actually takes place at Shot Head, but the fish farm itself will have no impact on any of the remaining angling locations, nor will it have any impact on juveniles of the fish species targeted by sea anglers.

9.11 Licence conditions

9.11.1 Underwater archaeology

The Applicant in their submitted appeal requested a withdrawal of the licence requirement to undertake further works for the protection of underwater archaeology, arguing that no evidence of archaeological interest was found during a commissioned marine geo-archaeological assessment. They further point out that this condition has not previously been applied to licence applications for similar operation.

In respect of the latter point, we would suggest that the stringency of licence conditions relating to archaeological concerns should be based on the potential of a site to yield valuable archaeological material and/or artefacts as determined by historical evidence, archive narratives or expert judgement. We have assumed that this is the reason behind the current licence condition.

We note, however, that the Applicant did comply with a request from the NPWS Development Applications Unit to undertake an archaeological impact assessment, including a full side-scan and magnetometer survey of the licence area, the results of which are presented in the report produced by Donal Boland dated June 2012 and included in the Minister's File.

The results of the field survey, while simultaneously acknowledging the potential for some of the sediment types to retain archaeological material, but observing that local hydrological conditions serve to reduce the survivability of such artefacts, indicates that no evidence for the site being of archaeological significance was found. The expert consultant pointed out, however, that the deployment of anchors may disturb and uncover buried items, recommending that a further side-scan survey be undertaken subsequent to anchor deployment. We are of the opinion that the previous survey was adequate and a further acoustic survey is unnecessary. An alternative suggestion would, however, be to deploy divers or a video-equipped remotely operated vehicle to make a rapid visual inspection of the anchors and to report any unearthed object of human origin.

9.11.2 Cage dimension and type

The Applicant submitted an appeal against the licence condition specifying the dimensions and type of the fish farm installation, arguing that this effectively restricts their ability to initiate improvements and upgrades to the cage and mooring systems.

We would agree that the Applicant should be given the flexibility to explore improvement options and where appropriate select and upgrade the cage specification and design as required, subject to consultation with, and subsequent approval from, the licencing authority.

9.11.3 Cage number and configuration

MHI submitted an appeal, requesting a change to the licence conditions that would allow an increased number of cages from 12 plus two temporary cages for grading to 16 with an additional two cages for management of disease treatments. Two reasons were given for the request, they were:

1. In-cycle grading has been phased out in preference to the maintenance of stock in the same individual pens from input to harvest. It is expected this will reduce stress to the stock which will reduce susceptibility to disease. MHI asserts that a MAB of 2,800 tonnes requires16 x 20,000 m^3 pens to ensure the biomass in the fastest-growing pens remains at <10 kg/m^3 prior to harvest.

2. As described by (Downes *et al.* 2015) the prevalence of Amoebic Gill Disease (AGD) has increased since the submission of the application. This requires treatments such as freshwater immersion, which benefits from the availability of spare pens for use in the treatment and recovery process.

We can find no reasonable grounds for objection to MHI's request for the additional cages, since the minor enlargement would still be contained within the licence area and would enhance disease management provisions. We acknowledge that the MAB of 2,800 tonnes, on which the EIA was based, will remain.

The addition of four cages will, however, result in an increased footprint on the seabed, with an associated potentially enlarged area of impact on the benthos. Clarification of the implications of the enlarged footprint area was subsequently sought from the Applicant under the provision of Section 47 of the Fisheries (Amendment) Act 1997 (see Section 10.3).

We do not expect any addition adverse environmental impacts resulting from the a change in cage arrangement within the licence area (i.e. a change from a 3x6 to a 2x9 arrangement). We would suggest, however, that some consideration should be given to the structural integrity of the preferred configuration, in particular its ability to withstand the previously-evaluated exposure regime and the adopted 1:50 year storm event

reference. Should a significant difference be predicted between each arrangement, a preference should be given to the least vulnerable pen arrangement.

9.11.4 Production and farm management strategies

A number of Appellants questioned the production strategy proposed by MHI for the Shot Head site. The proposed strategy is a single generation 22 month production over a two-year cycle. S0 smolts will be introduced to the site in October to November, and depending on growth rate, fish will be harvested between March and August of the second year. The site will operate on a MAB of 2,800 tonnes, which will typically occur in March or April and will subsequently decline over the harvest period. The site will then be fallowed for up to two months between August and September. This is in line with the requirements of SBM, which have proved successful in reducing disease incidence and has increased the efficacy of lice treatments. The requirements of SMB are:

- Separation of generations on a site
- Fallowing between production cycles
- Strategic application of lice treatments
- Good fish health management
- Close cooperation between farms

This production cycle will be alternated asynchronously, offset by one year with the Roncarraig site, which will produce a similar biomass of 3,500 tonnes per cycle.

Some Appellants have expressed dissatisfaction with this approach, advocated an alternative stocking strategy using S1 smolts introduced in January, arguing that this would reduce impacts on wild fish populations. Under the alternative strategy, harvesting would take place in June to November, with the MAB occurring around June and July. The site would be fallowed between November and December.

The rationale for the alternative approach is that low water temperatures in the winter slows down lice development, helping to break the cycle of lice burden and resulting in much lower lice numbers present on the site prior to the sensitive wild salmon migration in the spring period. In order to ensure that harvested fish are free from treatment residues and reach required withdrawal periods, lice treatments are typically reduced prior to the harvest period. Using S0 smolts imposes the disadvantage of having to consider a reduction in lice treatments coinciding with the sensitive spring period. Using S1 smolts results in a later harvest, allowing lice treatments to be undertaken in the spring. Smolts introduced in January would also be expected to have a reduced lice burden during the spring period. Currently all other sites stock S0 fish, which facilitates synchronised production in concert with another sites in the Bay. This carries the advantage of allowing site synchronised lice treatments and fallow periods timed to alternate with other sites. Since 2008, the existing sites in Bantry Bay have remained below trigger levels. The use

of a production with S1 smolts is therefore acceptable for this Bay and would be synchronous with the production schedule of the other sites.

We conclude that the production strategy proposed by MHI complies with SBM and is suitable for Bantry Bay. Consequently, we do not consider it necessary to impose restrictions on production strategy for the Shot Head site.

Although earlier harvesting will result in reduced lice treatments in the sensitive spring period, we recommend that the harvest period is not restricted by a license condition. Although MHI states that there is no precedent for prescribed harvest periods in other licenses, this is not a reason to omit it as a licence condition in the current application. Earlier harvests will allow for passive grading and early harvest of marketable fish. It may also be required in the unlikely event of jellyfish invasions or nuisance phytoplankton and will have the advantage that fish on site will decrease in number earlier.

The adoption of a single bay production strategy has been suggested by some Appellants. The advantages of single bay production have been outlined in the EIS (EIS section 3.2.2., page 149) and in this report (see Section 9.1). Single bay production, is a non-statutory aspiration in CLAMS, whereby all sites within the Bay have a synchronous production schedule, allowing fully coordinated whole-bay lice treatments and fallow periods. The results of the extensive hydrographic modelling (RPS, 2015) and historical low lice numbers in the bay indicate that there is adequate hydrological distance between sites, which would support the view that a single bay production strategy is currently not a necessity in Bantry Bay. Should these conditions change in Bantry Bay, then single bay production may be considered or might become necessary in the event of uncontrollable lice infestations.

At this time, however, we do not believe that the establishment of an additional farm site at Shot Head requires the imposition of synchronised whole-bay production as a license condition.

9.12 Cumulative impacts

The cumulative impacts *per se* were not directly addressed in the EIS, nor subsequently specifically assessed in the EIA. Some key cumulative impacts have, however, been evaluated in EIS Section 4.6 and subsequently by further hydrographic modelling (RPS, 2015). These include consideration of the most significant potential cumulative impacts to Bantry Bay, which relate to sea lice management, together with nutrient and pesticide discharges.

Hydrographic modelling (RPS, 2015) has been conducted on a worst-case scenario basis including synchronous bay production, as previously discussed in Sections 9.6 and 9.5. The addition of the Shot Site represents a significant increase, amounting to 43%, in farmed fish stocks in Bantry Bay, presenting additional risks to the marine ecosystem and

to existing aquaculture activities. Potential cumulative impacts arise from augmented lice loads, and increased discharges of pesticides and nutrients. These impacts must be assessed to safeguard both the marine environment and aquaculture interests in Bantry Bay. In summary, the hydrological modelling shows that effects on lice burden are mitigated by an adequate hydrological distance between sites. With the exception of the possible breaching of the EQS for EmBz, the modelling also shows that nutrient and pesticide discharges will not exceed established EQS.

In conclusion, whilst not addressed specifically or directly in the EIA, the most significant potential cumulative impacts have since been addressed by the best available hydrological modelling. The results indicate that the Shot Head site, when considered within the context of all aquaculture operations within Bantry Bay will not contribute to a significant in-combination environmental impact.

9.13 Noise impacts

The EIS indicates that there will be four sources of audible noise associated with the operation of the proposed fish farm. These will be:

- a heavily insulated generator
- the feed dosing equipment on the feed barge
- feed spreaders in each cage
- maintenance and service vessel engines

We also note that Acoustic Deterrent Devices (ADDs) may have to be considered in the future, but as stated in the EIA (Section 8, page 14), if these are required they would be the subject of a separate statutory consent process, at which time a full evaluation of the effects would be undertaken. We have therefore not considered the use of ADDs in this report, beyond acknowledging that they may be necessary in the future.

The Applicant maintains that noise from fish farm operations: "…*tend to be consistent, of middle register and quite low in decibel terms*" (EIS Vol. 1, Section 5.3.5, page 250. They also suggest that the level of overall marine traffic makes Bantry Bay a moderately noisy environment.

From an environmental impact perspective, the most notable prospective effects of noise emanating from the fish farm would be disturbance to birds or marine mammals. As there are no sites established for the protection of vulnerable seabird species within an ecologically significant distance from the site, we are confident that there will be no adverse impacts on sensitive bird populations. Similarly, the site is sufficiently distant from known harbour seal haul-out locations to be of no discernible threat to their movement or behaviour.

The shoreward location of the installation and the expected low decibel register would indicate that it represents a low risk to the occasional cetacean visitors. Bantry Bay holds

no breeding or foraging significance for cetaceans and it is probable that they would simply deviate a little to the south in response to the continuous low-level sound or vessel activity around the cages.

Sound generation from the installation has the additional potential to be a nuisance to any nearby human habitation. By our estimation, however, (and supported by direct observations made on a site inspection) the cage arrays and feeding barge would be between 200 – 400 m away from the closest shore point and probably more than 800 m away from the nearest house, which is also in an elevated position at cliff-top height. It is therefore highly likely that natural sound attenuation over those distances would render any potential nuisance sound level negligible.

It is our view that the noise generated from the operation of the proposed fish farm will present no risk, either direct or indirect, to birds or marine mammals and that sound levels will be sufficiently attenuated by distance, to below that which could be considered to constitute a nuisance to nearby human habitation.

9.14 Inadequate EIA/EIS

Most of the issues raised in respect of complaints relating to the accuracy or adequacy of the EIS are covered in the sections addressing individual issues.

The majority of Appellant's dissatisfaction was directed towards the EIS conclusions on the sea lice risk to wild salmonids and the potential impacts from farm discharges, which were largely evaluated using modelling methods. We are of the opinion that, on balance, the modelling results (incorporating empirical data sets), leaving aside the inherent limitations of such techniques, but assuming the empirical data have been applied entirely without bias, provides a reasonable argument for adequate dispersal of contaminants and low transference risk of copepodids. It must, however, be recognised that the model used is a simplified approximation of the real world and that there is always the possibility that other external factors have not been fully accounted for. That said, and in the absence of an alternative data-led submission offering opposing scenarios, we are disposed to accept the conclusions presented in the EIS and later response submission.

In general, we find that the EIS, together with the subsequent supplementary submissions is a comprehensive assessment which has satisfactorily identified and adequately addressed the majority of relevant issues.

There are, however, exceptions which we felt warranted further attention. These are:

1. The EIS and subsequent EIA did not address the following issues:

    (i) The ecological significance and any impacts to the nearby Dromagowlane River were not assessed.

(ii) The location of well boat discharges and any impact of discharge were not made clear.

(iii) The design specification of the *actual* cage structure to be installed, its suitability for the local seabed substrate types and bathymetry, together with its predicted performance under the expected high exposure conditions have not been provided or adequately defined. An assessment could not be made without this information and should be provided prior to the granting of a licence.

In addition, subsequent submissions raised the following issues which require further consideration:

2. Slice® is the only sea lice treatment which imparts extended protection against sea lice. Any restriction in its use is of concern for the effective management of sea lice. Clarification is required on the availability of the use of Slice® in light of the hydrological modelling results, which indicate that the expected site dispersal characteristics would cause a breach in the EQS threshold for this chemical.

3. The Applicant has requested an increase in cage number from 14 to 18, which will require a supplementary consideration of the impact of an increased footprint on the seabed the implications for impacts on *Nephrops* density.

These issues are considered further in Section 10.3.

9.15 Inadequate Public Consultation

The supplied Minister's File contains at least 22 documents relating to the process of public consultation. These include:

- Copies of newspaper advertisements for three separate rounds of consultation;
- Copies of responses to public notices. These comprise 77 in 2012 and 42 in 2014;
- Correspondence from DAFM to MHI in respect of contacting Statutory Consultees and instructions on providing adequate public access to information in respect of the licence application;
- Copies of letters to, and responses from Statutory Consultees;
- A screen grab from MHIs web page listing information publicly available for download in respect of the Shot Head application.

These documents confirm that, throughout the current licensing process, both MHI and DAFM have complied with all of the statutory requirements as set out in S.I. No. 236/1998 - *Aquaculture (Licence Application) Regulations, 1998 in respect of public notices, public consultation and universal access to relevant information*.

10.0 Recommendation of Technical Advisor with Reasons and Considerations

Following a site inspection, together with an extensive review of all appropriate literature and in accordance with Sections 59 & 61 of the Fisheries (Amendment) Act 1997, we find that **some issues remain and that final consideration by the Board should be subject to these issues being satisfactorily addressed through a review of evidence presented at an Oral Hearing.**

10.1 The case for licence approval

The information presented in the EIS, EIA and subsequent submissions presents a good case for granting the licence, but some notable omission have been identified and are further explored in Section 10.3.

The case for granting the licence on the basis of no significant effects on the environment, local economy and man-made heritage, constitutes the following:

Environment and ecology

- The proposed fish farm is not within a designated conservation area and will have no impact on adjacent *Natura* 2000 sites and their qualifying interests;
- There are unremarkable and locally common benthic communities within the expected footprint of the site, with no concerns for rare, protected or vulnerable species;
- Effects on the benthos will be localised to the site and will result in little or no impact on the seabed and water column beyond the site;
- Current sea lice control measures have been successful in maintaining sea lice levels below which they constitute a risk to wild salmonids;
- Any impact on marine mammals and seabirds will be negligible.

Chemical and hydrology

- On the basis of modern modelling techniques, the site is hydrologically isolated from adjacent main rivers and other fish farms and will therefore present low sea lice infestation;
- The site bathymetry and water exchange regime is favourable for anchored cages and is therefore suitable for salmonid culture;
- Pesticide discharges are not expected to have a significant impact on the marine environment or shellfish industries in Bantry Bay;
- Nutrient discharges will not stimulate algal blooms or enhance naturally occurring blooms and therefore presents no risk to wild or cultivated shellfish;
- The BOD resulting from the Shot Head site will not have significant impact in the Bay.

Socio-economic

- The proposed fish farm is not close to any national monuments and will have no impact on any marine archaeological sites;
- The location of the site below a cliff and seaward of raised land will completely obscure the farm from established tourist routes;
- There will be no impacts on the wider tourist industry:
- The farm site is not within sight of an established public footpath and the use of the adjacent land by recreational visitors is infrequent;
- The proposed fish farm is likely to be only partially visible to only one or two domestic dwellings;
- The site will pose no navigational issues for seagoing vessels in Bantry Bay, beyond the placing of navigational buoys;
- The proposed licence area currently falls under no particular or specific statutory status and there are no known instances where the establishment and operation of the fish farm would breach statutory restrictions, other than those specifically relating to aquaculture operations.

Farm management and production strategy

- The production strategy proposed by MHI complies with SBM and is suitable for Bantry Bay;
- The site is serviceable from an existing shore base, requiring only occasional access from existing local facilities;
- The proposed Shot Head site presents a negligible risk for the transfer of fish diseases to neighbouring sites or to wild salmonid stocks;
- The current sea lice levels constitute a manageable risk to farmed fish.

10.2 Licence conditions

We recommend that MHI's application for modifications to the licence conditions may be approved as follows:

(i) A change to operating on a Maximum Allowable Biomass of 2,800 tonnes rather than a Biennial Harvested Tonnage of 3,500 tonnes.

(ii) An increase in the number of cages from 14 to 18 to facilitate current best practice

(iii) The allowance of unrestricted harvests to permit flexibility in growth profiles, stocking densities and stock loss from harmful algal blooms and jellyfish invasions.

(iv) The ability to exercise flexibility in the selection of the best available cage and mooring technology, within the constraints of the site operating conditions.

In addition, we recommend that a requirement to undertake a review of the production strategy be incorporated as an additional condition, to be initiated in the event of

breaching of treatment trigger levels, either at the Shot Head site or, on other sites within the Bay.

We believe flexibility in production strategies will allow MHI to proactively adopt the best strategies for the optimisation of the control of sea lice and fish health issues as they arise.

In light of the difficulty of assessing the impacts of farm derived sea lice on wild salmonids, we believe the integrity of wild stocks in Bantry Bay should be safeguarded by the development and implementation of a monitoring program to assess sea lice prevalence in wild stocks. This should be regularly reviewed in parallel with farm lice monitoring and the best management strategies employed.

10.3 Section 47: Clarification of outstanding issues

Section 47 of the Fisheries (Amendment) Act 1997 states:

"*Where the Board is of the opinion that any document, particulars or other information is or are necessary for the purpose of enabling it to determine an appeal, it shall serve on a party or on any person who has made submissions or observations to the Board in relation to the appeal a notice—*

(a) requiring the party or person, within a period specified in the notice (being not less than 14 days beginning on the date of service of the notice) to submit to the Board such documents, particulars or other information as are specified in the notice, and

(b) stating that, if the documents, particulars or other information is or are not received by the Board before the expiration of the specified period, the Board will, after the expiration of that period and without further notice to the party or person, pursuant to section 48, determine the appeal."

A number of requests for clarification or further information were issued by the Board pursuant to Section 47. These are outlined below.

10.3.1 Section 47 requests

(i) Salmonids and freshwater pearl mussel in the Dromagowlane/Trafrask River system

The omission of the Dromagowlane/Trafrask River at close proximity to the proposed licence area was pointed out to the Applicant and clarification was sought in respect of whether the river does, or does not, support breeding populations of salmonids and freshwater pearl mussel and if so what the estimated size of such populations might be.

The same question regarding salmonid population presence and size was also directed to Inland Fisheries Ireland (IFI).

In addition, the National Parks and Wildlife Service (NPWS) were requested to provide any available information on the presence of freshwater pearl mussel in the Dromagowlane/Trafrask River system.

(ii) Well boat discharges

Confirmation was requested from the Applicant that well boat treatments using deltamethrin (Alphamax®) and the subsequent discharges would only be undertaken within the licence area as inferred but not explicitly stated in the EIS and later supporting submissions.

(iii) Information on the cage and mooring system

The Board noted that the Applicant acknowledged that the Shot Head site would be among the most exposed of all salmon farm sites in Ireland, with a location close to a downwind (prevailing wind) rocky shore and cliff coastline, allowing limited scope for remedial action in the event of cage or mooring system failure or damage. Further information was requested on the intended cage and mooring system, together with evidence that the system had been successfully deployed elsewhere in similar conditions. Assurances were also sought that the system would be sufficiently robust to withstand a one-in-fifty-year storm event.

(iv) The use of Emamectin Benzoate (Slice®) at Shot Head

The Board referred to the EIS and subsequent supporting submissions conclusion that use of Emamectin Benzoate (EmBZ) will be severely restricted due to the lack of dispersion during treatment resulting in a predicted breach of the statutory EQS. Given that the application of this in-feed pesticide is widely acknowledged to be the most effective of the available lice prevention and removal treatments, details of an alternative Shot Head treatment strategy in the event of a lice infestation event beyond the seven-month post smolt transfer period was requested from the Applicant.

(v) Seabed impacts in respect of the requested change in the licence conditions to accommodate four additional cages

The Board referred to the Applicant's request for a change in the licence conditions to allow an increase in the number of cages from fourteen to eighteen. While accepting that the increase in cage number could be comfortably accommodated within the licence area, the Board requested that the Applicant provide an account of the impact implications of any associated increase in effect footprint incurred by the proposed change in cage and mooring configuration,

(vi) The possible presence of a harvestable Nephrops norvegicus *resource within the proposed licence area*

The Board referred to the submission by the Marine Institute which questioned the Applicant's assessment of Dublin Bay prawn (*Nephrop novegicus*) density within the proposed licence area. A more accurate estimation of *N. norvegicus* was requested from the Applicant.

Further clarification was also sought on the proximity of a viable and ongoing *N. norvegicus* pot fishery from the Marine Institute.

10.3.2 Section 47 responses and outcomes

(ia) Salmonids in the Dromagowlane/Trafrask River system

While the potential impacts of bi-directional sea lice transfer between wild and farmed salmonids were comprehensively assessed by the Applicant for Bantry Bay's main river systems using hydrological modelling supplemented with real-world data, the Applicant pointed out that the Dromagowlane River is not a recognised National Salmon River and was therefore not considered in the sea lice risk evaluation process. Minor rivers and tributaries, including the Trafrask embayment area were, however, included in the assessment of waste and therapeutic chemical discharge impacts, again through the use of hydrological modelling.

The Applicant states that there were very little published data on the presence and status of salmonid species in the Dromagowlane/Trafrask River at the time of the preparation of the EIS. In order to respond to the Board's Section 47 request the Applicant consulted specific experts from IFI and NPWS.

Information provided by experts from *ad hoc* surveys subsequent to the production of the Applicant's EIS indicates that the Dromagowlane/Trafrask River does support small breeding populations of brown- or sea trout (*Salmo trutta*) and Atlantic salmon (*Salmo salar*), but the status and natural stability of these populations remain unknown. There is, however, no statutory protection attributed to either species within this river system.

The Applicant maintains that the RPS dispersion study indicates that the operation of a fish farm at Shot Head would not affect the health status of the small populations of salmonids in the river system and further points to the improving status of wild stocks in Bantry Bay against the background of currently-establish fish farm activity.

While we accept that the hydrological modelling indicates a negligible chemical contamination impact, we are not fully convinced that the presence of the farm presents no lice infection risk to any salmonid populations associated with the river. We acknowledge that the recently-produced MHI Integrated Pest Management Plan (see below) will serve to maintain lice levels at manageable levels, but a concern remains in respect of the risk to these populations and the implications for the interdependency with freshwater pearl mussel.

(ib) Freshwater pearl mussel in the Dromagowlane/Trafrask River system

In order to respond to the Board's Section 47 request the Applicant consulted NPWS published data, together with specific experts from NPWS, the Institute of Technology Tralee and an acknowledged freshwater pearl mussel specialist..

While freshwater pearl mussels are known to occur in some Bantry Bay river systems, information on current status is sparse and conservation protection through site designation for this species has not been applied in the Bantry Bay catchment. Confidential information (necessary due to the endangered status of the species) does, however, confirm the presence of freshwater pearl mussel populations at multiple locations in the upper tributaries of the river system.

Freshwater pearl mussel is an endangered species listed under Annex II and V of the EU Habitats Directive and protected under the Convention on the Conservation of European Wildlife and Natural Habitats. It is listed on the IUCN Red List as internationally endangered. It is legally protected in Ireland under Schedule 1 of the Wildlife Act, 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477, 2011) (as amended). As such, any plans developments or activities that may cause undesirable impacts on populations must be fully evaluated.

The decline of freshwater pearl mussel was historically due to collection for its pearls, but, with a universal ban on collection in place, continuing declines have been attributed to river water quality, largely due to discharges or contamination from domestic or agricultural sources. It is considered highly unlikely that waste discharges from the proposed Shot Head fish farm will have an impact on any freshwater pearl mussels established in the Dromagowlane/Trafrask river system.

The life cycle of freshwater pearl mussel, individuals of which are known to live for over 100 years, includes attachment of the larval stage to a salmonid host, through which the species is dispersed and recruited into established colonies. The most common dispersal agents are salmonids, so in this respect the continuing survival of the freshwater pearl mussel in the Dromagowlane/Trafrask River system is likely to be dependent on the maintenance of a healthy breeding population of salmonids.

<u>As indicated above, the proximity of the proposed Shot Head salmon farm to the Trafrask embayment entrance might arguably constitute an enhanced sea lice risk, in which a significant infestation event may substantially affect the viability of the river's salmonid population. The key issue is therefore whether the Applicant's recently submitted Integrated Pest Management Plan is sufficient to mitigate any future fish farm-derived impact on salmonid populations within the Dromagowlane/Trafrask River.</u>

(ii) Well boat discharges

The Applicant confirmed that well boat treatments and the subsequent discharge of effluent would be undertaken within the licence area and that the modelling data indicates that this regime would maintain chemical levels below the EQS at all times. We therefore consider that this issue has been adequately addressed.

(iii) Suitability of the cage and mooring system

The Applicant points out that under current licencing arrangements the Engineering Division of DAFM can only impose a specification and grant certification of the installation design after the licence has been approved, so they are unable to provide final details of the proposed Shot Head farm installation. They do, however, indicate that the system will be comparable to that successfully used at the similarly-exposed Clare Island smolt site.

Since the suitability of the system will be subject to scrutiny and approval at a later date, we consider this matter can be managed by deferral to DAFM expert approval.

(iv) Limitations in the use of Emamectin Benzoate (Slice®) at Shot Head

The Applicant indicated that subsequent to the licence application MHI have developed an Integrated Pest Management Strategy (supplied) for controlling sea lice on its farms. The strategy includes:

- Rigid monitoring programme, beyond statutory requirements (monthly lice inspection rising to twice-monthly during susceptible period)
- separation of generations
- annual fallowing of sites
- strategic application of chemotherapeutants
- good fish health management
- close co-operation between farms
- Use of non-medicinal treatments (cleaner fish – wrasse, lumpsucker)

Successful integrated pest management will keep lice burdens to both a minimum and within statutory limits. While they do not specifically address the issue of restricted use of Emamectin Benzoate at the Shot Head location due to low dispersion rates, the Applicant does point out that only four applications of the chemical have been required since 2008.

We are willing to accept that the current regime in Bantry Bay has maintained lice levels at the farm site at a low level and within statutory limits. A full adoption of an Integrated Pest Management Strategy is key to minimising the lice burdens and the need for the application of EmBz. It is therefore perhaps acceptable that where Slice® cannot be used the alternative chemical treatments will constitute a reasonable substitute. We would

point out, though, that one of the stated strategy elements will be restricted by the timing of a lice outbreak event, namely:

"*MHI shall focus its lice treatment regime around the pre-winter treatment for all fish in Bantry Bay including Shot Head, which will be over-wintered. During the months of January to May, numbers of ovigerous female and total* Lepeophtheirus salmonis *will be maintained as close to zero as possible using appropriate treatments where necessary. Where two sites are stocked in the Bay, treatments will be carried out on both during the same time period and with the same chemical class*."

Clearly, the simultaneous treatment with Slice® cannot be undertaken when the stock biomass (at around seven months' post-smolt transfer) prevents the safe use of the treatment at the Shot Head site.

Overall, the present situation suggests that lice issues remain a low-level risk. We do, however, remain to be convinced in respect of the Strategy's ability to safeguard the wild salmonid populations (and by association the freshwater pearl mussel population) in the Dromagowlane/Trafrask River system.

(v) Seabed impacts in respect of the requested change in the licence conditions to accommodate four additional cages

The Applicant confirmed that the maximum allowable biomass of 2,800 tonnes will be maintained across the additional cages and indicated that the change in cage configuration will only result in more diffuse waste outputs, with lower concentrations distributed over a slightly greater footprint area. We accept that this is the likely outcome of the requested increase in cage number and, since the impacts will be confined to well-within the licence area, we consider this issue of negligible concern,

(vi) The possible presence of a harvestable Nephrops norvegicus *resource within the proposed licence area*

The Applicant maintains that the density of *N. norvegicus* is low within the proposed licence area, pointing out that high resolution data on shell fishing activity are not available, going on to state that they believe there to be only one vessel engaged in potting for *N. norvegicus* in the vicinity of the proposed licence area. In addition, the Applicant argues that the area of suitable substrate type held within the boundary of the area constitutes around 0.5% of the available total suitable area and thus represents a reasonable sharing of resources. Moreover, they also point out that potting activity will not be excluded from the proposed licence area and would expect pot fishing to continue to occur adjacent to the mooring grid as it does at the other Bantry Bay farm sites.

A submission from the Marine Institute supports this view, drawing on expert information indicating that commercial pot fishing has only nominal overlap with the licence area, stating that:

"… disruption would appear limited and pot fishing could otherwise continue in very close proximity to the proposed salmon farm, should the Minister be minded to grant approval of the application.".

Taking these submissions into consideration, while also acknowledging that no appeals were received by the Bantry Bay fishing sector, we are of the opinion that the presence of *N. norvegicus* withn the Shot Head licence area should not constitute grounds for refusal of a licence.

11.0 Draft Determination Refusal /or Grant

It is recommended that final licence refusal or approval should be determined subsequent to further consideration of the outstanding technical issues in respect of the potential risk to the salmonid and freshwater pearl mussel populations in the Dromagowlane/Trafrask River system.

Technical Advisor: Dr. Graham Saunders

Date: 31st December, 2016

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