To: Ohara, Mary (Alab)
Cc: Helen Boles; Terry McMahon; Francis X O Beirn
Subject: ALAB - Appeal - Request for Documents Ref API/2019 Site Ref T06/202

Dear Mary

In response to your request for Documents in respect of Silver King Seafoods t/a MOWI to continue Aquaculture Operations for the culture of Salmon at a site east of Deenish Island. (your ref: API/2019 Site Ref T06/202) issued on 30th of October, please find attached a briefing paper on Maximum Allowable Biomass prepared by the Marine Institute for Department of Agriculture, Food and the Marine as a basis for determining and regulating finfish licences at individual sites.

Also, please find attached annual benthic review documents for the period requested. A summary of reporting and environmental compliance at the Deenish Site (T06-202A) as provided to Department of Agriculture Food and the Marine from 2005 to 2019 indicates that no fish were held onsite between 2005 and 2009. The full annual benthic monitoring site reviews for the Deenish Site prepared by the Marine Institute and submitted to DAFM, for the remaining period are included.

If there are any other records that you require please let us know.

Yours sincerely

Joe Silke
Director
Marine Environment and Food Safety Services
Marine Institute

Date:

To:

From: Marine Institute

CC:

Re: ALAB Section 47 request - Benthic reports Deenish (T06-202A)

An annual report is prepared by the Marine Institute and submitted to DAFM and includes a review of the marine fish farm benthic survey reports received by the Marine Institute Benthos Ecology Group (BEG) for surveys conducted during the previous year and a comment on their compliance with the standards identified in the Monitoring Protocol No. 1 for Offshore Finfish Farms - Benthic monitoring (December 2008)[1]. The mechanism of review and subsequent reporting has evolved since the inception of the protocol (May 2000). The change in formatting of the reports provided in Appendix 1 represents this evolution. As an example, in 2015 specific changes were made in the manner on which the site reports provided by the operators were assessed and reported by the Marine Institute. The level of reporting compliance continues to be reported as before. In relation to environmental compliance, a site would be assessed as acceptable or unacceptable or indeterminate based on the information provided in the audits. As of the 2015 reviews, the classification is as follows:

- **Acceptable**- conditions within the environmental standards stated in the 'Monitoring Protocol No. 1 for Offshore Finfish Farms – Benthic Monitoring, 2008'
- **Not acceptable**- conditions not within the environmental standards stated in the 'Monitoring Protocol No. 1 for Offshore Finfish Farms – Benthic Monitoring, 2008'
- **Indeterminate**- Essential information e.g. inclusion of residual current direct, maximum biomass and current speed missing which prohibits judgement regarding the environmental condition at the site.

This change, the introduction of the 'indeterminate' classification, is a consequence of reports being submitted with important technical information missing (e.g., residual current direction, stocking data, visual description, etc.).

Following (Table 1) is a summary of reporting and environmental compliance of the MI reports on the Deenish Site (T06-202A) provided to Department of Agriculture Food and the Marine from 2005 to 2019, inclusive.

Table 1: Summary of reporting compliance 2008-2019

Year	Report received	Comment
2005	No	Not required, no fish on site
2006	No	Not required, no fish on site
2007	No	Not required, no fish on site
2008	No	Not required, no fish on site

1 (https://www.agriculture.gov.ie/media/migration/seafood/aquacultureforeshoremanagement/marinefinfishprotocols/Benthic%20Monitoring.pdf).

2009	No	Not required, no fish on site
2010	Yes	Acceptable environmental conditions
2011	Yes	Acceptable environmental conditions
2012	Yes	Acceptable environmental conditions
2013	Yes	Acceptable environmental conditions
2014	Yes	Unacceptable. Environmental conditions could not be determined due to lack of information
2015	Yes	Acceptable environmental conditions
2016	Yes	Acceptable environmental conditions
2017	Yes	Acceptable environmental conditions
2018	Yes	Acceptable environmental conditions
2019	Yes	Acceptable environmental conditions

No reports were provided to the Marine Institute between 2005 and 2009. It was communicated that, during this period, the site did not hold any fish. The full annual benthic monitoring site reviews for the Deenish Site prepared by the Marine Institute and submitted to DAFM, for the period 2010 to 2019 are found below (Appendix 1).

Appendix 1.

2010	
Company	**Marine Harvest**
Location	**Kenmare River, Co. Kerry**
Site name	**Deenish (202A)**
Biomass	Unknown
Visual Assessment	The sediment at this site is dominated coarse material. Conditions were considered good throughout with little or no evidence of fishfarming activity.
REDOX	Given the extremely coarse nature of the sediments at this site it was not possible to acquire sufficient REDOX readings at depth in the cores. Those reading acquired indicated healthy sedimentary conditions.
Organic Carbon	Organic carbon readings were elevated in and around the cages. However, no values were provided for control location and hence comparisons could not be effected.
Overall Assessment of Conditions	**Acceptable.**

2011	
Company	**Marine Harvest**
Location	**Kenmare River, Co. Kerry**
Site name	**Deenish (T10/202A)**
Biomass	No tonnage was provided in the report – estimates based upon queries from MI Sea Lice team indicate that standing stock at the site was approx. 1400 tonnes (7 cages x 200T)
Visual Assessment	The sediment at this site is dominated coarse material. However, it was difficult to distinguish sediment type beneath and at the cage edge as the surface was covered by a combination of bacterial mats, fecal pellets and waste food. At 10m and beyond visual observations indicated conditions that were considered good with little or no evidence of fishfarming activity. Faunal data indicated depressed diversity indices in samples from beneath the cages. The multivariate analysis demonstrated grouping beneath and out to 20m as distinct from those stations further out. It is highly likely that the undercage site is distinct from the others due to impact of fishfarm and the other two groups distinguish themselves from each other as a consequence of sediment type.
REDOX	ARPD readings at the site indicated relatively well oxygenated sediments throughout. These results are contrary to the observations at the surface beneath and at the edge of cages.
Organic Carbon[i]	Organic carbon values were considered acceptable.
Overall Assessment of Conditions	**Acceptable.**

[i] The methodology used to measure organic matter was not appropriate. The method utilised measured total organic matter and carbonate (shell material) hence the high percentage values observed. The correct method would identify just organic matter by sample ignition at 550-600°C for 3-4 hours. This method will measure the most relevant indicator relating to finfish culture, i.e., organic matter.

2012	
Company	**Marine Harvest**
Location	**Kenmare River, Co. Cork**
Site name	**Deenish (T06/202A)**
Biomass	190.9 Tonnes were on site at the time of the survey
Visual and Faunal Assessment	The seabed beneath and out to the cage edge did have some moderate impact of fisharm activity. At stations beyond this and in the faunal analysis, no impact was evident.
REDOX	The ARPD values for the most part reflected the visual observations and indicated minor impact out to 20m stations and no impact beyond.
Organic Carbon	All organic carbon values were within allowable limits.
Overall Assessment of Conditions	**Acceptable**

2013	
Company	Marine Harvest
Location	Kenmare Bay
Site name	Deenish
Biomass	200.3 tonnes at time of survey
Visual Assessment	The choice of transects at this site were not according to suggested protocol. Transects were taken against the current and at the edge of the cage group, justification for this choice should have been included in the report. Fine medium sand was seen under the sea cages and became more coarse towards the end of the transects. Obvious signs of aquaculture were seen at stations under and to the edge of the cage. These signs included waste feed; faecal cast; faeces; patches of *Beggiatoa spp* and mussel debris. All of these signs were contained to with 20m of the cage. The surface sediment at all stations was olive brown in colour suggesting healthy oxygenated sediment.
REDOX	ARPD's at this site were generally shallow; the reference site had an ARPD of 2.5cm. Although the ARPD's were generally shallow, under the cages showed the most shallow reading of < 1 cm.
Organic Carbon	Organic carbon levels varied from 1.56% to 7.08%. T1 showed a lower level of organic carbon under the cage an increased as it neared the end of the transect. T2 showed the opposite with the highest value at the edge of the cage and decreasing towards the end of the transect.
Overall Assessment of Conditions	**Acceptable** - No impact of the sea cages can be seen beyond 10m. In the future the transect choice should be justified, where possible transect should show the worst possible impact area (down current of the cage group). The choice of transects in this survey are not representative of the site.

2014	
Company	Marine Harvest
Location	Kenmare Bay
Site name	Deenish
Biomass	Not specified
Visual Assessment	This report did not include a description at each sampling site, photographic evidence or the level of survey required under the monitoring protocol.
REDOX	The mean redox reading for each station was above the standard (>0 mV). The lowest reading was at the cage edge which had a reading of 0.2mV.
Organic Carbon	No information was presented.
Faunal analysis	The following faunal analysis was calculated, AMBI score, Shannon- Weiner diversity index and non pollutant indicators. The three stations nearest to the pen were moderately disturbed according to AMBI results, all other stations were classified as slightly disturbed and the reference station was undisturbed. Non pollutant indicator species were found at five of the nine stations samples.
Overall Assessment of Conditions	**Unacceptable**. An overall assessment of environmental health cannot be made based on the survey report presented. In future, Monitoring protocol No. 1 for Offshore Finfish Farms- Benthic Monitoring should be followed prior to survey and report completion.

2015	
Company	Marine Harvest
Location	Kenmare Bay
Site name	Deenish (T6/202)
Species	Atlantic Salmon
Date of Survey	June 2015
Stocking details	Stocked January – March 2015
Maximum Biomass	257.3 tonnes at time of survey
'Mean' of maximum current speeds	30cm sec $^{-1}$
Direction of prevalent current flow	Not included
Level of Benthic Monitoring	Level 1
Visual Assessment	The seabed was composed of fine to medium sand with shelly sand in areas. Under and close to the cage structure saw waste feed, faecal casts and patches of *Beggiatoa spp*. These impacts from aquaculture were contained to within 10m of the cage.
Redox Potential	ARPD's were not obtained at many of the stations due to the nature of the seafloor. SPI camera was unable to penetrate to obtain an accurate reading.
Organic Matter	Percentage LOI was relatively low at all stations, with a slight elevation in values under the cage.
Overall Assessment of Conditions	**Acceptable**
Previous Assessment	Unacceptable 2014- Report lacking information such as Organic matter measures, Biomass, level of survey and photographs.
Recommendations for License holders	Information on prevailing current direction should be included as this is the area most likely for spoil material to settle. If a transect is not in the direction of the prevailing current, justification is needed for the choice.

2016	
Company	Marine Harvest
Location	Kenmare Bay
Site name and DAFM code	Deenish (T6/202)
Species	Salmon
Date of Survey	20th July 2016
Stocking details	Stocked January 2015, fallow for 7 weeks prior.
Maximum Biomass	Not given 1517.5 tonnes at time of survey
'Mean' of maximum current speeds	Mean current speed 30cm sec^{-1}
Direction of residual current flow	Not given
Level of Benthic Monitoring	Level 1
Visual Assessment	There was no obvious sign of aquaculture at any of the stations.
Redox Potential	ARPD's were shallower under the cage but variable throughout the site.
Organic Matter	Organic matter levels were elevated under the cage but not significantly different to those see at the reference site.
Overall Assessment of Conditions	**Acceptable**- Minimal impact from fish farm.
Previous Assessment	Acceptable 2015
Recommendations for License holders	None. We would query the mean current speed presented (i.e., 30cm/sec)?

Monitoring Protocol No. 1 for Offshore Finfish Farms - Benthic Monitoring Individual Site Review 2017			
Licensed Operator	Marine Harvest Ltd.		
Site name and DAFM site code	Deenish (T6/202A), Kenmare Bay, Co. Kerry		
Species	Salmon		
Date of survey	26th October 2017		
Stocking details	Stocked March 2017 after 10 weeks fallow period. 558 tonnes at time of survey		
Mean bottom current speed	30cm/sec		
Maximum licensed Biomass			
Level of Benthic Monitoring	Level 1		
Direction of residual current flow	Not reported		
Accumulated feed within AZE?	No	**Feed pellets beyond the AZE?**	No
Bacterial mat >50% within AZE?	No	**Bacterial mat outside of AZE?**	No
Visual Assessment- Overview	No sign of impact from cages on either transect.		
Faunal analysis (Level 2 only)	N/A	N/A	
Redox Potential (Relate to control and sediment type)	Mean of 3.9cm at reference station. All other stations had a range of means from 2.1cm to 9.9cm		
Average %LOI within AZE	4.47	**Threshold value within AZE**	6.08
Average %LOI outside AZE	2.91	**Threshold value outside AZE**	3.80
Overall Assessment of Conditions	**Acceptable**		
Previous Assessment	Acceptable 2016		

Monitoring Protocol No. 1 for Offshore Finfish Farms - Benthic Monitoring Individual Site Review 2018			
Licensed Operator	Marine Harvest Ltd.		
Site name and DAFM site code	Deenish (T6/202A), Kenmare Bay, Co. Kerry		
Species	Salmon		
Date of survey	24th May 2018		
Stocking details	1,532.7 tonnes at time of survey. Stocked March 2017 with 44.6 tonnes of fish following a 10 week fallow period.		
Mean bottom current speed	Mean current speed 30cm/sec		
Maximum licensed Biomass	Not reported		
Level of Benthic Monitoring	Level 1		
Direction of residual current flow	North- South		
Accumulated feed within AZE?	No	**Feed pellets beyond the AZE?**	No
Bacterial mat >50% within AZE?	No	**Bacterial mat outside of AZE?**	No
Visual Assessment- Overview	Overall healthy appearance.		
Faunal analysis (Level 2 only)	N/A		N/A
Redox Potential (Relate to control and sediment type)	ARPD depths along each transect were similar to those recorded at the reference station.		
Average % LOI within AZE	4.14	**Threshold value within AZE**	5.84
Average % LOI outside AZE	2.82	**Threshold value outside AZE**	3.65
Overall Assessment of Conditions	**Acceptable**.		
Previous Assessment 2017	Acceptable		

Monitoring Protocol No. 1 for Offshore Finfish Farms - Benthic Monitoring Individual Site Review 2019			
Licensed Operator	MOWI Ltd.		
Site name and DAFM site code	Deenish (T6/202A), Kenmare Bay, Co. Kerry		
Species	Salmon		
Date of survey	13th September 2019		
Stocking details	387.2 tonnes of fish at time of survey.		
Mean bottom current speed	30cm/sec		
Maximum licensed Biomass	Not reported		
Level of Benthic Monitoring	1		
Direction of residual current flow	North- South		
Accumulated feed within AZE?	No	**Feed pellets beyond the AZE?**	No
Bacterial mat >50% within AZE?	No	**Bacterial mat outside of AZE?**	No
Visual Assessment- Overview	Some waste under the cage. Overall healthy appearance.		
Faunal analysis (Level 2 only)	N/A	N/A	
Redox Potential (Relate to control and sediment type)	ARDP depths similar to the reference station.		
Average %LOI within AZE	2.86	**Threshold value within AZE**	5.38
Average %LOI outside AZE	2.32	**Threshold value outside AZE**	3.36
Overall Assessment of Conditions	Acceptable		
Previous Assessment	Acceptable 2018		

Maximum Allowable Biomass in the context of aquaculture licencing of salmon farms

AFMD (DAFM) have requested, from the MI, briefing material on the relationship between the Maximum Allowable Biomass (MAB) at a finfish culture site and licence conditions at a number of finfish sites, i.e., harvest tonnage and input smolt numbers.

Background

Currently, finfish farming licence conditions relating to the loading of stock are varied in terms of the conditions and can range from annual inputs of number of fish to the site (i.e., 'smolts'), annual harvest tonnage to maximum allowable biomass (or surrogate) at any time. It should also be noted that some licences have conditions that are time-bound, i.e., relate to activities within a calendar year.

Many of these conditions were applied either at a time when stock was consistently moved between sites at various production stages. The conditions were largely derived from the production cycles proposed by the applicants and were proposed in the submitted applications. The practices currently proposed at many sites have changed and have been initiated to reflect current industry best-practice, e.g., single generation at sites to harvest, which are principally designed to manage for disease and parasite risks.

Previously, in relation to the use of MAB as a licence condition, the Marine Institute communicated that stock control methods at fish farm sites are such that operators have efficient and accurate means to estimate standing stock at sites (Annex 1 below). As such, the use of MAB as a licence condition would be easily verifiable.

These matters were further considered by a Working Group convened to develop new Aquaculture License Templates. The WG consisted of the Aquaculture and Foreshore Management Division, Marine Engineering Division, BIM and the Marine Institute. On the basis of the recommendations of this WG there was a new template produced to give effect to a move to Standing Stock Biomass as a measure of production capacity at a finfish aquaculture site.

The new Aquaculture License Templates were launched by Minister Coveney in December 2011. A Press Release issued by DAFM at the time noted that:

The new templates will be introduced as individual licences come up for renewal and as new licences are issued.

New Aquaculture licence templates have been devised to take account of the technological, environmental and legal issues that have arisen since the first licences were issued under the Fisheries (Amendment) Act 1997 - the core legislation governing aquaculture licensing. The templates were developed by a Working Group established to address these issues. The Working

Group consisted of the Department's Aquaculture and Foreshore Management Division, Engineering Division, Legal Services Division, the Marine Institute and BIM.

One of the core changes specifically referenced was:
to change from licensing by Annual Harvested Tonnage (i.e. the dead weight of fish harvested from a site in a calendar year measured in tonnes) to Standing Stock Biomass for Finfish (the weight of live fish on a site at any given time, measured in tonnes). Standing Stock Biomass is recognised internationally as the appropriate metric for assessing loading at an aquaculture production site and can be measured on a real time basis thus facilitating effective regulation and management of sites.

Subsequently the change to MAB was included in the National Strategic Plan for the Sustainable Aquaculture Development published by DAFM in 2015. The Plan recommended that:

1. Licences for individual sites should be issued on the basis of approval for an initial maximum allowable biomass and, where sought, a provision for a gradual, phased build up.
2. An appropriate maximum for new individual offshore salmon farms is considered to be 5,000 tonnes (peak biomass). The allowable peak biomass will be site specific and will rely upon a full assessment of environmental considerations, e.g. site characteristics, carrying capacity and separation distance from adjacent operations.
3. Following establishment of a farm, permission for additional tonnage beyond the initial licensed peak biomass may be sought, subject to a total maximum of 7,000 tonnes (peak biomass). Such a request could be considered subject to the following:

    a. The EIS accompanying the licence application shall include all of the relevant information to describe the physical characteristics of the project, the production processes, expected residues and emissions and the likely significant effects of the proposed project through the various phases;
    b. The phasing and timing for permission to scale-up beyond the initial allowable biomass should be set at the licensing stage, taking into consideration, for example, site characteristics, stocking strategies and production cycle issues;
    c. Approval to increase the capacity above the initial allowable biomass should only be considered following a rigorous assessment of monitoring outcomes;
    d. Monitoring requirements should be included as a licence condition.

Definitions / terminology

Some definition may be useful:

Biomass is the weight of live matter, of fish, in the case in question. It can also be used to describe the amount of shellfish or plant matter or a combination of all three depending on the context.
Standing Stock Biomass is defined as: The weight or mass of live fish (stock) held at a particular site or location at a particular time.
Maximum Allowable Biomass can be defined as the maximum Standing Stock Biomass permitted at a site or location. In effect standing stock biomass can be regarded as the measurement where the MAB is the limit.

Calculation / Estimation of Maximum Allowable Biomass

As noted above, Maximum Allowable Biomass as assessed in terms of Standing Stock Biomass is an appropriate parameter to measure production capacity at a finfish aquaculture site. The loading conditions at finfish installations in Norway, Canada and Scotland are based upon Maximum Allowable Biomass or some variation of same.

Upon review of a number of Environmental Impact Assessment Reports (EIAR) submitted as part of finfish licence applications, it would appear that a standard production model is being applied across the industry for new production sites. The model makes certain assumptions and considers variation inherent in the finfish production process and in relation to a number of factors including:

- All-in/all-out (24 month) production cycle.
- Timing of year production would commence, S1(Spring input) or S1/2/S0 (Autumn input)?
- Food Conversion Ratio (FCR)
- Site–specific growth rates (physiological parameters, temperature)
- Mortality rate
- Density (kg/m3)
- Weight of fish at input to site
- Number of fish at input to site

which reflect some of the assumptions identified above, i.e., a 24 month production cycle per site (including a 2 month fallow period), a mortality estimate of 19-20%, FCR of 1.25-1.20 and a standard growth rate applied per month over the 22 months while fish were in the water. Table 1 below represents an example of the production model produced for the Galway Bay fishfarm sites by BIM. In this model is it evident that maximum Standing Stock Biomass is achieved at months 16-17 after which it declines as harvest commences, until month 22 (the end of the cycle) when all fish have been harvested out. It should be noted that this model represents the production at sites where the process commences from scratch which are inherently different to some existing sites in terms of production models and licence conditions.

Table 1. Projected production model Galway Bay site (Source: BIM 2012). Note standing stock biomass at months 16/17 and total harvest tonnage.

EIS for proposed deep sea sites

Projected S1 base grow-out model for proposed Galway Bay sites.

Year	Month	Months growth	Fish number		Mortality		Mean weight gms		Total Biomass T		Mean SD @ pen volume 1,215,842.00	Biogain / month T	Harvest			FCR	Feed used T / month
			begin month	end month	per month %	number/ month	begin month	end month	begin month	end month			Number	MW kg	Tonnes		
	Feb																
1	Mar	1	3,582,355	3,492,796	2.50	89,559	75	109	268.7	380.7	0.3	112.0	0	0	0	2.13	239
1	Apr	2	3,492,796	3,440,404	1.50	52,392	109	156	380.7	536.7	0.4	156.0	0	0	0	2.13	332
1	May	3	3,440,404	3,412,881	0.80	27,523	156	231	536.7	788.4	0.6	251.7	0	0	0	1.62	408
1	Jun	4	3,412,881	3,395,817	0.50	17,064	231	343	788.4	1,164.8	1.0	376.4	0	0	0	1.39	523
1	Jul	5	3,395,817	3,378,837	0.50	16,979	343	517	1,164.8	1,746.9	1.4	582.1	0	0	0	1.26	733
1	Aug	6	3,378,837	3,361,943	0.50	16894	517	743	1,746.9	2,497.9	2.1	751.1	0	0	0	1.22	916
1	Sep	7	3,361,943	3,331,686	0.90	30257	743	1,008	2,497.9	3,358.3	2.8	860.4	0	0	0	1.18	1,015
1	Oct	8	3,331,686	3,291,706	1.20	39,980	1,008	1,318	3,358.3	4,338.5	3.6	980.1	0	0	0	1.17	1,147
1	Nov	9	3,291,706	3,242,330	1.50	49,376	1,318	1,621	4,338.5	5,255.8	4.3	917.3	0	0	0	1.16	1,064
1	Dec	10	3,242,330	3,167,756	2.30	74,574	1,621	1,923	5,255.8	6,091.6	5.0	835.8	0	0	0.00	1.15	961
2	Jan	11	3,167,756	3,110,737	1.80	57,020	1,923	2,169	6,091.6	6,747.2	5.6	655.6	0	0	0.00	1.15	754
2	Feb	12	3,110,737	3,092,072	0.60	18,664	2,169	2,436	6,747.2	7,532.3	6.2	785.1	0	0	0.00	1.15	903
2	Mar	13	3,092,072	3,054,967	1.20	37,105	2,436	2,753	7,532.3	8,410.3	6.9	878.0	0	0	0.00	1.15	1,010
2	Apr	14	3,054,967	3,030,528	0.80	24,440	2,753	3,129	8,410.3	9,482.5	7.8	1,072.2	0	0	0.00	1.16	1,244
2	May	15	3,030,528	3,009,314	0.70	21,214	3,129	3,634	9,482.5	10,935.8	9.0	1,453.3	0	0	0.00	1.16	1,686
2	Jun	16	3,009,314	2,973,202	1.20	36,112	3,634	4,050	10,935.8	12,041.5	9.9	1,105.6	0	0	0.00	1.16	1,283
2	Jul	17	2,973,202	2,573,238	1.20	35,678	4,050	4,415	12,041.5	11,360.8	9.4	958.7	364,286	4.500	1,639.29	1.16	1,112
2	Aug	18	2,573,238	2,038,366	0.80	20,586	4,415	4,808	11,360.8	9,800.5	8.1	856.8	514,286	4.700	2,417.14	1.16	994
2	Sep	19	2,038,366	1,443,488	0.80	16,307	4,808	5,169	9,800.5	7,461.4	6.1	698.4	578,571	5.250	3,037.50	1.16	810
2	Oct	20	1,443,488	984,827	0.60	8,661	5,169	5,318	7,461.4	5,237.3	4.3	205.9	450,000	5.400	2,430.00	1.16	239
2	Nov	21	984,827	508,474	0.50	4,924	5,318	5,544	5,237.3	2,819.0	2.3	221.7	471,429	5.600	2,640.00	1.16	257
2	Dec	22	508,474	0	0.40	2,034	5,544	5,600	2,819.0	0.0	0.0	17.1	506,440	5.600	2,836.06	1.16	20
	Jan	23															
	Feb	24															
Totals						**697,343**						**14,731**	**2,885,012**	**5.20**	**15,000.00**		**17,649**

Fish numbers / percent summary		
Fish transferred to grower site Nov	3,582,355	%
Grower site mortality allowance / %	697,343	19.5
Total fish number harvested	2,885,012	

Harvest / biogain summary tonnes	
Total weight harvested	15,000
Transfer weight in, start March	269
Total biogain	14,731

Feeding and feed conversion rate summary	
Growout cycle feed	17,649
Biogain	14,731
Thus overall feed conversion rate	1.20

Considering the above, it is the Marine Institute view that that it is not possible or justifiable to introduce a simple conversion to directly convert smolt input or annual harvest tonnage to Maximum Allowable Biomass. Notwithstanding the above as all applications for the renewal / review of existing aquaculture licences, as well as applications for aquaculture licences at new sites must be accompanied by EIS / EIAR, production models similar to that present in Table 1 above will be provided. If such models are not provided they can be specifically requested from the applicant by way of a request for further information. Therefore, information on proposed Standing Stock Biomass and Maximum Standing Stock Biomass will be available for consideration and assessment.

Verification of Standing Stock Biomass at a site is possible through the examination of records held by the farm operator on stock input, growth, mortality, harvest This would allow official collection of data on stocking numbers and mortality.

As identified above, the growth and performance of stock at any site is a function of a number of variables not the least which is the ability of the site from an environmental perspective, to withstand the pressure resulting from the activity in question. We note the previous advice from the MI on this matter which communicated that flexibility might be built into the production process as long as acceptable environmental conditions are maintained which ultimately result in performance based environmental standards. Similar to above, to establish such monitoring protocols would require an efficient and responsive monitoring system that can respond to real-time reporting.

The Marine Institute is of the view that this approach is consistent with the approach set out in the National Strategic Plan for the Sustainable Aquaculture Development published by DAFM in 2015.

Marine Institute

8 July 2020

Annex 1
Briefing Note to DAFM from MI (March 2011)

Maximum standing stock biomass as a measure to manage and license fin-fish production

First some definitions:

Annual Harvested Tonnage:	The dead weight of fish slaughtered &harvested from as site in a calendar year measured in tonnes.
Standing Stock Biomass:	The weight in tonnes of live fish on a site at any given time, measured in tonnes. It is arrived at by multiplying the estimated number of fish on site by their average weight.
Maximum Biomass:	The maximum Standing Stock Biomass permitted to be on site at any time.

The Marine Institute is in favour of the use of standing biomass as a measure of production and has also commented favourably on the suggestion that where no problems have been identified the environmental conditions should not be an impediment to increasing the loading on-site. However this view is with the caveat that good administrative procedures that will allow rapid turnaround of productions statistics allied with monitoring results so that changes occurring on site can be reflected in any variations on the conditions of operation for the site.

Annual harvested tonnage, which is the metric used in aquaculture licenses currently is intended as a proxy for maximum biomass and it has always been recognised that there were serious limitations with this approach. Not least of these is that annual harvested tonnage can only be determined after the fact and where tonnage is harvested over two calendar years can be a very imperfect measure of loading on a site. Where fish are not harvested at a site but moved to a second site for finishing before slaughter the concept of annual harvested tonnage is wholly inappropriate. For these and other reasons it is intended in the new licence templates currently being prepared to move to Maximum Standing Stock Biomass as a measure of production to be permitted at a site.

Internationally Standing Stock Biomass is recognised as the appropriate metric for assessing loading at an aquaculture production site and can be measured on a real time basis thus facilitating effective regulation and management of sites.

Summary of the benefits of using Standing Stock Biomass as a measure of production:-

1. It is the biomass that ultimately determines the effect on the local environment, as in output (nutrients and organic waste) as well as oxygen consumption (carrying capacity of the site). The biomass relates to the present at any time, while the harvested tonnage is a historic accumulation.
2. In case of a pre-harvest site or finishing site where fish are moved to enable other sites to fallow, or in order to protect grown stock from winter storms & enable reliable harvesting then the Maximum Standing Stock Biomass is still an appropriate measure but the concept of annual harvested tonnage cannot be applied.
3. Within the Maximum Standing stock Biomass, the farmer has flexibility to manage his fish to suit the requirements of the market, or cope with unforeseen stock performance:
    a. if the fish survive at a high percentage he may need to harvest off some fish early at a small size, or large size if some fish grow faster, yet can manage the remainder of the stock as would have been originally planned for the market. If this is production only, he would have to harvest all surviving fish early – smaller than the market requirement and at the wrong time.
    b. if the fish do not survive well, or grow very poorly then the farmer can postpone his harvest and catch up the growth towards the end of the cycle and recover his production cost which is driven strongly by volume.
4. Maximum Standing Stock biomass is used as the controlling parameter in both Scottish and Norwegian licenses and is considered best practice internationally.