

**IN THE ENVIRONMENT COURT
AT CHRISTCHURCH
I TE KŌTI TAIAO O AOTEAROA
KI ŌTAUTAHI**

Decision No. [2022] NZEnvC 169

IN THE MATTER of the Resource Management Act 1991

AND an application for declarations under
s311 of the Act

BETWEEN THE NEW ZEALAND KING
SALMON CO. LIMITED

(ENV-2021-CHC-74)

Applicant

AND MARLBOROUGH DISTRICT
COUNCIL

Respondent

Court: Environment Judge J J M Hassan
Sitting alone under s309 of the Act

Hearing: In Chambers at Christchurch

Appearances: Q A M Davies and J S Marshall for The New Zealand King
Salmon Co. Limited
M J Radich and S A Wadworth for Marlborough District
Council
J C Ironside for Friends of Nelson Haven and Tasman Bay
(Inc) and Guardians of the Sounds Incorporated
M J Slyfield for McGuinness Institute

Last case event: 4 February 2022

Date of Decision: 7 September 2022

Date of Issue: 7 September 2022



DECISION OF THE ENVIRONMENT COURT

A: Pursuant to s313 of the RMA, the application is granted insofar as declarations are made at [94].

B: Costs are reserved and a timetable set.

REASONS

Introduction

[1] The New Zealand King Salmon Co. Limited ('King Salmon') seeks a declaration under s311, RMA,¹ pertaining to the proper interpretation of certain conditions of its Resource Consent 'U140294' for the operation of its Waitata Salmon Farm.

[2] This arises from a dispute with Marlborough District Council ('MDC') as to the proper interpretation of Condition 40 of the consent following reporting of benthic monitoring by King Salmon's consultants, Cawthron Institute. MDC interpret the results as revealing breach of Cond. 40. King Salmon disagrees. It is concerned not only about the implications this dispute may have for its farming operations and also its reputation in regard to RMA compliance.

[3] The application is opposed by MDC, Friends of Nelson Haven and Tasman Bay Inc and Guardians of the Sounds Inc ('Friends & Guardians') and The McGuinness Institute.

[4] The issues centre on the proper interpretation of certain conditions of U140294 pertaining to 'environmental quality standards' ('EQS') for seabed

¹ Resource Management Act 1991.

deposition associated with the operation of the salmon farm.²

[5] The original application for U140294 was part of a plan change and resource consent application bundle lodged with the Environmental Protection Authority under the RMA's processes for matters of national significance on 3 October 2011. The application had sought to enable development of nine proposed marine farms. According to the RMA procedures for such applications, hearings were initially before a Board of Inquiry ('BOI'), under s149J RMA.³ The BOI issued its report including determination of the consent applications on 22 February 2013.⁴ Following subsequent appeals (including to the Supreme Court), the final outcome was that Waitata Salmon Farm was one of four farms that were approved under resource consents.⁵

[6] In its final decision, the BOI described the conditions of U140294 as "hav[ing] been developed through the involvement and input of a number of parties and experts".⁶ As is later discussed in this decision, those conditions are both numerous and open to some interpretative difficulties. A central feature of the design of the conditions' set is provision for detailed adaptive management plans.

² Resource consent U140294 has been changed pursuant to s127 RMA on three occasions, none of those changes pertain to the conditions that are the subject of the declarations sought. The changes were dated 5 September 2017, 4 October 2018, and 16 November 2018.

³ Chaired by the late Environment Judge Gordon Whiting.

⁴ NZ King Salmon Board of Inquiry NSP000002, 22 February 2013 <https://www.epa.govt.nz/assets/FileAPI/proposal/NSP000002/Boards-decision/58f6cea1ec/King-Salmon-Final-Decision-Volume-1.pdf>

⁵ *Environmental Defence Society Inc v New Zealand King Salmon Company Ltd* [2014] NZSC 41; *Sustain Our Sounds Inc v New Zealand King Salmon Company Ltd* [2014] NZSC 40.

⁶ MDC submissions at [4], referring to Johnson affidavit affirmed 29 October 2021, Exhibit A, Document 3, Board of Inquiry's decision *New Zealand King Salmon Requests for Plan Changes and Applications for Resource Consents*, 22 February 2013, at [54].

The declarations sought

[7] King Salmon seeks declarations to the following effect:⁷

In the Environmental Quality Standards (“EQS”) in Table 3 of the consent conditions for MDC resource consent U140294, the numerical limits on Enrichment Stage (“ES”) limit ES as a single aggregate measurement and do not limit the ES equivalents of individual component variables.

The term “conditions” in the EQS means ES as a single aggregate measurement. Individual component variables are not required to be statistically comparable with appropriate reference stations.

Statutory framework

The court’s powers in making declarations

[8] The Environment Court has no inherent declaratory powers. Under s310(h), RMA the court may make a declaration pertaining to any issue or matter relating to the interpretation, administration, and enforcement of the RMA. Under s313, the court may:

- (a) make the declaration sought, with or without modification; or
- (b) make any other declaration that it considers necessary or desirable; or
- (c) decline to make a declaration.

Approach to the interpretation of resource consents

[9] A resource consent is to be interpreted “from its text and in the light of its purpose and its context”.⁸ Resource consents are to be interpreted according to their plain ordinary meaning, having regard also to the context in which the words

⁷ King Salmon application for declaration as to scope of conditions of coastal permit dated 22 June 2021 at [1].

⁸ Legislation Act 2019, s10.

are used.⁹ That includes the statutory regime of which the consent was a part and the terms of the application itself.¹⁰ The interpretative context also includes provisions of the relevant RMA plan and the consent application (including accompanying plans, drawings and other information).¹¹ The purpose of a condition in relation to the activity the consent seeks to enable is a relevant consideration.¹² The context can include the consenting decision itself.¹³

[10] I agree with Mr Davies that part of a purposive interpretation of consent conditions is to prefer an available interpretation that reflects relevant principles of validity including that conditions:¹⁴

- (a) are for a resource management purpose, not for an ulterior purpose;
- (b) fairly and reasonably relate to the development authorised by the consent to which the condition is attached; and
- (c) are not so unreasonable that no reasonable planning authority duly appreciating its statutory duties could have approved it.

[11] The RMA provides for processes for the amendment of conditions in s127. King Salmon has a live appeal on its s127 application in regard to Cond. 40. Counsel explain that the application seeks to “make express” what the declaration seeks.¹⁵ However, they say the declaration remains valuable in covering matters retrospectively. In any case, a declaration serves a narrower purpose. It can only

⁹ *Speargrass Holdings Ltd v Van Brandenburg* [2021] NZHC 3391 at [117].

¹⁰ *Red Hill Properties Ltd v Papakura District Council* (2000) 6 ELRNZ 157 (HC) at [47].

¹¹ *Gillies Waikeke Ltd v Auckland City Council* HC Auckland A131/02, 20 December 2002 at [27].

¹² *Palmerston North City Council v New Zealand Windfarms Ltd* [2014] NZCA 601 at [87].

¹³ *Marlborough District Council v Zindia Ltd* [2019] NZHC 2765, (2019) 21 ELRNZ 364 at [100].

¹⁴ *Newbury District Council v Secretary of State for the Environment* [1981] AC 578; approved in *Housing New Zealand v Waitakere City Council* [2001] NZRMA 202 at [18]; explained in *Waitakere City Council v Estate Homes Ltd* [2006] NZSC 112, [2007] 2 NZLR 149, [2007] NZRMA 137 at [61]-[68].

¹⁵ ENV-2021-CHC-105, King Salmon application for declaration dated 22 June 2021 at [2(g)].

go so far as to interpret the relevant consent condition rather than remediate it.

The issues

[12] The issues concern the proper interpretation of the following ‘Environmental Quality Standard’ (‘EQS’) of Cond. 40 of U140294:

ES < 3.0

Conditions remain statistically comparable with relevant/appropriate reference Station(s).

Consideration of the evidence in light of interpretation principles

[13] In addition to relevant documentation,¹⁶ the parties filed affidavit evidence as follows:

- (a) King Salmon adduced affidavits of Mark Preece its Seawater Manager,¹⁷ Dr Emma Newcombe a coastal ecologist at Cawthron Institute,¹⁸ and
- (b) MDC adduced affidavits of Dr Hilke Giles a coastal and systems scientist¹⁹ and Peter Johnson its Environmental Planner.²⁰

The relevant conditions

[14] Annexure 1 sets out the most relevant conditions (and related figures and tables) of U140294.

[15] Condition 40 is one of a set of conditions concerning discharge of feed,

¹⁶ For ease of reference, Annexure 2 sets out extracts from the BOI decision.

¹⁷ Preece affidavit dated 18 June 2021.

¹⁸ Newcombe affidavit dated 21 June 2021.

¹⁹ Giles affidavit dated 29 October 2021.

²⁰ Johnson affidavit dated 29 October 2021.

marine fouling and antifouling to coastal water. Of particular interest are those conditions pertaining to feed discharges. There are also related conditions on “marine environment monitoring, adaptive management and reporting”.

Conds. 35 – 37 as to feed tonnages

[16] Cond. 37 prohibits any increase in annual tonnages of feed unless certain requirements are met. These include:

- b Annual monitoring results of the Enrichment Stage (ES) from the most recent two successive years shall be comparable, based on the monitoring undertaken in Condition 66, assessed as follows. The ... ES ... from the annual monitoring, assessed in accordance with Condition 40, shall statistically not be significantly more than the ES for the previous year, based on the average result for all sampling stations (Figure 3) within each compliance Zone. This requirement must be met for each of the Environmental Quality Standards (EQS) compliance Zones for which ES are specified in Condition 40; and
- c The marine farm complies with all the EQS specified in Condition 40 and is less than the relevant maximum EQS for each Zone.

Conds. 38 and 39 including Fig. 3 as to compliance with Cond. 40

[17] Cond. 38 relevantly requires that the discharge of feed at the marine farm shall:

... meet the requirements of Conditions 39-44 relating to ... EQS ... at all times. Any breach of these requirements shall, as soon as practicable, be notified to the Council and the members of the Tangata Whenua Panel (refer to Condition 77).

[18] Cond. 39 specifies that EQS Compliance Zones shall be defined for the marine farms, in accordance with Figure 3 and the dimensions and areas contained in Table 2 of that condition (for Waitata being 150m for the Zone 2/3 boundary and 600m for the Zone 3/4 boundary from the nearest net pen of and a total

Zones 1, 2 and 3 footprint of 24 ha).

[19] Fig. 3 is a stylised depiction of these ‘Zones’. ‘Zone 1’ and ‘Zone 2’ are the areas “beside and beneath the net pens” of the farm. These are encircled by ‘Zone 3’ being ‘near to the net pens’. ‘Zone 4’ is the sea beyond Zone 3 and outside the footprint area’ of the farm. Fig. 3 also depicts the “sampling stations” (also termed “compliance monitoring locations” or “boundary stations” in Table 3). These are on the outer edge of the farm pens, at the Zone 2/3 boundary and at the Zone 3/4 boundary.

Cond. 40 and related Fig. 4 and Table 5

[20] Cond. 40 essentially comprises the following parts:

- (a) the first part prescribes a compliance obligation, namely “[a]t all times, the seabed beneath and in the vicinity of the marine farm shall comply with the EQS specified in Table 3”. It also specifies that the “Zone dimensions and area for compliance purposes” are to be defined in accordance with Cond. 39 and that ES “shall be defined in accordance with Figure 4 and Table 5”;
- (b) Table 3 prescribes so-termed environmental quality standards (EQS) for each of these Zones including the one primarily in issue. The EQS are expressed as a maximum numeric ‘ES’ standard (in Zones 1 and 2 ≤ 5.0 , Zone 3 ≤ 4.0 and Zone 4 < 3.0) and associated narrative:
 - (i) for Zones 1 and 2:

No more than one replicate core with no taxa (azoic) ... No obvious, spontaneous out-gassing (H₂S/methane) ... Bacteria mat (*Beggiatoa*) coverage not greater than localized/patchy in distribution.

- (ii) for Zone 3:

Infauna abundance is not significantly higher than at corresponding “Pen” Station ... Number of taxa > 75% of number at relevant/appropriate reference Station(s).

(iii) and for Zone 4:

Conditions remain statistically comparable with relevant/appropriate reference Station(s).

(c) the remainder of Cond. 40 specifies compliance consequences for exceeding those specified numeric ES:

ES exceedance

- a. In the event that the ES is up to and including 0.3 above the EQS for the 1/2 (Pen), 2/3 or 3/4 Zone Boundary Stations in Table 3, the consent holder shall **in the year following receipt of confirmed notice** of such an ES result through its monitoring (and allowing one additional month from any initial notice to provide for re-testing), **reduce the amount of feed discharged to the marine farm by 20% of the amount discharged in the year before.**
- b. In the event that the ES is greater than 0.3 and not greater than 0.6 above the EQS for the 1/2 Pen, 2/3 or 3/4 Zone Monitoring Locations in Table 3, the consent holder shall **in the year following receipt of confirmed notice** of such an ES result through its monitoring (and allowing one additional month from any initial notice to provide for re-testing), **reduce the amount of feed discharged to the marine farm by 40% of the amount discharged in the year before.**
- c. In the event that the ES is greater than 0.6 above the EQS for the 1/2 Pen, 2/3 or 3/4 Zone Monitoring Locations in Table 3, the consent holder shall, **within four months from the date the consent holder receives confirmed notice** of such an ES result

through its monitoring (and allowing one additional month from any initial notice to provide for re-testing), **remove stock and fallow the site until compliance is achieved. Upon any re-stocking, the consent holder shall ensure that the amount of stock shall be designed to ensure that the ES levels required in Table 3 for the 1/2 Pen, 2/3 and 3/4 Zone Monitoring Locations will be met in the following year.**

[21] Fig. 4 and Table 5 are essentially companion provisions for the purposes of Cond. 40:

- (a) Fig. 4 is a “schematic diagram of enrichment stages” being seven stages ranging between “natural” and “severe enrichment”. As a schematic depiction of the relationship of the farm to its environment. Arrows represent two “gradients”. One is a “recovery gradient – increasing distance/time from enrichment source” (with “natural” including “aerobic sediments” being the ultimate head of this arrow). The other is a “degradation gradient – increasing exposure to organic deposition” (starting at “very high” enrichment with the emergence of “anoxic sediments” and “methane outgassing” towards the head of that arrow). Also shown are variable components of “enrichment”, namely “redox”, “species richness”, “Shannon-Diversity (H)”, “infauna abundance” and “sediment organic content & sulphides”;
- (b) Table 5 sets out a “General Description and Environmental Characteristics of Enrichment Stages (‘ES’)”. Corresponding with Fig. 4 there are the same seven ES stages ranging from 1 (“natural/pristine conditions”) through to 7 (“severe enrichment”). For most of these, there is an associated “general description” that provides further descriptive explanation of what Fig. 4 diagrammatically shows for each stage. Table 5 also gives narrative descriptions of the “environmental characteristics” for each described ES stage at “LF” (low flow) and “HF” (high flow). I will return to

these descriptions shortly.

Conds. 54 – 74 in particular as to adaptive management

[22] A central feature of U140294 is for marine farming activities to be managed under a so-termed ‘adaptive management’ regime including a suite of duly-approved management plans. Of particular interest are those aspects pertaining to Cond. 40 and feed management.

[23] The adaptive management regime is intended to manage, inter alia, the adverse effects of feed and other depositions on the seabed and foreshore and water quality (including for the purposes of Cond. 40) (Conds. 54, 55).

[24] There are specified obligations concerning preparation (and updating) of adaptive management plans, including a Baseline Plan, a Marine Environmental Monitoring and Adaptive Management Plan (‘MEM-AMP’) and an Annual Report. Their preparation is to be according to specified processes, including engagement of an appropriately qualified independent report author and a process for peer review.

[25] The conditions prescribe what the MEM-AMP is to include (e.g. Conds. 65, 66). This includes reporting in follow up to recommendations in the Baseline Report and the previous year’s Annual Report on matters regarding farm management actions and monitoring undertaken or intended in the following year. Cond. 66 prescribes certain monitoring matters to be included in the MEM-AMP including, relevant to Cond. 40, monitoring of:

- a The level of sampling and range of environmental variables (e.g. sediment grain size, infauna, percent organic matter, redox & sulphides) to be measured annually at each of the near-farm benthic (soft sediment) monitoring stations in order to determine compliance with the EQS – Seabed Deposition in Condition 40. This includes appropriate farm-specific stations, which may also double as far-field soft-sediment

monitoring sites (see Condition 66f) ...

...

- d Monitoring intensity for a-c above shall be dependent upon the age of the marine farm, how stable the feed discharge levels have been over the last 12 months, and whether or not the marine farm has been compliant with the EQS over the last 2 years (and the nature of any breaches).

[26] Cond. 67 prescribes matters for inclusion in an Annual Report including for example:

- b The results of all the monitoring undertaken in the previous year.
- c A comprehensive analysis of the results of that monitoring, including ... whether the monitoring information obtained is fit for the purpose of determining the effects from the operation of the marine farm and for determining whether compliance with the EQS specified in Conditions 38-44 is achieved ... whether there are any evident trends in terms of effects from the operation of the marine farm;
- d An assessment and conclusions as to whether compliance with the EQS specified in Condition 40 has, or has not, been achieved for the previous year.

[27] There is a Cond. 80 on review of consent conditions by MDC including for the following purpose (with any notice of review to be within 2 months of receipt of the Annual Report):

To review the tonnage of feed that may be discharged in accordance with the conditions of this consent, in order to ensure compliance with the EQS in Conditions 38-44 is achieved.

The experts' relevant opinions

Dr Newcombe

[28] Dr Newcombe was the principal Cawthron Institute author of the Annual Report at the centre of dispute between King Salmon and MDC.

[29] Dr Newcombe explains that ES is a means of incorporating a range of biological and chemical indicators of seabed enrichment into a single metric. That avoids placing too much weight on a single indicator, as these can vary widely due to factors other than farm-derived enrichment. She further explains that, because the overall ES value relies on multiple lines of evidence, the value is considered a more robust measure of the general seabed state than any single indicator.²¹ She explains that the ES concept relies on a quantitatively described gradient of enrichment, in which each potential component indicator value can be converted into a point on the gradient and then assigned an ES score from 1 (lowest enrichment) to 7 (highest enrichment). Scores are assigned based on statistical relationships between values of the indicator and the associated ES derived from a large set of field measurements from farm monitoring.²²

[30] Dr Newcombe explains that the three groups of indicators used, namely:²³

- (a) chemical variables (redox²⁴ and concentrations of sulphides);
- (b) sediment macrofauna community composition variables (abundance, total number of taxa, richness, Margalef richness index, evenness, diversity, and biotic indices); and
- (c) organic content.

²¹ Newcombe affidavit dated 11 June 2021 at [34].

²² Newcombe affidavit dated 11 June 2021 at [35].

²³ Newcombe affidavit dated 11 June 2021 at [35].

²⁴ Dr Newcombe gives a full explanation of redox, being 'redox' (reduction-oxidation) potential of the sediment is a measure of its chemical oxidising or reducing capacity and is measured in situ using a specialised electrode.

[31] There is then a process of staged scoring:²⁵

- (a) scores for each of the component variables within each of the sediment chemistry and macrofauna categories are averaged to provide a single ES score for each category;
- (b) then the ES scores for the three categories are combined to provide an overall ES score. The overall ES score for each sample is the weighted average of the three noted groups of variables.

[32] Dr Newcombe explains that, in King Salmon's seabed monitoring the weighting is organic loading = 0.1, sediment chemistry = 0.2, and macrofauna composition = 0.7. All samples (replicates) from a sampling station are then averaged, which allows for assessment of the degree of certainty of the reliability of the measurement (represented by the 95% confidence interval).²⁶

[33] The relative weightings of the three categories of ES variables derive partly from their reliability as predictors of ES (i.e. the strength of the statistical relationship between the variable and the allocated ES value) and partly from their relative ecological significance. Dr Newcombe comments:²⁷

Ultimately we are concerned with maintaining the ecological integrity of the benthic environment, represented by the macrofaunal variables. Organic matter and sediment chemistry are used mainly as predictors of this integrity. Consequently, the macrofauna category receives the highest weighting. The percentage of organic matter in the sediment around farm sites is highly variable, particularly in high-flow locations, and does not tend to increase until enrichment levels are relatively high. Organic matter is therefore weighted less than sediment chemistry. There is, of course, a residual degree of expert judgement in these weightings.

²⁵ Newcombe affidavit dated 11 June 2021 at [36].

²⁶ Newcombe affidavit dated 11 June 2021 at [37].

²⁷ Newcombe affidavit dated 11 June 2021 at [38]

[34] Dr Newcombe further comments that the reliability of ES as a means to measure organic enrichment of soft sediment seabeds in salmon farm monitoring in the Marlborough Sounds is now evidenced by its incorporation into the best management practice (BMP) guidelines.²⁸

Dr MacKenzie

[35] Biometrician, Dr MacKenzie considers that the only relevant metric is the overall ES.²⁹ He explains that the control sites which are assumed to be unimpacted by the presence of the salmon farm would be ‘non-compliant’ 67% of the time, on the MDC’s interpretation of Cond. 40. That compares with a 2% non-compliance of the control sites under King Salmon’s interpretation.³⁰ Dr MacKenzie identifies a further difficulty with MDC’s interpretation. If all component variables have to meet the standard of $ES < 3$ and that condition is being assessed via a series of hypothesis tests similar to how the overall ES value is currently assessed, then the statistical methods used must account for the multiple comparisons being made, and potential lack of independence of the 11 component variables.³¹

Dr Giles

[36] Dr Giles was commissioned for MDC to peer review Dr Newcombe’s Annual Report. She reported her view that Cond. 40 states that ... ES ... shall be defined in accordance with Figure 4 and Table 5” to the intent that “an assessment of the descriptors is also required ... not only ... at the OLE but whenever an assessment is made against an ES value specified as part of the EQS”.³²

[37] Dr Giles explains that her focus on interpreting the EQS according to

²⁸ Newcombe affidavit dated 11 June 2021 at [33].

²⁹ MacKenzie affidavit dated 19 November 2021 at [11].

³⁰ MacKenzie affidavit sworn 19 November 2021 at [33].

³¹ MacKenzie affidavit sworn 19 November 2021 at [34].

³² Johnson affidavit dated 29 October 2021 at [14].

Cond. 40 was in light of the changes in infauna communities and chemical sediment indicators at the Zone 3/4 boundary stations described in Cawthron's annual report.³³ Her concern was that applying Cawthron's interpretation would allow a greater level of organic enrichment outside the consented farm footprint, which is defined as the EQS Compliance Zone Area (maximum area) in Cond. 39.³⁴ Hence, she understands Cond. 40 to require the consent holder to evaluate ES through both the specified numeric values and the biological and chemical descriptors of the seabed included in Table 5. As she describes it, there is a need to "apply a purposive interpretation of 'conditions' in Zone 4 for comparison to reference stations".³⁵ She explains the significance of the different interpretations this way, on the basis of the levels of organic enrichment revealed in the 2018/19 and 2019/20 monitoring. In essence, if King Salmon is correct in its interpretation it would have met this specific aspect of compliance whereas if her interpretation is correct King Salmon was in breach.³⁶

[38] Dr Giles offers various related opinions on how the BOI process should be properly interpreted and also as to the invalidity of seeking to rely on the BMP guidelines, which came into existence subsequently, as a means of interpreting Cond. 40. As these are properly matters for statutory interpretation, however, I do not need to discuss those opinions further.

Mr Johnson

[39] MDC Planner, Mr Johnson points out that King Salmon originally advanced the detailed adaptive management approach before the BOI as a means of addressing uncertainty surrounding the proposal's environmental effects, particularly as associated with introducing commercial scale volumes of salmon

³³ Giles affidavit dated 29 October 2021 at [42].

³⁴ Giles affidavit dated 29 October 2021 at [16].

³⁵ Giles affidavit dated 29 October 2021 at [14].

³⁶ Giles affidavit dated 29 October 2021 at [17].

feed and salmon faeces into the waters of the Marlborough Sounds.³⁷ As part of that King Salmon proposed to monitor and manage those effects within acceptable limits by using various management measures.³⁸ He describes MDC’s view as to the purpose of the conditions in the following terms:³⁹

... the purpose of the ES is to monitor whether the discharges from the farm (particularly from feed or faeces) are collecting in the receiving environment or causing change at levels which are precursors to undesirable environmental effects. Any one of the characteristics in Figure 4 and Table 5 could lead to adverse environmental effects. In this case, the chemical which is manifesting at higher levels is sulphide. On the degradation gradient, sulphides are identified specifically as being one of the components of undesirable organic deposition. Similarly, within the relevant area there is an increased level of macrofaunal abundance. This is one of the environmental characteristics described in Table 5 as being consistent with the “moderate environment” identified by the ES3 score.

[40] Mr Johnson goes on to comment on the monitoring that Cawthron Institute has undertaken under the conditions on behalf of King Salmon. He comments that the *2018/2019 Annual Environmental Monitoring Summary for the Waitata Reach Salmon Farm*, identified an issue with the interpretation of EQS scores at the farm. Specifically, it noted a need for clarification “on the EQS at the OLE as to whether the observed level of enrichment beyond the OLE is acceptable, despite being within the industry operational goal (and consented EQS) of ES 3.0”.⁴⁰

The parties’ interpretations of Condition 40

King Salmon

[41] Counsel for King Salmon, Mr Davies and Mr Marshall, explain what has

³⁷ MDC submissions at [4].

³⁸ Johnson affidavit dated 29 October 2021 at [8].

³⁹ Johnson affidavit dated 29 October 2021 at [16].

⁴⁰ Johnson affidavit dated 29 October 2021 at [11].

led to the interpretation dispute with MDC. It arises from what an Annual Report prepared by Cawthron Institute revealed concerning some individual component variables as identified in Fig. 3 (e.g. Redox potential and Sulphide levels).

[42] The dispute centres on the proper interpretation of the following EQS in Cond. 40 Table 3 standard:

ES < 3.0 Conditions remain statistically comparable with relevant/appropriate reference Station(s).

[43] Counsel submit that this standard is to the effect that the numerical ES limit is a single aggregate measurement such that that individual component variables are not required to be statistically comparable with appropriate reference stations.⁴¹ In particular, counsel read the word “conditions” as allowing for an aggregation approach.⁴² They submit the standard should not be construed so that natural perturbations in the environment or changes caused by other anthropogenic causes triggers a breach of consent. Rather the better approach is to favour an interpretation that assesses ES and the word “conditions” as referring to the enrichment stage in aggregate across all relevant environmental variables.⁴³

[44] Counsel submit that interpretation does not conflict with the prefacing words “Enrichment Stages (ES) shall be defined in accordance with Figure 4 and Table 5” noting that:

- (a) Fig. 4 is itself a schematic diagram and somewhat ambiguous. It does not require its five variables to be assessed individually for compliance with the thresholds for meeting the numeric $ES \leq$ threshold, relative to the baseline measurements taken from the appropriate reference stations;⁴⁴

⁴¹ King Salmon submissions at [69].

⁴² King Salmon submissions at [10].

⁴³ King Salmon submissions at [46]-[47].

⁴⁴ King Salmon submissions at [12], [15].

- (b) Table 5 provides a general description of the environmental characteristics expected at each ES. Counsel note the Table's broad descriptions of the different observed conditions (e.g. as to matters of sediment chemistry, richness and diversity) and the flexible choice of language in Table 5 (e.g. words such as "general description" and "usually"). They submit that this tends to suggest "that it is the overall condition rather than the individual variable which is of importance".⁴⁵

[45] Counsel submit that the better interpretation of Cond. 40 and its relationship to Fig. 4 and Table 5 is that, for a given set of environmental characteristics:⁴⁶

- (a) there will be one applicable ES;
- (b) with the precise conditions leading to that ES being able to vary depending on the context.

[46] Mr Davies and Mr Marshall refer to several passages from the BOI decision as either supportive or consistent with their interpretation or not revealing the BOI had any contrary intention.⁴⁷

[47] Counsel maintain it was always acknowledged that the presence of the salmon farm might be detectable beyond the outer limits of effects.⁴⁸ They rely on the opinions of Dr Newcombe and Dr MacKenzie about the operation of the ES approach. They submit that their evidence provides strong support for King Salmon's interpretation and reveals the flaws of MDC's interpretation.

[48] Counsel submit that Dr Newcombe's evidence demonstrates how the

⁴⁵ King Salmon submissions at [20].

⁴⁶ King Salmon submissions at [21].

⁴⁷ King Salmon submissions at [56], [59], [61]-[64], referring to the BOI decision at [315]-[319], [331], [337].

⁴⁸ King Salmon submissions at [4].

specified variables that make up ES are inherently variable in a natural environment. Furthermore, her evidence explains why ES, as an aggregate, is a better indicator of enrichment and environmental effects than any one variable. Moreover, counsel note Dr Newcombe’s observation that the environmental effects of salmon farming at the sort of levels we are discussing here are quickly reversible.⁴⁹ Drawing from her opinion, counsel submit that change is not necessarily adverse but can be neutral or even positive.⁵⁰ Hence, to avoid failing the *Newbury* test the conditions of consent must focus on the materiality of a change not its detectability.⁵¹

[49] Drawing from Dr MacKenzie’s evidence, counsel submit that an interpretation method that does not account for natural perturbations and result in a type 1 error 67% of the time is not fit for purpose.⁵²

[50] King Salmon submits the court should exercise its discretion to make a declaration in this case which will serve an important purpose of vindicating King Salmon’s compliance records following the Council issuing reports that it is in breach of its consent conditions which undoubtedly impact negatively on King Salmon’s reputation.⁵³

MDC

[51] For MDC, Ms Radich and Ms Wadsworth submit that Cond. 40 has both a quantitative and qualitative component of measuring ES, as addressed in Fig. 4 and Table 5. Counsel interpret the condition as requiring each of the five variables depicted in Fig. 4 to “remain statistically comparable with relevant/appropriate

⁴⁹ King Salmon submissions at [51].

⁵⁰ King Salmon submissions at [50].

⁵¹ King Salmon submissions at [50].

⁵² King Salmon submissions at [52].

⁵³ King Salmon submissions at [66]-[68].

reference station(s)” (measured at the Zone 3/4 boundary).⁵⁴

[52] Fig. 4 depicts various stages of benthic enrichment charted on the X-axis from the natural state of the seabed (ES1) (on the right) to a very high level of benthic environment (ES 7) (on the left).⁵⁵ The schematic diagram depicts the non-linear changes observed in each of the variables as sediments are exposed to greater levels of organic deposition.⁵⁶

[53] In the specification in Cond. 40 that “conditions remain statistically comparable with relevant appropriate reference stations”, counsel submits that “conditions”, means each of the variables in Fig. 4 (i.e. sediment organic content and sulphides, infauna abundance, species diversity, species richness, and redox) relative to the appropriate reference station. Counsel submit that each is to be individually measured rather than applying the King Salmon approach of combining them into a single aggregate measure.⁵⁷

[54] Ms Radich and Ms Wadsworth submit that a single aggregate measure of different ecological phenomena would be meaningless and would have no statistical integrity as the comparisons would not be like for like. The meaning is derived for purposes of measuring benthic enrichment, from the presence of each of these different ecological phenomena at certain levels relative to baseline. The variables are of different organic measurements which individually can be indicators of undesirable benthic enrichment. Counsel submit that a further problem with King Salmon’s alternative interpretation whereby the five variables are reduced to a single aggregate measurement is that the consent conditions does

⁵⁴ MDC submissions at [29].

⁵⁵ MDC submissions at [25].

⁵⁶ “Sediment organic content and sulphides” (as shown on the black line), “Infauna abundance” (as shown on the red line), the measure of species diversity calculated in terms of the “Shannon-Diversity” Index (as shown on the Green line), “Species richness” (as shown on the Blue line), and the extent of reduction-oxidation “Redox” (shown by the black dotted line).

⁵⁷ MDC submissions at [33].

not include a method for doing so.⁵⁸

[55] Counsel submit that the interpretation advanced by King Salmon cannot be correct when considering the text, purpose and context of U140294 and its conditions.

Friends of Nelson Haven and Tasman Bay Inc and Guardians of the Sounds Inc

[56] Mr Ironside submits that much of King Salmon’s focus is on what it would prefer rather than what the conditions clearly require.⁵⁹ He submits that, on King Salmon’s interpretation, the words used in the third column of Table 3 would be unnecessary. Instead, all words in this column of the Table are part of the standards to be met.⁶⁰

[57] Counsel characterises as “contrived” King Salmon’s argument that the word “conditions” in Cond. 40 is difficult and ambiguous. Rather, in a context of specified environmental quality standards, the words clearly refer to the environmental conditions (assessed as primary environmental variables) that are to be measured and reported on.⁶¹ He submits that interpretation is supported by the wider context of other conditions, notably as to adaptive management. He notes that a “fundamental purpose” of the required environmental monitoring is to ensure that the discharge of feed meets the requirements of the consent conditions imposing environmental quality standards.⁶² In particular, he notes the sequence of obligations on monitoring, namely:⁶³

- (a) to prepare a Baseline Plan, before carrying out any salmon farming at

⁵⁸ MDC submissions at [31].

⁵⁹ Friends & Guardians submissions at [20].

⁶⁰ Friends & Guardians submissions at [7].

⁶¹ Friends & Guardians submissions at [11].

⁶² Friends & Guardians submissions at [12].

⁶³ Friends & Guardians submissions at [12]-[13].

the site, to specify the monitoring and analysis to be undertaken in order that baseline information can be obtained and analysed prior to the placement of farm structures. This is so that effects of deposition on the seabed and foreshore are able to be addressed;

- (b) to then prepare a Baseline Report which presents the results from the monitoring and analysis undertaken in accordance with the Baseline Plan, and makes recommendations for the development of the salmon farm and the monitoring to be undertaken in the first year of operation; and
- (c) thereafter to prepare an Annual Report specifying the proposed monitoring and marine farm management actions required for the following year.

[58] Mr Ironside identifies in particular Cond. 63(a) as to “quantitative and qualitative mapping of soft-sediment habitats and communities” and Cond. 66(a) (as to the level and range of sampling of environmental variables).⁶⁴ He describes the purpose of the latter condition as being:⁶⁵

... to measure annually the range of environmental variables at the nominated monitoring sites is to ensure that environmental conditions at the critical zone 3/4 boundary remain statistically comparable with relevant/appropriate reference stations. This is so that compliance with this aspect of the environmental quality standards can be determined. The information requirements for the Baseline Plan, Baseline Report and Annual Reports enable that comparison to be carried out. It is an assessment of the similarities and differences in these environmental variables between the zone 3/4 boundary and relevant reference stations that becomes important under this requirement.

[59] As for monitoring, counsel refers to the following “practical dimension” of

⁶⁴ Friends & Guardians submissions at [14].

⁶⁵ Friends & Guardians submissions at [18].

what it requires:⁶⁶

It enables a relative comparison of the various components of the overall enrichment stage assessment with those obtained from relevant reference stations. The zone 3/4 boundary is where the depositional footprint for the salmon farm is anticipated to yield to naturally occurring background conditions. A comparison between the monitored and assessed environmental variables at the zone 3/4 boundary and at reference stations is likely to provide an early indication (or degree of comfort) that the depositional footprint is at risk (or not at risk) of extending beyond the zone 3/4 boundary. This is an additional environmental quality reporting requirement over and above the overall enrichment stage assessment included in condition 40. It meets the purpose of requiring Annual Reports to provide an analysis of the monitoring results and to specify marine farm management actions for the coming year to address the condition 40 requirements.

[60] Reading Cond. 40 in this relevant context, he submits that there is “no ambiguity” about what it requires concerning Zone 4:⁶⁷

The Baseline Plan was required to specify what monitoring and analysis would be undertaken to inform the Baseline Report and subsequent Annual Reports. The Baseline Plan required quantitative and qualitative mapping of soft-sediment habitats and communities across zones 1, 2 and 3, including replicate data for the primary environmental variables from each of the proposed on-going monitoring stations and at appropriate reference stations. The Baseline Report and subsequent Annual Reports are required to identify the level of sampling and range of environmental variables that are to be measured annually at each monitoring station in order to determine compliance with condition 40. This plainly includes an assessment whether the environmental variables remain statistically comparable with relevant/appropriate reference stations.

The McGuinness Institute

[61] By memorandum, counsel Mr Slyfield adopts the submissions for MDC,

⁶⁶ Friends & Guardians submissions at [19].

⁶⁷ Friends & Guardians submissions at [16].

and Friends & Guardians.⁶⁸

What do the contested parts of Cond. 40 mean or is that meaning inherently unclear?

[62] Read in isolation, the meaning of “Conditions remain statistically comparable with relevant/appropriate reference Station(s)” is unclear. “Conditions” is capable of referring either to a consolidated comparison or one undertaken for each individual variable. However, it is plainly necessary to consider those words in terms of how they operate within Cond. 40 as a whole and how Cond. 40 applies within the consent as a whole.

[63] Within Cond. 40, the EQSs in Table 3 operate both as a compliance standard and a trigger for other actions. In terms of compliance, the consent holder is obliged at all times to ensure the seabed beneath and in the vicinity of the marine farm complies with them (within the compliance areas as determined by Cond. 39). When exceeded, depending on the levels of exceedance, they can trigger specified obligations to make reductions in the discharge of feed or potentially to de-stocking the farm.

[64] On the face of Cond. 40 EQS’s are both numerical and qualitative. The numerical component is stated as the relevant ‘ES’ for each specified Zone. For Zone 4, being the area “outside the footprint area” as measured at the identified Zone 3/4 Boundary Stations, that is specified as $ES < 3$. I return to what that means shortly.

[65] The associated qualitative specification is relatively more specific in regard to Zones 1 – 3 than for Zone 4:

- (a) for Zones 1 and 2, these are with regard to taxa (azoic),⁶⁹ spontaneous

⁶⁸ Memorandum of counsel for The McGuinness Institute, dated 20 December 2021.

⁶⁹ Having no life.

outgassing (hydrogen sulphide, methane) and the bacteria mat coverage;

- (b) for Zone 3, these are for infauna abundance and number of taxa;
- (c) for Zone 4 the qualitative standard is as above-noted (i.e. conditions remain statistically comparable with relevant/appropriate reference stations).

[66] It can be observed that, at least for Zones 1 – 3, the qualitative specifications of the EQS correspond to matters illustrated in Fig. 4. For instance, Fig. 4 illustrates and notates methane out-gassing, sulphides, degrees of “infauna abundance” and “species richness” i.e. taxa (including azoic) and bacterial mat coverage (from abundant to non-existent). Table 5 adds to this in that it gives qualitative general descriptions of each of the seven ES and their related environmental characteristics.

[67] Cond. 40 specifically ties numeric ES and qualitative dimensions of the EQS together with its specification that “Enrichment Stages (ES) shall be defined in accordance with Figure 4 and Table 5”.

[68] Dr Giles offers an opinion that those words necessarily intend “an assessment of the descriptors is also required ... not only ... at the OLE but whenever an assessment is made against an ES value specified as part of the EQS”.⁷⁰ I do not find that to be a necessary or indeed the correct interpretation. Rather, I find that the numeric and qualitative aspects of the Zone 4 EQS operate in an integrated way as follows:

- (a) the relevant variables in Fig. 4 and Table 5 are to be assessed and evaluated by proper qualitative scientific method;
- (b) once so assessed and evaluated they are to be collated so as to inform the derivation of the single numeric ES as a collation of all the

⁷⁰ Giles affidavit dated 29 October 2021 at [44].

evaluated variables (ie “conditions”);

- (c) that single numeric ES must be both ≤ 3 and remain statistically comparable to the numeric ES at relevant and appropriate reference station(s). Individual component variables are not required to be statistically comparable with appropriate reference stations. Cond. 40 does not require that there be an ES for each individual component variable.

[69] I find the integrated nature of the numeric and qualitative dimensions of the Zone 4 EQS of Cond. 40 favours King Salmon’s interpretation of “Conditions remain statistically comparable with relevant/appropriate reference Station(s)”, namely that it this refers to a single aggregate measurement.

[70] Turning to other related conditions, the allowable increase in the annual tonnage of feed is governed under Conds. 33-37. Specifically, one of the prerequisite requirements to be met before there can be an increase is:⁷¹

Annual monitoring results of the ... ES ... from the most recent two successive years shall be comparable, based on the monitoring undertaken in Condition 66, assessed as follows. The ... ES ... from the annual monitoring, assessed in accordance with Condition 40, shall statistically not be significantly more than the ES from the previous year, based on the average result for all sampling stations (Figure 3) within each compliance Zone. This requirement must be met for each of the ... EQS ... compliance Zones for which ES are specified in Condition 40.

[71] The adaptive management conditions govern monitoring and reporting and the regulation of farming operations (including feed) through related adaptive management plans.

[72] There are various indicators in these conditions of an intention that there be a single EQS for each Zone comprising a single numeric ES derived from

⁷¹ Condition 37b.

consideration of relevant qualitative dimension or inputs to that ES.

[73] One indicator is in the fact that several conditions refer to EQS as a single standard for each relevant “zone”. I refer, for instance, to Cond. 66 (“in order to determine compliance with the EQS – Seabed Deposition in Condition 40” and “whether or not the marine farm has been compliant with the EQS over the last 2 years”) and Cond. 67 (“whether compliance with the EQS specified in Condition 40 has, or has not, been achieved for the previous year”). Furthermore Cond. 66a treats the various qualitative matters as being inputs for the determination of “the EQS”, i.e. (emphasis added):

- a The level of sampling and range of environmental variables (e.g. sediment grain size, infauna, percent organic matter, redox & sulfides) to be measured annually at each of the near-farm benthic (soft sediment) monitoring stations **in order to determine compliance with the EQS** – Seabed Deposition in Condition 40. This includes appropriate farm-specific stations, which may also double as far-field soft-sediment monitoring sites (see Condition 66f) ...

[74] Cond. 80 as to review of consent conditions is similarly expressed.

[75] None of the conditions of U140294 prescribe a methodology either of treating “conditions” to mean the consideration of all qualitative matters on a consolidated basis so as to derive a single numeric ES (i.e. as favoured by Dr Newcombe and Dr MacKenzie) or treating them separately (as favoured by Dr Giles).

[76] Also consistent with King Salmon’s interpretation, none of the relevant adaptive management plan conditions appear to preclude a single aggregate measurement approach to be taken for the purposes of Cond. 40. Rather, their prescriptions as to the purposes and nature of qualitative and quantitative monitoring and mapping and reporting do not disqualify a single aggregate measurement approach from being taken by the appointed independent person(s).

Plainly as a peer review expert, Dr Giles disagrees with Dr Newcombe's methodology. However, that does not render that methodology necessarily wrong.

[77] Therefore, on balance I find that other related conditions of U140294 favour King Salmon's interpretation of "conditions" as used in Cond. 40. That is to the effect that it would allow for each of the qualitative factors as illustrated in Fig. 4 to be treated by proper scientific method on a consolidated basis for the purposes of statistical comparison with the relevant reference Stations.

[78] As for the resource management purposes of Cond. 40, I find force in the submissions for King Salmon concerning the *Newbury* principles, as modified by the Supreme Court in *Estate Homes*.⁷² That is particularly as to the requirement that conditions "fairly and reasonably" relate to the development authorised. Counsel refer to this as counting against an interpretation of Cond. 40 that would catch "natural perturbations, or variability of the environment unrelated to the consent".⁷³ Insofar as this fairly describes the position, I agree that this also favours King Salmon's interpretation.

[79] I acknowledge, however, that MDC's concerns are more substantive. In particular, Dr Giles considers there are indeed adverse ecological consequences at risk from King Salmon's current operations at the farm. I have considered Dr Giles' concerns about the scientific efficacy of Dr Newcombe's preferred methodology.

[80] Both Dr Giles and Dr Newcombe are highly experienced experts. I find no material scientific methodology flaws in Dr Newcombe's approach. Furthermore, I am satisfied it duly accords with the relevant U140294 conditions which I find deliberately designed to allow for the due exercise of scientific

⁷² *Waitakere City Council v Estate Homes Ltd* [2006] NZSC 112, [2007] 2 NZLR 149, [2007] NZRMA 137 at [61]-[68].

⁷³ King Salmon submissions at [45].

judgement in the face of uncertainties.

[81] Those scientific uncertainties were clearly a central focus of the BOI. A number of passages indicate the BOI's concerns about these things, including in relation to modelling uncertainties (e.g. [320], [406], [407]). As to nutrient trends, the BOI decision refers to an "astonishing gap" in the prediction of effects, and the related importance of a graduated regime for feed discharge increases based on "more robust monitoring and the adaptive management regime" (e.g. [437]-[439]).

[82] Those uncertainties and risks led the BOI to reject some marine farming sites. However, the Waitata farm was consented according to the detailed adaptive management conditions designed to account for those uncertainties. Central to the intentions of those conditions is that intensification of usage of the marine farm, including by changes to feed discharge limits, is contingent on regulatory adaptive management. That management by the consent authority is ongoing. Importantly, it is to be informed by scientific judgement as applied in accordance with conditions on regular monitoring and reporting.

[83] In essence, the BOI was satisfied that was in proper accordance with the RMA to allow it to consent the farm despite a lack of certainty as would allow it to fully prescribe all controls on activities for the purposes of managing the ecological and other environmental risks. Rather, the BOI authorised for management to occur, adaptively, during the farm's operation as proper scientific assessment revealed necessary further contextual knowledge on these matters. Explicitly, the consent allows this adaptive management approach to be informed by later contextual scientific judgements as to observed operational effects and their significance or otherwise.

[84] That regime was determined by the BOI partly in reliance on the evidence of Mr Keeley.⁷⁴ The BOI also drew from the opinions of other scientists including

⁷⁴ Dr Keeley had not then completed his PhD.

in a joint witness statement on EQS measures (e.g. [304]-[307], [444]-[447], [450]). The BOI also drew from the submissions of a range of parties. The decision records that King Salmon provided the BOI with various iterations of proposed adaptive management conditions and that the BOI drew from these (not without making various changes (e.g. [305], [330]-[374], [440]-[443], [448]-[460]).

[85] There is of course a degree of risk with such an adaptive management approach. However, most RMA consenting relies to some extent on the making of predictions about effects. The inherent risks in that are part of the reason why the RMA provides for processes for an applicant to seek to change conditions or a local authority to review them.

[86] In an overall sense, I find that the interpretation offered by King Salmon is the better one on a reading of Cond. 40 in the context of all related conditions and in a purposive sense.

[87] Importantly, it does not render the qualitative aspects of the EQS redundant nor diminish the proper role of monitoring and reporting as part of the overall adaptive management regime specified in the consent. Rather, it ensures that the derivation of the ES as a numerical standard for the Zone is duly informed, in a properly scientific way, by each of the noted qualitative inputs. In an ecological sense, it treats these variable factors as inputs not standards in their own separate right. Inevitably, that relies on scientific judgement and there are clearly associated risks in that. However, the BOI's reasoning reveals that those risks were front of mind and informed a design of conditions as part of what was then a novel response to significant environmental science uncertainties in the consenting process.

[88] The desirability or otherwise of such an extensive adaptive management approach to such significant environmental risks is itself a matter for philosophical debate. However, whether or not it is a sound approach in environmental management terms to fulfil the pt 2 purpose is not a factor that should inform my

determination of what Cond. 40 means.

Should declarations be made?

[89] On those findings, I am satisfied that I can make appropriate declarations to the effect of bringing to light the relevant meaning of Cond. 40 without going beyond the permissible boundaries of a declaration.

[90] Even in the face of King Salmon's live appeal against MDC's decline of its s127 application to change Cond. 40, I am satisfied there would be value in making the declaration. It is plainly important that the consent holder and authority approach their respective responsibilities for ensuring compliance from the same legal footing. The same applies to experts who serve this process either as consent holder consultants or MDC peer reviewers.

[91] There is a further important reputational dimension for King Salmon as a publicly listed company with a reasonably significant profile in regard to activities in sensitive environments.

[92] Furthermore, it may assist King Salmon and MDC in regard to their consideration of the s127 appeal and any review of consent conditions.

Outcome

[93] The conditions do not give free licence for the making of all judgements of that kind. Rather, they prescribe various requirements that must be met as I have discussed.

[94] I am generally satisfied with each of the declarations proposed by King Salmon as according with my findings and interpretation. Therefore, the application is **granted** and it is hereby declared that:

- (a) in the Environmental Quality Standards ('EQS') in Table 3 of the consent conditions for MDC resource consent U140294, the numerical limits on Enrichment Stage ('ES') limit ES as a single aggregate measurement and do not limit the ES equivalents of individual component variables;
- (b) the term "conditions" in the EQS means ES as a single aggregate measurement. Individual component variables are not required to be statistically comparable with appropriate reference stations.

[95] Costs are reserved. Any application for costs is to be made within fifteen (15) working days and any reply within a further ten (10) working days and a final reply within a further ten (10) working days.



J J M Hassan
Environment Judge



Annexure 1

Relevant conditions of U140294 (and related figures and other terms)

Condition 36

The annual tonnage of feed discharged to the marine farm may only be increased above the Maximum Initial Feed Discharge specified in Condition 35, or above any subsequent allowable annual feed discharge level, if the following requirements are met:

- a. the requirements of Condition 37;
- b. the requirements of Conditions 38-44 (relating to compliance with Environmental Quality Standards (EQS)); and
- c. any specifications for marine farm management in the **Marine Environmental Monitoring and Adaptive Management Plan (MEM-AMP)** for that year (Condition 65).

Table 1: Maximum initial and maximum annual feed discharges, and maximum increases in annual feed discharges (from one year to the next)

Farm	Maximum Initial Feed Discharge (tonnes per annum)	Maximum Increase in Feed Discharge (tonnes per annum)	Maximum Feed Discharge (tonnes per annum)
Waitata	3000	1000	6000

Notes

1. The annual feed discharge may exceed relevant maximum feed discharges specified in **Table 1** by up to 15% provided that over any continuous 3 year period, the average annual feed discharge does not exceed the relevant maximum feed discharges specified in **Table 1**.

2. There is no limit to any decrease in the annual tonnage of feed discharge.

Condition 37

There shall be no increase in the annual tonnage of feed discharged to the marine farm unless the following requirements are met:

- a. The marine farm shall have operated at or near ($\pm 15\%$) its current maximum annual feed discharge level for at least 3 years;

and

- b. Annual monitoring results of the Enrichment Stage (ES) from the most recent two successive years shall be comparable, based on the monitoring undertaken in Condition 66, assessed as follows. The Enrichment Stage (ES) from the annual monitoring, assessed in accordance with Condition 40, shall statistically not be significantly more than the ES from the previous year, based on the average result for all sampling stations (Figure 3) within each compliance Zone. This requirement must be met for each of the Environmental Quality Standards (EQS) compliance Zones for which ES are specified in Condition 40;

and

- c. The marine farm complies with all the EQS specified in Condition 40 and is less than the relevant maximum EQS for each zone.

Condition 38

The discharge of feed ... at the marine farm shall meet the requirements of Conditions 39-44 relating to the Environmental Quality Standards (EQS) at all times. Any breach of those requirements shall, as soon as practicable, be notified to the Council and the members of the Tangata Whenua Panel (refer to Condition 77).

Condition 39

EQS Compliance Zones shall be defined for the marine farm, in accordance with **Figure 3** and the dimensions and areas contained in **Table 2**.

Table 2: Maximum distances of EQS Compliance Zone 2/3 and Zone 3/4 boundaries from the nearest edge of the marine farm net pens; and the maximum total affected areas of Zones 1, 2 and 3.

	EQS Compliance Zone boundary dimensions (maximum distances)		EQS Compliance Zone Area (Maximum area)
Farm	Distance from nearest net pen to Zone 2/3 boundary	Distance from nearest net pen to Zone 3/4 boundary	Total area of Zones 1, 2 and 3 (the footprint)
	Metres (m)	Metres (m)	Hectares (ha)
Waitata	150	600	24

- a The above Zones shall be fixed.
- b Notwithstanding, Condition 39a, the size and shape of the above Zones will be reviewed (to enable comparison with the zone dimensions contained in **Table 2**), after 3 years of operation at the Initial Feed Discharge level in **Table 1**, as part of the **Annual Report** (refer to Condition 67j) for that year. The dimensions and area of the Zones may be amended as a part of a recommendation in the **Annual Report**, provided that the total area of Zones 1, 2 & 3 does not increase by more than 10% from the area specified in **Table 2**.

Condition 40

At all times, the seabed beneath and in the vicinity of the marine farm shall comply with the EQS specified in **Table 3**. Zone dimensions and area for compliance purposes shall be defined in accordance with Condition 39. Enrichment Stages (ES) shall be defined in accordance with **Figure 4** and **Table 5**.

Table 3: Environmental Quality Standards (EQS) – Seabed Deposition

Zone	Compliance Monitoring Location	EQS
Zones 1 & 2 – beside and beneath the net pens	Measured beneath the edge of the net pens – “Pen” Stations on Figure 3	ES ≤ 5.0 No more than one replicate core with no taxa (azoic), No obvious, spontaneous out-gassing (H ₂ S/methane), Bacteria mat (<i>Beggiatoa</i>) coverage not greater than localized/patchy in distribution.
Zone 3 – near to the net pens	Measured at the Zone 2/3 Boundary Stations on Figure 3	ES ≤ 4.0 Infauna abundance is not significantly higher than at corresponding “Pen” Station Number of taxa > 75% of number at relevant/appropriate reference Station(s)
Zone 4 – outside the footprint area	Measured at the Zone 3/4 Boundary Stations on Figure 3	ES < 3.0 Conditions remain statistically comparable with relevant/appropriate reference Station(s)

ES exceedance

- a. In the event that the ES is up to and including 0.3 above the EQS for the 1/2 (Pen), 2/3 or 3/4 Zone Boundary Stations in Table 3, the consent holder shall in the year following receipt of confirmed notice of such an ES result through its monitoring (and allowing one additional month from any initial notice to provide for re-testing), reduce the amount of feed discharged to the marine farm by 20% of the amount discharged in the year before.
- b. In the event that the ES is greater than 0.3 and not greater than 0.6 above the EQS for the 1/2 Pen, 2/3 or 3/4 Zone Monitoring Locations in **Table 3**, the consent holder shall in the year following receipt of confirmed notice of such an ES result through its monitoring (and allowing one additional month from any initial notice to provide for re-testing), reduce the amount of feed discharged to the marine farm by 40% of the amount discharged in the year before.

- c. In the event that the ES is greater than 0.6 above the EQS for the 1/2 Pen, 2/3 or 3/4 Zone Monitoring Locations in Table 3, the consent holder shall, within four months from the date the consent holder receives confirmed notice of such an ES result through its monitoring (and allowing one additional month from any initial notice to provide for re-testing), remove stock and fallow the site until compliance is achieved. Upon any re-stocking, the consent holder shall ensure that the amount of stock shall be designed to ensure that the ES levels required in Table 3 for the 1/2 Pen, 2/3 and 3/4 Zone Monitoring Locations will be met in the following year.

Condition 54

The marine environmental monitoring, adaptive management and reporting to be undertaken in accordance with 56-67 shall address, but not be limited to, the following potential effects from the operation of the marine farm:

- a Effects of deposition on the seabed and foreshore;
- b Effects on water quality.

Condition 55

The **Purposes** of the marine environmental monitoring, adaptive management and reporting to be undertaken in accordance with Conditions 56-67 shall be:

- a To ensure that the discharge of feed, marine biofouling and antifouling at the marine farm meets the requirements of Conditions 38-44 relating to Environmental Quality Standards (EQS) at all times;
- b To ensure that the operation of the marine farm does not result in adverse effects to notable biological features within 1 km of the marine farm including any areas of blue cod habitat or any areas identified by the Tangata Whenua Panel (refer to Condition 77 as customary kaimoana gathering areas, as a result of biodeposition or nutrient enrichment. For purposes of this condition “notable biological features” shall include but not be limited to areas of significant reef, tubeworm mounds and hydroid colonies;
- c To ensure that the operation of the marine farm does not result in seabed enrichment in areas of natural deposition in neighbouring bays to the marine farm including any areas in those bays identified by the Tangata Whenua Panel (refer to Condition 77) as customary kaimoana gathering areas;

- d To confirm that the operation of the farm does not result in any adverse effects on macroalgal biomass on intertidal and shallow rocky reefs, including any reefs identified by the Tangata Whenua Panel (refer to Condition 77) as customary kaimoana gathering areas, as a result of biodeposition or nutrient enrichment;
- ...
- g To confirm average feed loss levels from the marine farm, including how the feed loss varies over time;
- ...

Condition 56

The following plans and reports shall be prepared by the consent holder, in order to address the potential effects set out in Condition 54 and achieve the Purposes in Condition 55.

- a Prior to the initial placement of the first structure(s) at the marine farm, a **Baseline Plan** to specify the monitoring and analysis to be undertaken in order that baseline information can be obtained and analysed prior to the initial placement of the first structure(s) at the marine farm;
- b Prior to initial placement of the first structure(s) at the marine farm, a **Baseline Report** which presents the results from the monitoring and analysis undertaken in accordance with the **Baseline Plan**, makes recommendations for the development of the marine farm and the monitoring to be undertaken in the first year of operation of the marine farm, and specifies the initial WQS and responses in accordance with Condition 44;
- c For each year of operation of the marine farm, a **MEM-AMP** to provide a summary of the relevant recommendations from the previous year's **Baseline Report** or **Annual Report**, and specify the proposed monitoring and marine farm management actions for the following year. The **MEM-AMP** may be prepared as one Plan jointly with the **MEM-AMP(s)** for other marine farms managed by the same consent holder.
- d For each year of operation of the marine farm, an **Annual Report** to provide the details of the monitoring results from the previous year, an analysis of the monitoring results (including in terms of compliance with the EQS), and recommendations for changes to the monitoring and marine farm management actions for the following year. The **Annual Report** may be prepared jointly with **Annual Reports** for other marine farms managed by the same consent holder.

Condition 57

The consent holder shall engage an independent person (or persons) with appropriate knowledge and expertise to prepare the **Baseline Plan** and **Baseline Report**, the **MEM-AMP** and the **Annual Report**, in accordance with the conditions of this consent.

Condition 63

The **Baseline Plan** shall include, but not be limited to, the following:

- a Quantitative and qualitative mapping of soft-sediment habitats and communities across the occupancy and activity area specified in Condition 2; and across the area of EQS compliance Zones 1, 2 & 3 specified in Conditions 39 and 40, including replicate data for the primary environmental variables from each of the proposed on-going monitoring stations and at appropriate reference stations;
- ...
- d Quantitative and qualitative baseline monitoring (for potential biodepositional effects following the marine farm operation) of habitats that support notable biological features within 1km of the marine farm (“reef” monitoring), including any areas of blue cod habitat or any areas identified by the Tangata Whenua Panel (refer to Condition 77) as customary Kaimoana gathering areas, as well as comparable habitats at appropriate reference sites. The monitoring shall be undertaken two times during one year. For the purposes of this condition “notable biological features” shall include but not be limited to areas of significant reef, tubeworm mounds and hydroid colonies.
- e Quantitative and qualitative baseline monitoring (for potential seabed enrichment effects following marine farm operation) at soft sediment sites in neighbouring bays near to, and removed from, the marine farm, chosen based on potential exposure to increased biodeposition including any areas in those bays identified by the Tangata Whenua Panel (refer to Condition 77) as customary kaimoana gathering areas. This monitoring shall be undertaken at a selection of representative soft sediment sites, which may also double as reference sites for near-farm monitoring (see Condition 63a), and shall be undertaken two times during the year. [*The same monitoring may be undertaken for a group of marine farms, as it will provide baseline information for all marine farms in that group*].
- f Quantitative and qualitative baseline monitoring (for potential effects on macroalgal biomass from biodeposition and/or nutrient enrichment) of ephemeral macroalgae (e.g. *Ulva* sp.), benthic algal films) and perennial algae (e.g. *Hormosira*

banksii) percentage cover and the abundance of grazing invertebrates (e.g. cats' eyes snails (*Turbo smaragdus*) and Kina (*Evechinus chloroticus*) on intertidal and shallow subtidal rock reefs, including any reefs identified by the Tangata Whenua Group (refer to Condition 77) as customary kaimoana gathering areas. Monitoring shall be undertaken two times during one year at the following locations:

- i. At or near locations expected to have the greatest potential for marine farm-related cumulative enrichment effects (either within 1km of the marine farm or in neighbouring bays);
- ii. At or near locations further away from the marine farm or groups of marine farms in locations that are expected to have less marine farm-related cumulative enrichment effects.

Condition 65

The **MEM-AMP** shall specify the following:

- a. A summary of the recommendations from the **Baseline Report** (in the case of the first **MEM-AMP** for the marine farm) or from the previous years' **Annual Report** regarding marine farm management actions and monitoring (including any increases or decreases in the tonnage of feed to be discharged).
- b. A description of all monitoring to be undertaken for the coming year (detailed monitoring requirements are set out in Condition 66). This shall include the methods, locations and frequency of the monitoring, including any control/reference sites. This shall give effect to any recommendations contained in the **Annual Report** for amendments to the dimensions and areas of the EQS compliance Zones specified in **Table 2** and/or to the location of the representative compliance monitoring Stations specified in **Table 3**, following the review of the results of the monitoring undertaken after 3 years of operation at the initial Feed Discharge level in Table 1.
- c. All monitoring and management actions to be undertaken at the marine farm in order to meet the requirements of Conditions 38-44 (including any increases or decreases in the tonnage of feed to be discharged).
- d. Any other actions to be undertaken in order to address the potential effects from the operation of the marine farm set out in Condition 54 and achieve the Purposes in Condition 55, including to avoiding remedying or mitigating any significant adverse effects from the operation of the marine farm identified in the previous year's **Annual Report**.

Condition 66

The **MEM-AMP** shall include the following monitoring:

- a The level of sampling and range of environmental variables (e.g. sediment grain size, infauna, percent organic matter, redox & sulfides) to be measured annually at each of the near-farm benthic (soft-sediment) monitoring stations in order to determine compliance with the EQS – Seabed Deposition in Condition 4.0. This includes appropriate farm-specific reference stations, which may also double as far-field soft-sediment monitoring sites (see Condition 66f).

...

- d Monitoring intensity for a-c above shall be dependent upon the age of the marine farm, how stable the feed discharges have been over the last 12 months, and whether or not the marine farm has been compliant with the EQS over the last 2 years (and the nature of any breaches).
- e Targeted water column surveys to quantify the localised effect of the marine farm on surrounding water quality, for the purpose of obtaining information regarding marine farm-specific, near-farm mixing properties in order to provide a context for evaluating compliance with the WQS in Condition 44. This shall involve a series of fine-scale surveys in the vicinity of the marine farm (within 1km from the net pens) measuring: salinity, clarity, temperature, chlorophyll a, turbidity, dissolved oxygen (DO), nutrient concentrations (NH₄-N, NO₃-N, NO₂-N, DRP, Si, TN and TP), phytoplankton composition and biomass along transects that move away from the marine farm and span potential nutrient gradients. The surveys shall be undertaken at least twice per year and continued for at least two years after the marine farm has reached stable maximum feed discharge levels and no future increases are proposed.
- f Annual quantitative and qualitative monitoring for potential depositional effects at soft sediment sites in neighbouring bays near to, and removed from, the marine farm, in order to ensure that the marine farm is not resulting in seabed enrichment in areas of natural deposition in neighbouring bays. The sites shall be chosen based on potential exposure to increased biodeposition including any areas in those bays identified by the Tangata Whenua (refer to Condition 77) as customary kaimoana gathering areas. This monitoring shall be undertaken at a selection of representative soft sediment sites, which may also double as reference sites for near-farm monitoring (see Condition 66a), and shall be continued until at least 5 years after the marine farm has reached a stable level of feed discharge and no future increases are proposed [*The same monitoring may be undertaken for a group of*

marine farms, as it will assess the cumulative effects from all marine farms in that group].

- g Annual quantitative and qualitative monitoring of habitats that support notable biological features under or within 1km of the net pens (“reef” monitoring), including any areas of blue cod habitat or any areas identified by the Tangata Whenua Panel (refer to Condition 77) as customary kaimoana gathering areas, in order to ensure that the operation of the marine farm is not causing adverse effects to these features as a result of biodeposition. Monitoring shall also include comparable habitats at appropriate reference sites. This monitoring shall be continued until at least 5 years after the marine farm has reached a stable level of feed discharge and no future increases are proposed. For the purposes of this condition “notable biological features” shall include but not be limited to areas of significant reef, tubeworm mounds and hydroid colonies. *[This condition only applies if notable biological features are located within 1km of the marine farm].*

...

- i After 3 years of operation at the Initial Feed Discharge level in Table 1, a repeat of the baseline monitoring undertaken in accordance with Condition 63a, in order to review the dimensions and areas of the EQS compliance Zones in Table 2, Condition 39, and the location of the compliance monitoring Stations specified in Table 3, Condition 40. This monitoring may incorporate the compliance monitoring for the EQS – Seabed Deposition in terms of Condition 66a for that year.

...

- k Monitoring of feed loss at a range of appropriate times across a full production cycle once the marine farm has reached a stable level of feed discharge and no future increases are proposed, to establish feed loss levels and their variability through time.

...

Figure 3: Environmental Quality Standard (EQS)
 – Definition of EQS Compliance Zones

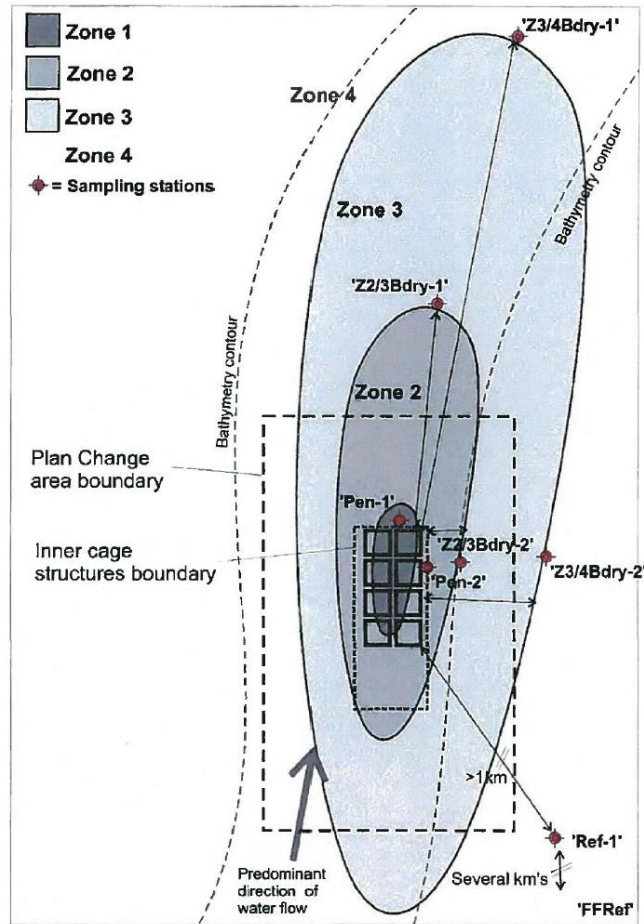


Figure 4: Schematic Diagram of Enrichment Stages

Figure 4: Schematic Diagram of Enrichment Stages

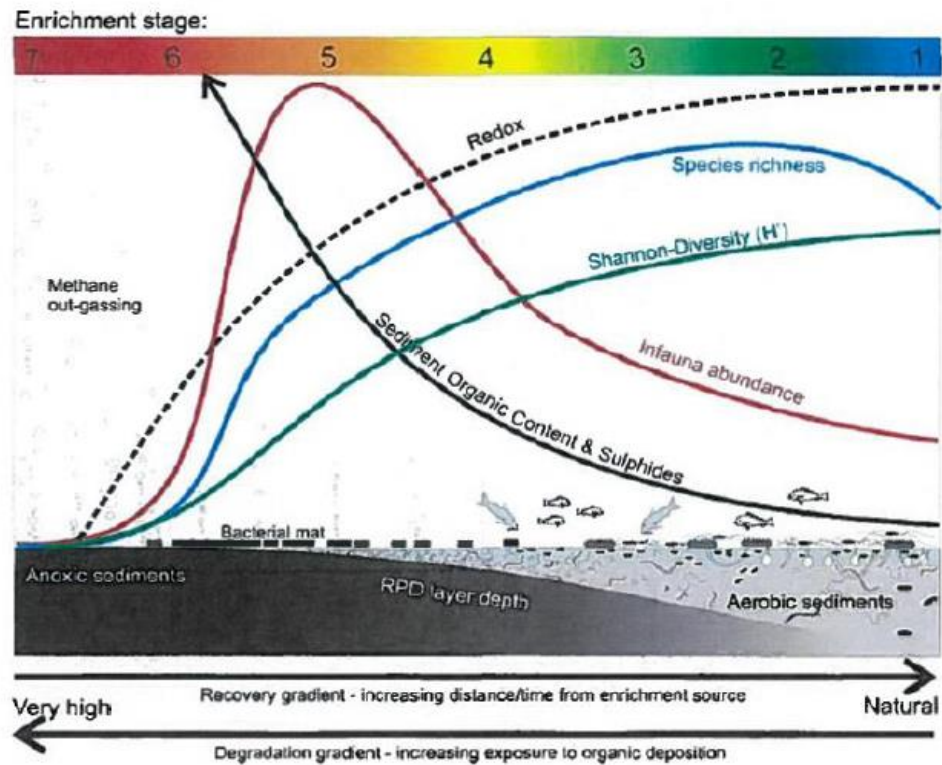


Table 5: General Description and Environmental Characteristics of Enrichment Stages (ES)

ES	General Description		Environmental characteristics
1	Natural/pristine conditions	LF	Environmental variables comparable to unpolluted/un-enriched pristine reference site.
		HF	As for LF, but infauna richness and abundances naturally higher (~2×LF) and % organic matter (OM) slightly lower.
2	Minor enrichment: Low level enrichment. Can occur naturally or from other diffuse anthropogenic sources. 'Enhanced zone'	LF	Richness usually greater than for reference conditions. Zone of 'enhancement' – minor increases in abundance possible. Mainly compositional change. Sediment chemistry unaffected or with only very minor effects.
		HF	Changes as for LF
3	Moderate enrichment: Clearly enriched and impacted. Significant community change evident.	LF	Notable abundance increase, richness and diversity usually lower than reference site. Opportunistic species (i.e. Capitellid worms) begin to dominate.
		HF	As for LF

4	High enrichment: Transitional stage between moderate effects and peak macrofauna abundance. Major community change.	LF	Diversity further reduced, abundances usually quite high, but clearly sub-peak. Opportunistic species dominate, but other taxa may still persist. Major sediment chemistry changes (approaching hypoxia).
		HF	As above, but abundance can very high while richness & diversity are not necessarily reduced.
5	Very high enrichment: State of peak macrofauna abundance.	LF	Very high numbers of one of two opportunistic species (i.e. Capitellid worms, Nematoda). Richness very low. Major sediment chemistry changes (hypoxia, moderate oxygen stress). Bacterial mat usually evident. Out-gassing occurs on disturbances of sediments.
		HF	<u>Abundances</u> of opportunistic species can be extreme (10×LF ES 5 densities). Diversity usually significantly reduced, but moderate richness can be maintained. Sediment organic content usually slightly elevated. Bacterial mat formation and outgassing possible.
6	Excessive enrichment: Transitional stage between peak abundance and azoic (devoid of any organisms).	LF	Richness & diversity very low. Abundances of opportunistic species severely reduced from peak, but not azoic. Total abundance low but can be comparable to reference sites. %OM can be very high (3-6 times reference).
		HF	Opportunistic species strongly dominate, with taxa richness and diversity substantially reduced. Total infauna abundance less than at sites further aware from the farm. Elevated %OM and sulphide levels[sic]. Formation of bacterial mats and out-gassing likely.
7	Severe enrichment: Anoxic & azoic; sediments no longer capable of supporting macrofauna with organics accumulating.	LF	None, or only trace numbers of macrofauna remain. Some samples with no taxa. Spontaneous out-gassing; <i>Beggiatoa</i> usually present but can be suppressed. %OM can be very high (3-6 times Ref).
		HF	Not previously observed – but assumed similar to LF sites

Annexure 2

Relevant extracts from the Board of Inquiry decision dated 22 February 2013

[Footnotes to evidential basis for findings not included]

Enrichment and Modelling of Impacts on the Seabed

[304] Mr Keeley described the enrichment effects of farm derived biodeposits along a gradient from “natural” to “azoic”, corresponding to numerical enrichment stages (ES) from 1 to 7. He made a distinction between the “primary depositional footprint”, as the area directly exposed to farm derived organic deposits, and “far field” effects. Directly beneath the cages “highly impacted” conditions are evident with the effects decreasing with distance from the cage boundaries. The level of effects is directly related to the farming intensity, in particular, the amount of feed over the preceding 6 to 12 months. Natural background conditions can be expected within about 150m of the cages at low flow (LF) sites, that is, the seabed effects are localised. At higher flow (HF) sites there is a correspondingly larger and more diffuse depositional footprint.

[305] Given the importance of the Enrichment Scale to the conditions governing the management of effects on the seabed we set this out in full:

General description	Environmental characteristics
1. Natural/pristine conditions	LF – unpolluted or unenriched reference site HF – as for LF but infauna richness and abundance naturally higher and % organic matter slightly lower
2. Minor enrichment – low level enrichment that can occur naturally	LF & HF – minor increase in abundance possible, richness usually greater, sediment chemistry largely unaffected
3. Moderate enrichment – clearly impacted with significant community change	LF & HF – notable increase in abundance, lower richness and diversity, opportunistic species (Capitellid worms) begin to dominate
4. High enrichment – transition between moderate effects and peak macrofauna abundance	LF – quite high abundance, further reduced diversity, opportunistic species dominate but other taxa still persist, major sediment chemistry changes (approaching hypoxia) HF – very high abundance while richness and diversity not necessarily reduced
5. Very high enrichment – peak macrofauna abundance	LF – very high numbers of one or two opportunistic species (Capitellid worms, nematodes), very low richness, major sediment chemistry changes (hypoxia, moderate oxygen stress), bacterial mat evident, out-gassing when sediments disturbed

	HF – extreme abundance opportunistic species (10x LF densities), significantly reduced diversity, moderate richness, sediment organic content elevated, bacterial mat formation and out-gassing possible
6. Excessive enrichment – transition between peak abundance and azoic (devoid of any organisms)	LF – abundances of opportunistic species severely reduced from peak, richness and diversity low, organic matter very high HF – total infauna abundance reduced, opportunistic species strongly dominant, richness and diversity substantially reduced, elevated organic matter and sulphide in sediments, bacterial mat formation and out-gassing likely
7. Severe enrichment – anoxic and azoic (no longer capable of supporting life)	LF – none or only trace numbers of infauna, spontaneous outgassing, bacterial mats present, organic matter very high HF – has not been observed but assumed similar to LF

[306] The relationship between the ES and a number of enrichment indicators (including infauna statistics, sediment chemistry and organic loading) has been numerically described. ES scores are calculated for each group of variables and a weighted average determined for each sample. The average score for the sampling location is given by the average of the replicate samples. In response to questions from the Board Mr Keeley explained that there were characteristics differences in the enrichment responses between low and high flow sites. While the sampling and survey methods would be the same the relationships between the environmental variables and the enrichment score would be different. He noted that the enrichment scores are heavily weighted towards the parameters describing the biological communities (rather than the sediment chemistry and organic loading).

[307] During cross-examination Mr Keeley clarified that ES levels above 1 were not necessarily induced by some external impact or activity and that some naturally muddy areas would always have been up to about ES 2.5. In response to questions from the Board Mr Keeley characterised the scale as being “oriented around enrichment” whether naturally occurring or derived from some direct input such as a marine farm.

[308] The primary driver of the level of impact is the mass of feed used. The amount of feed wasted (estimated at less than 0.5%), the feed conversion ratio (feed into growth versus faeces), and the type of feed are minor factors. The extent of the impact is directly related to the depth and water velocity at each site – the greater the depth and the swifter the current the more widely dispersed the organic material beyond the farm. Particles may also biodegrade or become assimilated within the water column. At high flow sites the seabed deposits may be re-suspended, promoting the supply of oxygen to the sediments and supporting life. Hence at low flow sites the effects on the seabed are typically highly localised and more pronounced. High flow sites

have a larger and more diffuse footprint with extremely high abundances of opportunistic taxa.

...

[319] There is no doubt that the area beneath the proposed salmon farms would be highly impacted, with much reduced biodiversity and significant changes in sediment chemistry. We acknowledge that conditions beneath the farms do respond and improve rapidly (within months) if the feed levels are substantially reduced. If farming ceases the effects are largely reversible. However, the experience at Forsyth Bay indicates that excessive enrichment ($ES \geq 6$) at low flow sites is difficult to come back from even over a period of some years.

[320] We acknowledge that there are uncertainties in the modelling of the effects on the seabed particularly with respect to the exact size and shape of the depositional footprints. However, these effects would be controlled by the conditions of consent and the proposed conditions are not dependent upon the outputs of the model. If the effects have been underestimated then King Salmon would be required to reduce the level of effect to that authorised by the conditions.

[321] The total area impacted is large but we note that only 7ha to 24ha would be highly impacted. The remaining areas would still be functioning well in an ecological sense although there would be noticeable differences in appearance and community structure.

[322] We find that the impacts on the seabed beneath the farms are adverse and likely to persist for some years following the cessation of farming. However, in the wider context of the Sounds we agree with Mr Keeley's conclusion that, given appropriate consent conditions, these effects would not amount to a significant adverse effect on the benthos. We address the issue of appropriate consent conditions, particularly for the low flow site at Papatua, later in this decision.

[323] ... The predicted flux within the primary depositional footprint, where benthic effects may be measurable, is $0.5\text{kg}/\text{m}^2/\text{yr}$. Mr Keeley concluded that, beyond the primary footprint of the farms, the flux would be sufficiently small and diffuse that it would be assimilated without any obvious ecological effects [fn: Keeley EiC [103]-[106]] [...]

[327] Dr Taylor considered that any of the habitats beyond the primary depositional footprint would be receiving very low levels of deposition ($<0.5\text{kg}/\text{m}^2/\text{yr}$ or $<1.3\text{g}/\text{m}^2/\text{day}$) which would not be likely to have any adverse effects. Based on this modelling and the annual reef monitoring at existing salmon farms he concluded that ecologically important habitats beyond the primary depositional footprints were not likely to be negatively affected.[fn: Taylor Rebuttal at [35]-[36]]

[...].

Discussion and Finding

[329] Beyond the primary depositional footprint the predicted additional flux is small in relation to the existing background flux. Accordingly, we accept that any significant or even observable ecological effect from far field deposition is unlikely. The results of long term monitoring of biological features in the proximity of existing salmon farms provides considerable comfort on this point. The proposed conditions require monitoring of such potential effects. ...

Proposed Conditions

[330] The conditions relating to benthic effects are formulated as “trigger and response” conditions with the details of the monitoring and adaptive management responses set out in Marine Environmental Monitoring and Adaptive Management Plan (MEM-AMP). Concerns have been raised about the trigger levels and the appropriate management responses as well as the ability of the Council to take timely enforcement action.

The Trigger Conditions

[331] The conditions of consent specify “zones” and “environmental quality standards” to be achieved at the zone boundaries beneath the farms. The four zones are described by Mr Keeley:

- Zone 1 – small area of most pronounced effects usually directly beneath the cages
- Zone 2 – area near the cages where effects can be highly impacted but dramatically improving with distance (out to 50–200m)
- Zone 3 – moderately enriched area extending 150–800m from the cages
- Zone 4 – beyond the primary footprint and comparable to natural background conditions

...

[334] Condition 48 sets out the Environmental Quality Standards (EQS) at the edge of the net pens, the Zone 2/3 boundary, and the Zone 3/4 boundary. Mr Baxter supported the approach of setting EQS at the zone boundaries and made some suggested improvements to the conditions that have been accepted by King Salmon. The EQS for seabed deposition as proposed by King Salmon are (in summary):

Zone	Monitoring location	EQS
1 and 2	Edge of net pens	ES \leq 5.0 (except Papatua); ES $<$ 6.0 (Papatua) No more than one replicate core with no taxa (azoic) No obvious outgassing Bacteria mat coverage no more than patchy
3	Zone 2/3 boundary	ES \leq 4.0 Infauna abundance not higher than at net pens Number of taxa $>$ 75% reference site
4	Zone 3/4 boundary	ES $<$ 3.0 Conditions statistically comparable with reference site

[335] Monitoring is conducted along two transects radiating away from the cages, one in the direction of the predominant current and the other perpendicular (or cross current) to the first. Three monitoring stations are placed on each transect – at the edge of the net pens, at the zone 2/3 boundary and at the zone 3/4 boundary. The MEM-AMP sets out the level of sampling and range of environmental variables to be measured annually at each of these benthic monitoring stations.

...

[343] We are satisfied that the approach of predicting the depositional footprint, defining the zones of impact, and setting limits in terms of the enrichment stage at the zone boundaries is an appropriate method to control the adverse effects on the benthos. The dimensions of the zones define the maximum physical extent of the effects and the EQS, alongside the narrative criteria, control the level or intensity of impact. The proposed monitoring would identify and quantify the effects.

...

[346] ES \leq 5.0 is proposed as the EQS for Zones 1 and 2 for all other farms. For the very high flow sites, such as Waitata, Kaitira and Ruaomoko, this would allow a highly impacted zone to extend 150m to 200m from the edge of the net pens. Only when the ES level goes above 5.5 is any specific action required to be taken under the proposed conditions. We are acutely aware that any reduction in the numerical EQS at the net pens has significant consequences for the productivity of the salmon farms and all of the modelling has been undertaken using an EQS of 5.0. We agree with the submission of the Minister of Conservation that a tolerance of +0.5 is too great before action is taken to reduce the impact.

...

Discussion and Finding

[373] We concur with the experts that there was a paucity of data presented to us on the existing water quality of the Marlborough Sounds, particularly given the temporal and spatial variations in nutrient concentrations and phytoplankton. It was somewhat frustrating to hear that additional data and information did exist but was not available to, and had not been properly considered by, the various experts for this hearing. In the absence of such consideration we are unable to comment on the adequacy of this information.

[374] The trend of increasing nutrient additions from the land and the absence of any robust research into the impact of the existing farms adds to our concerns about the characterisation of the existing environment. We go on to consider the implications of this lack of information and the uncertainties about the state of the existing environment in the context of the modelling and predictions of the environmental impact of nutrient additions from the proposed farms.

...

Discussion and Findings

...

[406] The scenarios modelled are for the “maximum initial feed discharge” in the proposed conditions of consent. While these levels are increased by 50% to demonstrate the impact of summer loadings Mr Knight has not modelled the “maximum feed discharge” also set out in the proposed conditions. He explained that these levels may never be reached and the intention was to take an adaptive management approach. We are somewhat astounded and cannot understand why these maximum discharges were not modelled to give the truly worst case scenario for nutrient additions and the potential effects at both local and Sounds wide scale. Such modelling would not have precluded an adaptive management approach.

[407] The lack of spatial modelling of the maximum feed discharges makes it extremely difficult to come to a finding on the nature or magnitude of the effects of this discharge. Obviously a doubling of the feed inputs is a considerable increase in the nutrient load, particularly over the summer period when the feed discharge is higher than the average for the year. We return to the

issue of the effects of the maximum feed discharge after considering the proposed conditions of consent and the detail of the adaptive management approach.

...

Overall Summary and Findings on Effects on the Water Column

[437] We agree with the experts that the background data and information on water quality, as presented to the Board, is not an adequate description of the existing environment given the scale of the proposed increase in finfish farming and consequential release of nutrients into the marine environment. Some of this deficiency in information can be remedied through the conditions of consent requiring baseline monitoring. Some is expected to be filled by the monitoring currently underway for the Council. However there remains considerable uncertainty as to the nature of the receiving environment, including the trends in other nutrient sources, and consequently the ability of the Sounds to adequately assimilate a significant increase in nutrients.

[438] We accept that the modelling of the nutrients introduced to the water column is conservative for the scenarios presented to us. However those scenarios were generally for the initial feed rates for each farm and, for some of the modelling, the (higher) summer loadings. The applications for each salmon farm seek almost double this feed level – the maximum conceivable feed levels as listed in the proposed conditions of consent. The approach taken was in marked contrast to the modelling of effects on the benthos which used these maximum feed levels. This astonishing gap in the prediction of effects on the environment cannot be explained away by emphasising that the modelling is conservative and nor can it simply be filled by invoking adaptive management. It is a fundamental failing in the assessment of effects on the environment that we would not expect to see in a project of this magnitude and importance.

[439] Accordingly we can only consider granting consent for these graduated increases in feed discharge levels with any increases based on a more robust monitoring and adaptive management regime than that presented in the proposed conditions.

The Proposed Conditions of Consent

[440] Initially the conditions of consent set out baseline and ongoing monitoring requirements for water quality close to the farms, locations with the potential for nutrient accumulation and control or reference sites. Every three years the results of the wider water quality and ecosystem monitoring were to be reviewed to assess trends and implications for the ecosystem, including

any potential for a shift in trophic status, and to make recommendations as to management actions and/or suitable indicators for assessing the water column ecosystem. Ms Dawson had considered these conditions and the associated monitoring and management plans to provide “a sufficiently structured, but flexible, adaptive management approach”.

[441] The Minister of Conservation submitted that the further amendments to the proposed conditions were required to ensure that the adaptive management regime for water quality would be sufficiently robust. The Minister was particularly concerned about baseline information, controlling the nutrient release (submitting that controlling the feed alone was not sufficient), an independent peer review panel, use of a food web model, setting appropriate thresholds for water quality, the management response to any breach of thresholds and enforceability. In closing the Minister focussed on the location of the monitoring sites and the associated modelling, the setting of thresholds and associated responses, and the roles of the peer review panel and the Council in reviewing and certifying the various management plans and thresholds. Further detailed suggestions were made with respect to controlling nitrogen inputs.

[442] Similarly Sustain our Sounds submitted that the peer review panel should be more independent, essential baseline information was missing, and the thresholds or limits of acceptable change should be set by the Board. They were troubled by the cause and effect requirements in the conditions in the event that a particular salmon farm may not “cause” an observed effect but may “enhance or multiply”.

[443] The Council submitted that the proposed conditions were overly detailed and complicated and could be simplified. They wished to see changes to the role of the peer review panel and clear standards, set out in the conditions, to be met by the management plan.

The Water Quality Objectives, Thresholds and Standards

[444] In response to the concerns expressed by submitters subsequent iterations of the conditions introduced a series of objectives, expressed in narrative form, to maintain the environmental quality of the Sounds. Dr Gillespie explained that specific quantitative thresholds or management triggers were not recommended “at this stage” because of the wide natural variability in nutrient levels. He preferred a “more holistic approach” based on monitoring a suite of enrichment indicators at selected sites to detect spatial gradients. Monitoring could include side embayments and sites of particular social or ecological concern. After three years of monitoring to evaluate the natural (seasonal and inter-annual) variation initial thresholds would be defined for specific indicators or an integrated trophic index. Any monitoring results

exceeding the thresholds would trigger a more intensive investigation to establish a cause and effect relationship and to inform of the need for an appropriate mitigation response.

[445] This approach was considered during caucusing and the experts were agreed that the condition specifying the water quality objectives should be amended to read as follows

[446] The experts also agreed:

Specific EQS measures are capable of being developed in the manner provided for in condition 50 through collaboration between relevant parties, and should be confirmed prior to fish being stocked in any of the farms.

[447] Drs Hartstein and Longdill added that trigger values should be supplied preapproval. During cross-examination Mr Knight also agreed that it would be ideal for the quantitative standards to be set prior to the fish going into the water.

[448] At the close of the hearing King Salmon proposed the following two conditions recasting the objectives as “qualitative water quality standards” and outlining the process for developing the quantitative standards and responses

[449] King Salmon submitted that the condition defining the qualitative standards clearly identifies the outcomes to be achieved and the precise means of achieving them (through adopting numerical thresholds or quantitative water quality standards) could appropriately be left to a management plan and carried out subsequently. Further conditions require the Baseline Report and the Annual Report to be provided to the Peer Review Panel for its review, assessment and recommendations. The consent holder is to have “particular regard” to any recommendations and must give reasons if any have not been adopted. Finally the Baseline Report and the Annual Report (with respect to any recommendations for changes to the WQS, adjustment to the EQS (for the seabed) compliance zone dimensions, and increase in feed discharge) must be approved by the Council.

[450] During cross-examination on the water quality standards Dr Gillespie explained that the narrative objectives were designed as a “safeguard” as the specific quantitative standards could “miss” the effects. He emphasised the need for a holistic approach and was reluctant to rely solely on the quantitative standards or thresholds. Any breach of a threshold would trigger more intensive monitoring, probably over a period of months, to establish cause and effect. That information would need to go to the peer review panel with recommendations as to whether or not to cut back on production. With respect to the narrative objectives Dr Gillespie would add

“intensity” to the frequency and duration of algal blooms and noted that there should be “no obvious shift towards a eutrophic state.

[451] The Minister of Conservation submitted that the condition relating to the trophic state should take into account both temporal aspects and the magnitude of change, suggesting the words “no statistically significant shift” to replace “no persistent shift”. The Minister proposed that the conditions setting the quantitative water quality standards should specify both “target” and “intervention” standards where any breach triggers further monitoring and reduced stocking respectively.

[452] Dr Broekhuizen believed that thresholds of acceptable change should be “promptly negotiated” and, if exceeded, the conditions should require prompt destocking of the farm. Dr Longdill agreed and described “target (or acceptable change) thresholds” above which a management response is required as well as maximal thresholds above which immediate action is required. The thresholds should be agreed on by the stakeholders including the consent holder and the Council with the support of the peer review panel. Dr Gillespie also addressed the issue of a two tiered response to the water quality thresholds when answering questions from the Board. He accepted that there should be additional detailed monitoring in the first instance and that a major breach, directly linked to the farm, should prompt a “short cut” to a response.

[453] During cross-examination Dr Broekhuizen commented further on the proposed conditions of consent (26 August 2012 version). He believed the conditions needed to clearly set out the process for developing the thresholds, the levels of acceptable change and the associated responses.

Discussion and Findings

[454] Dr Gillespie was careful to ensure that appropriate ecological safeguards were in place through the conditions of consent. He warned against relying on a single set of standards or thresholds even when adequate information became available to set such standards. We agree. While simplification to a series of thresholds or standards is tempting, and much easier to monitor and enforce through conditions, such an approach ignores the complexity of the ecological processes taking place within the Marlborough Sounds. While thresholds or standards will become important triggers in the future they are unlikely to be sufficient on their own. We find that setting objectives for water quality and the consequential ecosystem response is necessary to manage the potential adverse effects of the nutrient additions. Our task is to ensure that these objectives, as part of the conditions of consent, are reasonably certain and enforceable.

[455] Comparing the “qualitative water quality standards” in the proposed conditions to the suggestions for objectives in the agreed statement of the experts we make the following observations. First, these qualitative standards are not standards as that term is usually used in resource management practice – they are indeed objectives for an adaptive management approach to water quality (and the wider ecosystem) and it does no harm to use the more correct term. Some of these objectives are able to be stated reasonably precisely however others are broad and involve a measure of professional judgement. In this context we find the conditions requiring a Peer Review Panel to be both necessary and appropriate.

[456] Second, the issue of any shift in trophic state needs to be expressed in terms of an “increase” or “shift towards” rather than a full scale change in state. A change from today’s oligotrophic/mesotrophic conditions to a eutrophic state would represent an ecological disaster with significant implications for recreation and tourism, natural character, cultural values and other primary production operators within the Sounds. Preventing such an extreme scenario is hardly an appropriate safeguard, something less must trigger action. What represents a material or significant shift (with respect to magnitude, temporal and spatial extent) must be left to the judgement of the Peer Review Panel in the light of all of the information from the monitoring programme. Being able to demonstrate statistical significance may well require additional monitoring. We agree with the change proposed by the Minister of Conservation to this objective. Further, as discussed earlier in this decision, we think the present state should be described as oligotrophic/mesotrophic and the word “towards” should be used rather than “to” – thus conveying the message that avoiding a significant movement along the scale is the objective.

[457] We also favour adding an integrated trophic index to the list of quantitative water quality standards. While it may be sometime before such an index can be reliably “calibrated” for the Sounds, or possibly for different regions within the Sounds, we accept the evidence of Dr Gillespie that it may become a valuable indicator in the future.

...

[459] Any breach of the benthic standards requires a decrease in feed levels or the following of the farm. The hierarchy of responses with respect to any breach of the water quality standards is to first require more information and if that information indicates a problem caused by the farm then an “action plan” must be formed. We do not entirely disagree with this approach but do think that large exceedences of the standards should result in more immediate action – that is a two tier approach. Our recommendations for changes are shown in the attached conditions of

consent.

[460] Finally we note the experts' agreement on involving "other parties" in setting the water quality standards. This recognises the reality that setting standards is a values based decision and science can only take us so far. In this instance the Board must make the decision, based on the evidence presented, as to the levels of acceptable change. We have already discussed what is acceptable in terms of the benthic standards. While we are not able to make a decision as to the appropriate water quality standards the thresholds must relate to the agreed objectives as modified by this decision. And the conditions must clearly set out the process and timelines for setting these standards. We are satisfied that the proposed conditions provided by King Salmon in closing are adequate in this regard. The Peer Review Panel is tasked with reviewing the baseline information, the quantitative water quality standards, the management responses and the supporting monitoring programme.

...

Discussion and Findings

[472] The purpose of the monitoring is to ensure that the environmental quality standards for both the seabed and the water column are met. As for the Baseline Plan the proposed conditions specify that the ongoing monitoring plan – Marine Environmental Monitoring and Adaptive Management Plan or MEM-AMP – must be prepared by an independent person and is subject to peer review. The Peer Review Panel is to assess the adequacy of the MEM-AMP and make recommendations regarding any changes, including any requirement for further modelling.

[473] While we share the concerns of Dr Broekhuizen and Dr Longdill regarding the adequacy of the proposed monitoring, including the modelling for the purposes of identifying the sampling locations, we consider the conditions proposed by King Salmon in closing to have addressed these issues. Given the robust peer review process incorporated into the conditions of consent we are satisfied that the monitoring conditions are adequate.

