February 2024 - Draft for Public Consultation

ASC Farm Standard

Setting The Standard for Seafood

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Trade register number 34389683

For comments or questions regarding the content of this document, please contact the Standards and Science Team of ASC via standards@asc-aqua.org.

Document ID: ASC-STD-001

Version control

Document version history:

Version:	Sign-off date:	Effective date:	Remarks/changes:
V0.1		N/A	
V0.2		N/A	Indicator language updates based on finalisation meeting May 2023
V0.3		N/A	Full standard for TAG 29 endorsement in January 2024
V0.4		N/A	Full standard for public consultation in April 2024

It is the responsibility of the user of the document to use the latest version as published on the ASC-website.

Available language(s)

The ASC Farm Standard document is available in the following language(s):

Version:	Available languages
v0.1-04	English (official language)

In case of any inconsistencies and/or discrepancies between available translation(s) and the English version, the online English version (PDF format) will prevail.

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About the Aquaculture Stewardship Council (ASC)

We are setting The Standard for seafood.

Impact-focused, Aquaculture Stewardship Council (ASC) is driving **the world's leading independent certification programme for responsibly farmed seafood.**

Setting the most robust standards and providing the highest assurance and integrity throughout the supply chain, we are leading the transformation of the seafood farming industry transparently towards environmental sustainability and social responsibility.

All this ensures that ASC labelled seafood, available in over 100 countries, has been farmed with care.

Farmers choose ASC certification to benefit from the biggest global footprint providing the most supply and sales opportunities.

Retailers choose ASC labelled seafood to benefit from the highest assurance throughout the supply chain and strong global recognition of the ASC brand.

Seafood lovers choose ASC labelled seafood to make a healthy and tasty choice and drive a positive impact on the planet and people.

The ASC Document and Certification System

ASC is a code-compliant member of the ISEAL Alliance and runs an independent third-party certification system consisting of three independent actors:

Scheme Owner : Aquaculture Stewardship Council

Accreditation Body : Assurance Services International (ASI)

Conformity Assessment Body (CAB) : accredited CABs

Scheme Owner

ASC, as scheme owner:

- sets and maintains Standards according to the ASC Standard Setting Procedure which is in conformance with the "ISEAL Standard-Setting Code of Good Practice."
- sets and maintains Interpretation and Assessment Guidance. ASC expects the UoC and Conformity Assessment Bodies (CABs) to follow this guidance to clarify a requirement within the local context, in line with the intention of the Criterion and Indicator in the Standard.
- sets and maintains the Certification and Accreditation Requirements (CAR) which is in conformance with the "ISEAL Code of Good Practice - Assuring conformance with Social and Environmental Standards". The CAR describes the accreditation, assessment and certification process requirements for the CAB.
- sets and maintains the Certification Requirements for the Unit of Certification (RUoC). The RUoC describes assessment and certification process requirements for the UoC.

The ASC Standards, the CAR and the RUoC are normative documents. These documents are available on the ASC website.

Accreditation Body

Accreditation is the assurance process of assessing the CAB against accreditation and certification requirements. It is carried out by an Accreditation Body (AB). The appointed AB for ASC is Assurance Services International (ASI) which uses the CAR as the main normative document for the accreditation process.

Assessment findings of ASI accreditation audits and an overview of currently accredited CABs are available on the ASI website.[1]

Conformity Assessment Body

The UoC contracts the CAB which employs auditor(s) to conduct a conformity assessment (hereafter 'audit') of the UoC against the relevant Standard. The management requirements for CABs as well as auditor competency requirements are described in the CAR and are assured through accreditation.

ASC Audit and Certification Process

An ASC audit follows pre-defined process requirements, detailed in the CAR and the RUoC. Only ASI accredited CABs are allowed to conduct certification audits against ASC Standards and issue certificates. ASC is never involved in the audit or certification decision of a UoC. Granted certificates are the property of the CAB.

Certificates issued by the CAB, as well as the corresponding audit reports containing findings and resolution of any non-conformities, are available on the ASC website. Where certification was not granted by the CAB, audit findings and the negative certification decision are also made available on the ASC website.

[1] https://www.asi-assurance.org/s/

Document Structure and Language Use

Standard Structure

The ASC Farm Standard (hereafter 'the Standard') is structured as follows:

- The Standard consists of four Principles – each **Principle** defines a high-level outcome which, collectively, contribute to delivering the ASC vision.
- Each Principle consists of multiple **Criteria** which collectively address topics that are relevant to the Principle's outcome.
- Each Criterion is composed of a Rationale, an Intent statement and multiple **Indicators**. The audit is conducted against the Indicators, including any referenced Definitions, Footnotes or Appendices.

Language use, definitions, and acronyms

Throughout the Standard, several verbal forms are used:

- "Shall" indicates an action a producer must take.
- "Should" indicates an action a producer may take but a situation in which conformance may be possible if the action is not taken.
- "May" indicates something that is permissible.
- "And" indicates that all listed options are required.
- "Or" indicates that not all listed options are required.

Acronyms are listed in **Appendix 1**.

The first instance of a term is highlighted in **bold**. Definitions can be found in **Appendix 2**.

Standard Scope and Standard Applicability

Standard Scope

The Standard addresses the key Environmental, Human Rights and Animal Welfare impacts related to the aquaculture industry. These are reflected in four Principles:

- **Principle 1** - The UoC operates legally and applies effective business management.
- **Principle 2** - The UoC operates in an environmentally responsible manner.
- **Principle 3** - The UoC operates in a socially responsible manner.
- **Principle 4** - The UoC operates responsibly with respect to animal health and welfare.

The Standard is applied to the Grow Out site(s). These are all site(s) that grow eligible product after the cut-off line defined in **Appendix 14**. This means that site(s) used between hatcheries and the final Grow Out site (e.g. intermediate sites, transfer sites, etc.) are certifiable.

Sites that grow eligible product before the cut-off line are assessed through documented evidence as part of the Grow Out certification process.

Criteria and Indictor Applicability

The ASC Farm Standard is globally applicable to the main aquaculture Production Systems, Water Types and the Certifiable Species produced within Grow Out sites.

Due to the diversity of Production Systems, Water Types and the Certifiable Species produced, the ASC Farm Standard defines the specific 'applicability' of certain Criteria and Indicators. This applicability is referenced either directly below the title of the Criterion, the Indicator text or within the Appendices. The following considerations are made regarding applicability:

- Applicability in relation to Laws and Regulations:
    - In cases where a Law or Regulation is stricter than the Indicator, the Law or Regulation will prevail. In cases where a Law or Regulation is less strict than the Indicator, the Standard prevails unless the Indicator requires actions that are not allowed by Law or Regulation.
- Applicability in relation to Production System and Water Type:
    - In cases where it is not defined (i.e. *blank*), the Criterion or Indicator applies to every Unit of Certification. Auditors may assess the applicability differently depending on the context of the farm.

- The Standard addresses the impacts generated from the main Production Systems[2]:
  - **Cage Production Systems**
  - **Flowthrough/Raceway Production Systems**
  - **Pond Production Systems**
  - **Recirculation Aquaculture System (RAS) Production Systems**
  - **Suspended Production Systems**
- The following grouping of Production Systems is also referenced:
  - **Water-based Production Systems**
  - **Land-based Production Systems**
  - **Fed Production Systems**
  - **Non-fed Production Systems**
  - Production Systems with **Point Source Effluent Discharge**
- Where needed, the Standard refers to the following Water Types:
  - **Freshwater**
  - **Brackish Water**
  - **Marine Water**

- Applicability in relationship to Certifiable Species[2]:
  - Under 'Certifiable Species' all species are listed that are eligible for ASC certification. Applicability can be attributed at Animal Group (e.g. Fish), Species Group (e.g. Salmonids), Genus (e.g. *Salmo*) or Species (e.g. S. *salar*).
- Applicability otherwise defined:
  - A limited number of Indicators are applicable to unique circumstances. These are defined in the Indicator text itself.

[2] When used Production Systems, or cultured Species are not listed, please contact the ASC Standards Team for support via Standards@asc-aqua.org prior to entering the certification process.

Applicability examples

Resulting from the wide range of combinations in Production System, Water Type and Certifiable Species, the applicability description can vary. Some examples are listed below.

- Criterion applicability: 'not specified' (i.e. blank):
    - Criterion *applies to all certified producers.*
- Criterion applicability: 'Marine Salmonid Cage Production Systems':
    - Criterion *applies only to producers that culture Salmonids in marine Cage Production Systems. Salmonids is a reference to a Species Group, not a single Species.*
- Indicator applicability: 'All fish species':
    - Indicator *applies to all fish species, but not to abalone, bivalves, crustaceans, seaweed.*
- Indicator applicability: 'Water-based Production Systems':
    - Indicator *applies to production systems that are water-based (i.e. cages, rafts, racks, etc.).*

Unit of Certification (UoC)

The Unit of Certification (UoC) is the Grow Out site(s) used for growing certified product after which product enters further into the chain of custody.

This may include:

- production sites (i.e. farming sites)
- harvest sites
- storage sites
- slaughter or processing operations (including subcontracted operations)
- activities under the responsibility of the UoC, such as transport

Furthermore, the UoC may consist of one site (Single Site Certification) or more than one site (Multi-Site/Group Certification). The certification requirements for these approaches are outlined in the CAR.

Certifiable species

The species or genera covered by the Standard (i.e., species for which CABs can issue a certificate) are:

Fish:

- **Flatfish**
    - **Flounders** – all species in the genus *Paralichthys*, *Pseudopleuronectes*
    - **Halibut** – all species in the genus *Hippoglossus*
    - **Turbot** – all species in the genus *Scophthalmus*
- **Pangasius** - all species in the family *Pangasiidae*
- **Pike perch** – *Sander lucioperca*
- **Salmonids - freshwater**
    - **Salmon, trout and char** – all species in the genera *Salmo*, *Oncorhynchus* and *Salvelinus*
    - **Greyling** – all species in the genus *Thymallus*
    - **Whitefish** – all species in the genus *Coregonus*
- **Salmonids – marine**
    - **Salmon, trout and char** – all species in the genera *Salmo*, *Oncorhynchus* and *Salvelinus*
- **Seabass, Seabream, Meagre**
    - **Seabass** - all species in the genus *Dicentrarchus*
    - **Seabream** - all species in the genera *Sparus* and *Pagrus*
    - **Meagre** - all species in the genus *Argyrosomus*
- **Seriola and Cobia**
    - **Seriola** - all species in the genus *Seriola*
    - **Cobia** - *Rachycentron canadu*
- **Tilapia** - all species in the genera *Oreochromis*, *Tilapiini* and *Coptodon*

- **Tropical Marine Fish (TMFF)**
    - **Groupers** – all species in the genera *Epinephelus*, *Cromileptes*, *Plectropomus* and *Cephalophis*
    - **Snappers** – all species in the genera *Lutjanus* and *Ocyurus*
    - **Pompano** – all species in the genus *Trachinotus*
    - **Barramundi** – all species in the genus *Lates*
    - **Croaker** – all species in the genus *Larimichthys*

Molluscs:

- **Abalone** – all species in the genus *Haliotis*
- **Bivalve** – all (filter-feeding) species in the class *Bivalva*, except the (non-filter-feeding) families *Nuculanidae, Nuculidae* and Solemyidae

Crustaceans:

- **Shrimp** – all species in the genus *Penaeus*
- **Freshwater prawn** – all species in the genus *Macrobrachium*
- **Bivalve** – all species in the genera *Cherax*, *Procambarus*, *Astacus*

Naming of species, genera, families and orders follow the FAO ASFIS List of Species naming convention where possible. Grouping and taxonomic classification here can differ from other sources. ASC provides an updated list annually with certifiable species that fall under the biological scope of the Standard.

Certificate Validity and ASC Label use

All valid ASC certificates are available on the ASC website for verification.

For more information see ASC's Logo User Guide or contact logo@asc-aqua.org.

Unauthorised label display or use of trademarks is prohibited and will be treated as a trademark infringement.

Principle 1: The UoC operates legally and applies effective business management

Scope - Every UoC.

Rationale - the aquaculture sector is rapidly growing and it is becoming a major player in some economies and a key contributor to global food security. Despite this, the enforcement of aquaculture legislation and regulations often fall short. Consequently, negative impacts on societies and the environment can, and do, occur. Although legal compliance comes with investment costs, it is vital for the successful management and development of the industry that all actors comply with existing legislation and regulation.

Embedded within ASC's vision of promoting responsible aquaculture, this Principle requires that certified facilities operate a legal and ethical business in a well-managed manner that assures conformance with the ASC requirements (including those outlined in the CAR) throughout the validity of a certificate.

Criterion 1.1 – Legal Compliance

Rationale – A legal business operation includes compliance with licencing and permit requirements, and applicable laws. Compliance with national law is fundamental to the development of socially and environmentally responsible aquaculture, and essential to a well-managed sustainable business.[3] All ASC certified farms are expected to comply with local and national laws and regulations.

Intent – The farm complies with applicable laws and regulations.

Indicators:	
Indicator 1.1.1	The UoC shall have all required legal licences and permits.
Indicator 1.1.2	The UoC shall comply with all applicable environmental, human rights and animal welfare-related laws and regulations.

[3] FAO. 2018. The State of World Fisheries and Aquaculture 2018 - Meeting the sustainable development goals. http://www.fao.org/3/i9540en/I9540EN.pdf

Criterion 1.2 – Management System

Rationale – A **management system** is the method in which an organisation manages the interrelated parts of its business to achieve its objectives. The level of complexity of the system will depend on each organisation's specific context, size, scope and risks of its activities.[4]

The management system includes policies, procedures and processes. It should be overseen by a designated manager and supported by **employees** with relevant competencies to ensure objectives are achieved effectively and efficiently. Management systems should ensure compliance with applicable laws and regulations as well as with ASC Farm Standard requirements. A robust management system will enable the UoC to plan, implement and monitor its conformance with the ASC Farm Standard.

Intent – The farm has a management system in place to continuously implement, verify and demonstrate conformance with all ASC Requirements and monitor, detect, prevent and mitigate risks.

Indicators:	
Indicator 1.2.1	The UoC shall implement and maintain a management system covering all ASC Requirements, signed-off by senior management.
Indicator 1.2.2	The UoC shall have at least one named member of management who is responsible for the implementation of the ASC Requirements.
Indicator 1.2.3	The UoC shall ensure that relevant **employees** have the necessary competencies to implement the ASC Requirements.
Indicator 1.2.4	The UoC shall conduct an internal self-assessment at least annually to monitor its conformance with the ASC Requirements, determine the root cause of any non-conformity detected, and develop and implement corrective actions to address those non-conformities.
Indicator 1.2.5	The UoC shall be able to demonstrate conformance with the ASC Requirements to the Conformity Assessment Body auditors, the ASC accreditation body, and ASC as scheme owner.
Indicator 1.2.6	Senior management shall review the UoC's management system at least annually, to ensure its continuing suitability, adequacy, and effectiveness in meeting the ASC Requirements. This review shall be documented, and issues identified addressed within an appropriate timescale.

[4] https://www.iso.org/management-system-standards.html

Criterion 1.3 – Business Ethics

Rationale – The Institute of Business Ethics explains that 'business ethics is the application of ethical values to business behaviour,'[5] relevant across every aspect of a business, from the behaviour of an individual, to how companies treat their employees and suppliers, to sales and accounting practices.[6] The benefits of running an ethical business are well-documented. Within an organisation it can create stronger teams and employee loyalty, and looking outwards it can improve a business' reputation, increase profitability and provide a competitive advantage.[7]

Often businesses operate in environments that can make operating ethically a challenge. **Corruption** is widespread and exists in every country in the world. Transparency International defines corruption 'as the abuse of entrusted power for private gain.' Corruption erodes trust, weakens democracy and further exacerbates inequality, poverty, social division and the environmental crisis.'[8]

The United Nations Convention Against Corruption states that corruption poses a threat to the stability and security of societies.[9] It can affect economic development, increase income inequalities, undermine steps that are being taken towards social development and result in lower levels of human development,[10] and can undermine democracy and the rule of law.[11] Corruption and misrepresentation can also have an impact on employees, reducing morale and creating a lack of trust and accountability in the workplace.

Many businesses also face problems with fraud, which Transparency International defines as cheating, and 'the offence of intentionally deceiving someone in order to gain an unfair or illegal advantage (financial, political or otherwise)[12]'. In many countries, fraud is a criminal violation. Despite the presence of corruption and fraud, businesses should work towards operating in a legally compliant and ethical manner.

Intent – The farm ensures an ethical operating and business environment.

Indicators:	
Indicator 1.3.1	The UoC shall maintain a culture to prevent acts of **corruption**, extortion, embezzlement or bribery within its operations.
Indicator 1.3.2	The UoC shall ensure that records are not falsified and information is not misrepresented.

[5] https://www.ibe.org.uk/knowledge-hub/what-is-business-ethics.html
[6] https://www.ibe.org.uk/knowledge-hub/what-is-business-ethics.html
[7] https://www.thehumancapitalhub.com/articles/The-Advantages-Of-Ethical-Behaviour-In-Business
[8] https://www.transparency.org/en/what-is-corruption
[9] https://www.unodc.org/documents/treaties/UNCAC/Publications/Convention/08-50026_E.pdf
[10] https://www.transparency.org/files/content/corruptionqas/Impact_of_corruption_on_growth_and_inequality_-2014.pdf
[11] https://www.unodc.org/documents/treaties/UNCAC/Publications/Convention/08-50026_E.pdf
[12] https://www.transparency.org/en/corruptionary/fraud

Criterion 1.4 – Traceability and Disclosure

Rationale – **Traceability** plays an integral role in seafood sustainability certification, as it ensures that claims are transferred properly through the supply chain to the end consumer. As one of the most internationally traded food commodities, often through complex supply chains, seafood is highly vulnerable to food fraud, especially product mislabelling, species substitution and provenance misrepresentation[13,14,15].

To ensure that ASC certified products are correctly differentiated from non-ASC certified products, traceability systems must be in place.

Intent – The farm ensures the conformity, disclosure and traceability of products sold as ASC certified.

Indicators:	
Indicator 1.4.1	The site shall evaluate and mitigate risks of mixing and substitution between certified products and non-certified products.
Indicator 1.4.2	The site shall develop and implement a traceability system with the following elements: a) A mechanism to ensure only batches of larvae/juveniles compliant with Criterion 2.14 are used to produce certified product; b) All batches of larvae/juveniles/fish received are traceable back to the supplier; c) All batches harvested are traceable back to the production unit; d) All batches of certified and non-certified product are identifiable, segregated and traceable at every stage; e) Covers each stage of the production cycle and post-harvest activities, if included in the scope of the UoC; f) Corrective actions to be taken if non-conforming product has been sold or dispatched; g) Identification of the ASC certified status of products sold and dispatched within accompanying delivery documentation when products are sold as certified.

[13]FAO. 2018. Overview of food fraud in the fisheries sector. http://www.fao.org/3/i8791en/I8791EN.pdf
[14] Kroetz et al. 2020. Consequences of seafood mislabelling for marine populations and fisheries management. http://www.pnas.org/content/117/48/30318#sec-1
[15] Sumaila et al. 2020. Illicit trade in marine fish catch and its effects on ecosystems and people worldwide. http://www.science.org/doi/10.1126/sciadv.aaz3801

Indicator 1.4.3	*Indicator scope: every site using feed* The site shall confirm products conform with Indicators 2.12.1 and 2.12.2 upon receipt and prior to feeding. In relation to Indicator 2.12.1 and as a minimum, the site shall confirm the following: a) The feed mill holds valid certification against the ASC Feed Standard; b) Documentation accompanying the product clearly identifies the product as ASC-compliant; c) Feed is traceable as ASC-compliant throughout all steps between the feed mill and farm; d) Documentation accompanying the product clearly identifies the feed production model applied (i.e., mass balance or segregation); and e) For ASC-compliant segregated feed, the product is clearly identifiable by a distinct feed name in formal documentation accompanying the product and is listed on the schedule to the feed mill certificate.
Indicator 1.4.4	The site shall only sell products as certified which are eligible to be sold as certified. Product is non-certified under the following circumstances: a) Shrimp treated with antibiotics at the grow out. b) Any product treated with antimicrobials listed as Critically Important Antimicrobials for Human Medicine by the World Health Organisation (WHO).
Indicator 1.4.5 	The site shall disclose to all buyers of their ASC certified product where product fed contains[16] Genetically Modified Organisms (GMO) or ingredients[17] produced from GMO.
Indicator 1.4.6	The site shall, upon request, provide buyers of their ASC certified product a list of all veterinary therapeutants applied to the product.

[16] A threshold of 0.9% is permitted to allow for the adventitious or accidental presence of GM material in non-GM food or feed sources. Reference: EU Regulation 1830/2003 concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms.

[17] Applies to macro ingredients as defined by EU regulation 1830/2003 concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms.

Indicator 1.4.7 	The site shall annually report to ASC the production volumes and sales/dispatch volumes of ASC and non-ASC products originating from the UoC, in accordance with ASC data submission procedures.

Principle 2: The UoC operates in an environmentally responsible manner

Rationale – Aquaculture is reliant on ecosystem services for inputs, and absorption of outputs. If not managed well, the capacity of environment services can be exceeded, resulting in negative environmental impacts. Rapid growth of the aquaculture sector, particularly in remote regions and areas with inadequate regulations for the scale of operations, may further amplify these negative environmental impacts.

The ASC certification programme addresses, mitigates and prevents negative environmental impacts with third party assurance and can help provide the industry with the social licence to operate (SLO) it needs if it is to address the food security challenges of the 21st century and play a major role in supplying food for mankind.

Aquaculture production varies widely in terms of species cultured, production systems used, and environment in which it operates. As a result, the potential impacts of production also vary widely. The ASC Farm Standard defines the key impact areas for all main culture systems and applies specificity where needed. The measures to minimise impacts are continuously reviewed and consider new insights with the intent of constantly redefining what “least impact” means.

The intended outcome of Principle 2 is that ASC-certified facilities operate in an environmentally responsible manner, by ensuring that:

I. The farm’s siting and operation does not impact wider ecosystem functioning.
II. Resource use is optimised.
III. Outputs do not exceed ecosystem absorption rates.
IV. The species cultured do not harm native species and/or ecosystems.

Criterion 2.1 – Environmental Risk Assessment

Rationale – Many of the environmental impacts of the aquaculture industry are the result of the context in which the farm is operating and the risk this poses for the nearby environment. Defining these specific risks is beyond the capacity of a global standard and therefore a site-specific evaluation of environmental risks is required.

Environmental **Risk Assessments** (or Environmental Impact Assessment or ERA) are globally applied in a wide range of industries and through regulatory requirements in many countries and have proven to be an effective means to assess and mitigate the implications of current and future actions.

Within the context of the ASC Certification Programme, certified farms are required to assess their environmental impact through an ERA and mitigate identified risks accordingly.

Intent – The farm minimises their site-specific environmental impacts.

Indicators:	
Indicator 2.1.1	The UoC shall conduct a site-specific ERA following the Standardised Risk Methodology in **Appendix 4.1**.
Indicator 2.1.2 	The UoC shall submit to ASC a summary of the ERA, including at least: 1. the relevant risk factors and their corresponding risk levels; 2. identified mitigation measures; and 3. effect of implementing the mitigation measures; in accordance with ASC data submission procedures.

Criterion 2.2 – Ecologically Important Habitats

Rationale – The development and activities of aquaculture operations can damage wild species, disrupt ecosystems and reduce valuable ecological services across marine, terrestrial and freshwater habitats. Through responsible siting requirements, essential habitats can be protected and the critical resources on which **threatened and protected species** depend maintained.

Intent – The farm siting and operation does not interfere with the function and conservation objectives of nearby important ecological habitats.

Indicators:	
Indicator 2.2.1	The UoC shall not be sited in **Protected Areas** (PA), Areas with Associated Designations or **Other Effective Area-based Conservation Measures** (**OECMs**), unless permissible under the conditions listed in **Appendix 5**.
Indicator 2.2.2	The UoC shall not have a negative impact on **critical habitats** near the farm as is determined through the ERA (see Indicator 2.1.1).
Indicator 2.2.3	The UoC shall maintain critical habitat within the farm boundaries as determined through the ERA (see Indicator 2.1.1).
Indicator 2.2.4	The UoC shall not have a negative impact on **sensitive habitats** near the farm as determined through the ERA (see Indicator 2.1.1) other than already addressed through Indicators 2.2.1 – 2.2.3, 2.2.5 – 2.2.8.
Indicator 2.2.5	The UoC shall maintain natural **wildlife corridors** through the farm to provide for wildlife movement across (larger) production landscapes as determined through the ERA (Indicator 2.1.1).
Indicator 2.2.6	The UoC shall maintain an appropriate **buffer zone** to waterways with a minimum width determined through the ERA (Indicator 2.1.1), or as a default 100m for buffer zones to the open coastline (including adjacent waterbodies) and 15m from rivers and other waterbodies (whichever is stricter).
Indicator 2.2.7	The UoC shall have successfully rehabilitated a minimum of 50% of the surface area of **natural wetland** (including mangroves) converted before May 1999.

Indicator 2.2.8	The UoC shall not convert natural wetlands (including mangroves) after May 1999, except for maintaining or establishing pumping stations or water pipes/canals and provided that a surface area equivalent to the total of the converted surface area is successfully rehabilitated.

Criterion 2.3 – Wildlife Interactions

Rationale – Aquaculture operations may attract and interact with wildlife. Interactions may lead to the injury of, or predation upon, culture animals. Therefore, aquaculture operations may employ wildlife deterrents. Deterrents can, in some instances, disturb, injure or kill predators and other wildlife. Examples include entanglement in farming operation equipment, harm from **acoustic deterrent devices**, or direct lethal action on wildlife. Aquaculture operations may also impact on wild populations through the extraction of larvae, juveniles or mature animals for the purpose of cultivation or breeding.

To protect both wildlife and the culture animals, aquaculture operations should minimise interaction with wildlife, and minimise injury and mortalities of predators and other wildlife, particularly threatened or protected species.

Intent – The farm minimises negative wildlife interaction to ensure low risk of wildlife disturbance.

Indicators:	
Indicator 2.3.1	The UoC shall as part of the ERA (Criterion 2.1) assess Human-Wildlife Interactions and the risk of Human-Wildlife Conflict near to, and on, the UoC and implement mitigation measures where needed.
Indicator 2.3.2	The UoC shall not injure or cause mortality of any Threatened and Protected Species, except[18] for situations where at least one of the following conditions apply: 1. Injured animals are unlikely to recover, or; 2. Immediate human safety is threatened, or; 3. Legal requirements mandate emergency euthanasia of injured animals.
Indicator 2.3.3	The UoC shall not injure or cause mortality of mammals, elasmobranchs, or reptiles (excluding **vermin**), except[18] for situations where at least one of the following conditions applies: 1. Injured animals are unlikely to recover, or; 2. Immediate human safety is threatened, or; 3. Where legal requirements mandate emergency euthanasia of injured animals.

[18] Exceptions are limited to occasional mortality incidents, rather than systemic incidents, and as long as the incident does not affect the favourable population status. As an example, a written statement by a veterinarian or the responsible authorities may confirm animals were unlikely to recover or the situation evidently threatened human safety, and a written statement by authorities may confirm legal requirements to euthanise. In all cases, a written statement shall be available confirming that a) injured animals were unlikely to recover, b) animals evidently threatening human safety, or c) legal requirements mandated euthanisation by a senior manager above the farm manager, which can be issued during or after the incident.

Indicator 2.3.4	The UoC shall not exceed more than five bird mortality incidents per year.
Indicator 2.3.5	The UoC shall conduct root cause analysis and implement preventative actions for each wildlife mortality incident with the intent to prevent repetition.
Indicator 2.3.6	The UoC shall only apply (aquatic) acoustic deterrence, where there is clear scientific evidence that the used technology or method does not result in significant stress, injury or mortality of the impacted species or their populations.
Indicator 2.3.7	*Indicator scope: all finfish species* The UoC shall only stock fish that is hatchery-raised.
Indicator 2.3.8	*Indicator scope: Seriola/Cobia only* The UoC shall only stock fish that is wild-originating if: 1. The species is not listed as a Threatened and Protected Species; 2. The originating fishery is certified to a GSSI-recognised Fisheries Certification Scheme; 3. Traceability back to originating fishery is provided.
Indicator 2.3.9	*Indicator scope: all shrimp species* The UoC shall only stock hatchery-originating post-larvae.
Indicator 2.3.10	*Indicator scope: shrimp farming only* The UoC shall only use passive stocked wild larvae, under the following conditions: 1. The production system is a non-fed, low-intensive pond production system; 2. Inflow of larvae occurs through natural tidal flow into the ponds.
Indicator 2.3.11	*Indicator scope: all bivalve farming* The UoC shall only use wild caught bivalve seed if: 1. The species is not listed as a Threatened and Protected Species, and; 2. The seed is harvested from a regulated area.
Indicator 2.3.12	*Indicator scope: all abalone farming* The UoC shall only use seed originating from native wild broodstock (not selectively bred animals) in situations where the species is listed as Threatened and Protected Species.
Indicator 2.3.13 	The UoC shall publicly disclose wildlife mortalities within 30 days after the incident.

Indicator 2.3.14 	The UoC shall annually report to ASC on wildlife mortalities, in accordance with ASC data submission procedures.

Criterion 2.4 – Alien Species and Native Biodiversity

Rationale – As a result of human activities, organisms ("taxa") are constantly taken from their native habitat and introduced into new (non-native) habitat at which point they are considered an "**alien species**" (synonyms are non-native, exotic and non-indigenous species). This also includes the use of breeds or strains within their native habitat.

Alien species can impact their new environment in negative, neutral or positive ways – but are mostly known as a result of their (potential) negative impacts such as altering genetic composition of native populations, impacting ecological trophic coherence, changing habitat structures and in doing so potentially contributing to the likelihood of species extinction.

The actual degree of these possible impacts varies greatly among the receiving habitats but is often only detected after a (longer) period of time. As considerable resources and efforts are typically needed to intervene in controlling alien species, it is important to allocate these resources where and when it matters. This has resulted in the critical need for scientifically robust tools to evaluate, compare, and predict the magnitudes of the impacts of different alien taxa, in order to determine and prioritise appropriate actions where necessary (Blackburn et al., 2014).

Based on the mechanisms of impact used to code species in the International Union for Conservation of Nature (IUCN) Global Invasive Species Database, a method has been developed to classify the environmental impact of alien taxa (EICAT). Within the method, 13 potential Impact Mechanisms (e.g. competition, hybridisation, parasitism, disease transmission, predation) are evaluated based on evidence of observed harm, and classified according to five impact categories (Minimal Concern (MC), Minor (MN), Moderate (MO), Major (MR), Massive (MV)). The latter three categories are considered "harmful" alien species. In addition, the Methodology also has a category for species that are 1) Data Deficient, or when 2) No Alien Populations are found or 3) Not (yet) Evaluated.

Intent – The farm minimises their contribution to harm caused to the native biodiversity as a result of escapees.

Indicators:	
Indicator 2.4.1	The UoC shall not stock **transgenic** animals.
Indicator 2.4.2	The UoC shall implement Precautionary **Escape** Prevention Measures that include as a minimum the following; 1) the installation, inspection and maintenance of suitable containment structures for the species and life stages in culture and the environmental conditions in which the farm is operating; 2) regularly checking for escapees outside the culture units, and where found, remove captured fish; 3) measures to reduce the risk of escapes during fish handling and movement within the UoC.

Indicator 2.4.3	The UoC shall determine the EICAT Category and corresponding Confidence Level for their species and realm in which the farm is operating (see Table 1 in **Appendix 6**).
Indicator 2.4.4	*Indicator scope: farms with EICAT Category DD/MC/MN, MO, MR/MV* The UoC shall implement the Additional Requirements associated to the EICAT Category (associated indicators 2.4.7 to 2.4.32 can be found in **Appendix 6** tables 3, 4 and 5.)
Indicator 2.4.5	*Indicator scope: EICAT Category MO, MR/MV* The UoC shall, upon exceedance of the metric limits, inform the Conformity Assessment Body (CAB) and ASC within 7 calendar days upon detection.
Indicator 2.4.6 	The UoC shall annually report to ASC the Total Escape Count, in accordance with ASC data submission procedures.

Additional requirements for UoCs stocking Salmon Smolts produced in open cages culture operating in freshwater (e.g. lochs, lakes, reservoirs)

Rationale – The production of cage-culture salmonid smolts creates potential impacts that extent beyond the impacts addressed through Principles 1 to 4. These potential impacts relate mainly to the consequences of escaped farmed smolts into areas with no native salmonids present as well as to the possible introgression of escaped farmed smolts with wild salmonid populations. Given the impact of escaped salmonids on ecosystems without indigenous salmonid populations present, ASC does not allow cage-culture of salmonid smolts in regions where no indigenous salmonids are present.

Furthermore, the intent of Indicators 2.4.33 – 2.4.39 is to require salmonid smolt producers to collaborate with local fisheries trusts in monitoring programmes and through scientific research aimed to establish a baseline study of the genetic composition of the local farmed and wild salmonid population(s). This study will reflect upon the genetic composition of the contemporary population(s) and if any historic introgression has occurred as a result of escaped farmed fish or through other mechanisms (natural straining or stocking programmes). Through periodic updates of the baseline study, it is intended to establish an actual insight into the success rate of escaped salmonid smolts breeding into the local wild salmonid population(s).

Indicators:	
Indicator 2.4.33	The UoC shall only stock salmon smolts produced in open cage culture if the supplier: a) operates in a region where indigenous salmonids of the same species being cultivated are present; and b) is certified to the ASC Farm Standard.
Indicator 2.4.34	The UoC shall communicate each fish **escape event** to the local fishery trust(s).
Indicator 2.4.35	The UoC shall collaborate with fisheries trusts in wild salmonid monitoring programme(s) related to the waterbody it operates in.
Indicator 2.4.36	The UoC shall conduct, in collaboration with the local fishery trust(s), a scientific baseline study[19] to determine the genetic composition of the contemporary wild and farmed[20] salmonid population(s) within the waterbody it operates in. The baseline study shall: a) include known historical farmed and wild salmonid genetic profiles; b) determine if changes in the genetic composition of the contemporary wild salmonid population(s) have occurred; c) if changes in the genetic composition of the contemporary wild salmonid population(s) are detected, seek to determine if these have occurred through introgression of farmed salmon or through other mechanisms[21] (e.g. natural straining or stocking programmes); d) be updated every three years.
Indicator 2.4.37 	The UoC shall publicly disclose the scientific baseline study.
Indicator 2.4.38	The UoC shall, if fallowing periods are applied, time them to occur outside the local wild salmonids out-migration period.

[19] The study shall use credible methodologies and analysis and undergo peer review.
[20] Referring to the genetic profile of the fish farmed at the UoC.
[21] Changes of genetic composition of wild (salmon) populations can also occur as a result of natural gene flow between populations. It is therefore important to determine if genetic changes are the result of introgression of farmed salmon into the wild population or due to natural gene flow between wild populations.

Criterion 2.5 – Benthic Impact

Scope – Every UoC using cages in marine/brackish water or freshwater lakes/reservoirs, suspended marine mollusc systems and freshwater systems discharging into rivers.

Rationale – Most aquaculture systems discharge effluents containing organic material (e.g., faeces, uneaten feed) and, on some occasions, heavy metals (i.e., copper from treated nets). Although the manner of discharge can vary (dispersed vs point-source), all have the potential to negatively impact the structure and function of the receiving ecosystem.

When the deposition of organic material occurs at a rate that exceeds the capacity of the receiving environment to assimilate the inputs, changes in the chemical and physical composition of the sediment can occur which can, in turn, negatively impact the benthic community. The extent of the impacts depends on the flux of organic material released by the operation, the characteristics of the water body, and the natural decomposition capacity of the benthic microbial community. However, if managed well, the rate of deposition is kept below the rate of natural aerobic decomposition, thereby minimising benthic impacts.

Intent – To maintain the ecosystem structure and function of the area surrounding the farm.

Indicators:	
Indicator 2.5.1	*Indicator scope: marine/brackish cages, cages in freshwater lakes/reservoirs, and suspended marine mollusc systems.* The UoC shall monitor seabed organic enrichment following the benthic monitoring programme outlined in **Appendix 7**[22].
Indicator 2.5.2	*Indicator scope*[23]*: marine/brackish cages and suspended marine mollusc systems.* The UoC shall achieve an "acceptable" benthic status according to the Ecological Quality Status (EQS) in the area surrounding the farm as outlined in **Appendix 7**.
Indicator 2.5.3	*Indicator scope: freshwater systems discharging into rivers.* The UoC shall conduct a macro invertebrate sampling downstream from the effluent discharge, as outlined in **Appendix 7**, to demonstrate

[22] Farms situated in areas classified as having "hard bottom" are exempted from Indicator 2.5.1. Bottom video or other evidence is required to support the classification "hard bottom".
[23] For cage farms in lakes and reservoirs, conformance with the requirement of meeting an acceptable benthic status in the area surrounding the farm (Indicator 2.5.2) is not required for the first three years of the aligned ASC Farm Standard being effective. Conformance with the monitoring (Indicator 2.5.1) and reporting (Indicator 2.5.3) requirements is required from the effective date of the ASC Fam Standard.

	benthic status that is similar to, or better than, sampling upstream from the discharge.
Indicator 2.5.4 	*Indicator scope: marine/brackish cages, cages in freshwater lakes/reservoirs, and suspended marine mollusc systems.* The UoC shall annually report to ASC on EQS, in accordance with ASC data submission procedures.
Indicator 2.5.5 	*Indicator scope: freshwater systems discharging into rivers.* The UoC shall annually report to ASC the results of the macro-invertebrate sampling, in accordance with ASC data submission procedures.

Criterion 2.6 – Water Quality

Scope – Farms using feed or fertilisers and releasing effluents[24,25].

Rationale – Eutrophication and its consequences are amongst the most serious environmental problems facing humanity today[26]. Excessive inputs of nitrogen (N) and phosphorus (P) profoundly alter the composition and functioning of freshwater and marine ecosystems, leading to shifts from long-lived macro-algae to bloom-forming toxic algae and other nuisance species. Water quality impacts, particularly oxygen depletion (hypoxia), can then kill sensitive aquatic species with cascading effects on entire aquatic ecosystems and overall loss of biodiversity. The general deterioration of water quality may also preclude water use by other industries and communities.

The release of nutrients (N and P) and particulate matter (total suspended solids) from fed and fertilised aquaculture systems can contribute to eutrophication and other water quality impairments (e.g., taste and odour problems). The severity of these effects is contingent on many factors, including the depth/shape and latitude of the water body as well as nutrient inputs from other natural and anthropogenic sources.

Aquaculture contributions to eutrophication can be limited by ensuring nutrient loads in farm **effluents** do not have excessive localised impacts (e.g., through oxygen depletion) or cumulatively exceed the assimilative capacity of the wider water body ecosystem. Various in-farm response measures can reduce nutrient loading by limiting the amount of N and P released per unit of production. However, farm sites in at-risk waterbodies will need to implement collective actions to address cumulative impacts.

Intent – The farm assesses and minimises the risk that nutrients or suspended solids released negatively impact the **receiving water body** and associated ecosystem structure and function.

Summary for Certificate Holders:

At the initial audit, UoCs located in Type A waterbodies shall present the timeline proposed by the UoC to establish an Area Management Agreement (AMA), evidence of outreach to other members of the AMA and the proposed sampling methodology for collecting baseline data.

At the first surveillance audit, a minimum of 12 months baseline data shall be collected and presented by the first UoC(s) to have entered certification within a newly defined Waterbody Unit of Management (WUM), which can also serve as a baseline for UoCs entering certification over the following 12 months. Thereafter 24 months of rolling

[24] Releasing effluents: see Definition List.

[25] For farms which never release effluents, the requirements in this Criterion do not apply.

[26] Steffen, W., Richardson, K., Rockstrom, K., Cornell, S.E., Fetzer, I., Bennett, E.M., Biggs, R., Carpenter, S.R., De Vries, W., De Wit, C.A., Folke, C., Gerten, D., Heinke, J., Mace, G.M., Persson, L.M., Ramanathan, V., Reyers, B. and Sorlin, S. (2015). Planetary boundaries, Guiding human development on a changing planet. *Science*, Vol 347, Issue 6223. https://doi.org/10.1126/science.1259855

baseline data shall be required. Where UoCs have 12 months of baseline data at the initial audit, this shall be presented at the initial audit.

UoCs located in jurisdictions with regulations and management measures for water quality can present evidence to demonstrate compliance with such regulations during audits to determine whether the evidence provided meets the intent of applicable Indicators (2.6.2 - 2.6.10).

An ad-hoc Water Quality Advisory Committee (AWQAC) will resolve issues with the justification and dispute resolution of initial WUM characterisation (for Type A waterbodies only) and subsequent revisions where there is a lack of clarity around the WUM boundaries. The AWQAC will therefore reduce complexity for sites and Conformity Assessment Bodies (CABs) by providing resolutions outside of the audit process.

Indicator 2.6.1
Receiving water classification by sensitivity to nutrient loading.

Indicator 2.6.1	The UoC shall classify the receiving water (RW) body into Type A, B or C, according to its sensitivity to nutrient enrichment (**Appendix 8 (1.1)**): ○ Type A - Sensitive freshwater and marine **lentic**: ○ Hydraulic retention time (HRT) > five days (low nutrient flushing rates) (**Appendix 8 (1.2)**) ○ Examples: most lakes, reservoirs, many fjords, lagoons and some estuaries and embayments (**Appendix 8 (1.4)**) ○ Type B – Sensitive **lotic**: ○ HRT < five days ○ Examples: some rivers (including **headwaters**) and other channelised systems ○ Type C – Less sensitive freshwater and marine: ○ HRT < five days and flow rate > 1000m^3/s, or TSS > 20mg/l at low flow (**Appendix 8 (1.3)**) ○ Examples: alluvial flood plain rivers, some estuaries, well flushed near and offshore marine systems

Indicators 2.6.2 - 2.6.10
Area-level and farm-level mitigation of trophic shifts.

Sub-scope: farms releasing effluents to Type A (sensitive freshwater and marine lentic) receiving waters.

Indicator 2.6.2	The UoC shall be party to an area management agreement (AMA) (**Appendix 8 (2.2)**), including commitments to the following collective actions:

	1. Characterisation of a Waterbody Unit of Management (WUM), by initial entrant(s) (**Appendix 8 (2.1)**). 2. Coordinated environmental monitoring including limiting nutrient(s), carrying capacity assessment and planning response measures within the WUM (**Appendix 8 (2.2)**). 3. Sharing of data with other parties of the AMA (**Appendix 8 (2.2)**). 4. Outreach to other users contributing to nutrient loading of the WUM to participate in actions under points 2 and 3 above. 5. The AMA shall designate a focal point responsible for communicating with ASC, including reporting of all collated water quality data (**Appendix 8 (2.2)**).
Indicator 2.6.3	The UoC shall present the AMA's 24-month WUM baseline monitoring survey[27], including the parameters dissolved oxygen (DO), Secchi disk (SD) depth, Chl-a, total nitrogen (TN) and total phosphorus (TP) nutrient concentrations (**Appendix 8 (2.3)**).
Indicator 2.6.4	The UoC shall present the WUM-level baseline characterisation (**Appendix 8 (2.3.2)**) and perform its own farm-level baseline characterisation (**Appendix 8 (2.3.1)**): 1. Run the 24-month initial WUM baseline monitoring survey (Indicator 2.6.3) through the ASC water quality calculator, to determine the following: o Limiting nutrient(s); N-, P- or co-limited; o Trophic status; hyper-eutrophic, eutrophic, mesotrophic, oligotrophic, or ultra-oligotrophic (**Appendix 8 (2.3.4)**); o Depths of the zone of oxygen depletion (DO ≤4mg/l) and anoxia (DO ≤2mg/l); o Modelled BOD. 2. Record the number of (i) adverse turnover events and (ii) harmful algal blooms over the last 10 years (**Appendix 8 (2.3.3)**).
Indicator 2.6.5	The UoC shall perform quarterly monitoring of DO, TN, TP, SD and Chl-a (**Appendix 8 (2.3.1, 2.3.2 and 2.3.5)**), to populate the ASC water quality calculator as required in Indicators 2.6.6 -2.6.8.
Indicator 2.6.6	Using the ASC water quality calculator, the UoC shall demonstrate annually that there is no upward transition of trophic status (**Appendix 8 (2.3.4)**) compared with the initial WUM and farm-level baseline characterisation (Indicator 2.6.4).
Indicator 2.6.7	Using the ASC water quality calculator, the UoC shall demonstrate annually that neither the limiting nutrient(s) nor Chl-a indicate an upward rate of change > 15% at the WUM or farm level over the previous 24 months.
Indicator 2.6.8	If one or more of the following scenarios apply, the UoC shall present the aquaculture sectoral contribution to nutrient loading in the WUM (**Appendix 8 (2.3.4)**):

[27] Only one survey is required per WUM, i.e., if this has already been carried out, for example by other ASC certified site(s) in the WUM, no additional baseline survey is needed.

	○ The WUM is ≤5 index points[28] below a TSI limiting nutrient or Chl-a breakpoint, indicating an approaching upward transition of trophic status, i.e., approaching the assimilative capacity limit of the waterbody (**Appendix 8 (2.3.4)**), OR ○ Limiting nutrient(s)or Chl-a concentration increase >15%, OR ○ The depth of the zone of oxygen depletion[29] or anoxia[30] has decreased by ≥25%, OR ○ There has been ≥1 adverse turnover event or ≥1 harmful algal bloom(s) over the last 10 years [31] (Indicator 2.6.4) (**Appendix 8 (2.3.3)**).
Indicator 2.6.9	*Indicator scope: applicable when **one or more of the scenarios under Indicator 2.6.8 apply.*** If the aquaculture sectoral contribution to WUM nutrient loading (Indicator 2.6.8) is >30%, the UoC shall present the AMA plan to: ○ Increase the nutrient loading efficiency limits (Indicator 2.6.10); or ○ Reduce allowable nutrient loading by AMA farms, in order to reduce the rate of change and prevent an upward transition of trophic status.

Indicators 2.6.10 - 2.6.14 Management of nutrient loading to receiving waters.	
Indicator 2.6.10	The UoC shall adhere to species-specific limits on annual TN and TP load per tonne of production over the previous 24-month period (**Appendix 8 (3.1)**).
Indicator 2.6.11	The UoC shall ensure that the feed fed contains < 1% fines (**Appendix 8 (3.2)**).
Indicator 2.6.12	*Indicator scope: **point source** effluent release only* The UoC shall ensure that water released goes through a treatment system capturing ≥65% of suspended solids originating from feed or fertiliser used, and that the concentration of settleable solids in effluent water is <3.3ml/L, if any of the following apply (**Appendix 8 (4.2 and 4.3)**): ○ using aeration over >90% of the production cycle; ○ exchanging >10% of culture water per day; ○ exchanging all water once per week or more during **peak biomass**; ○ using stocking densities >2kg/m^3.

[28] 'Çarlson' trophic status boundaries are based on index values (0-100) with 'breakpoints' set at minimum intervals of 10 index points (Appendix 2.3.5).
[29] i.e., depth at which DO falls below 4mg/l (see also Indicator 2.6.3).
[30] i.e., depth at which DO falls below 2mg/l (see also Indicator 2.6.3).
[31] Where loss of aquatic fauna can clearly be attributed to natural phenomena (e.g., under ice oxygen consumption, geologic activity), events shall not count against frequency limits but shall be recorded.

Indicator 2.6.13	*Indicator scope: point source effluent release only* The UoC shall not release or dispose of nutrient containing materials, e.g., sludge and sediments, to public waterways, wetlands or other natural ecosystems.
Indicator 2.6.14	*Indicator scope: cages* The UoC shall maintain open culture systems in water that is at least twice the cage depth or ≥10m above the waterbody floor, whichever is less, unless it can be demonstrated that mean current velocity below the cage system is >0.1 m/s during periods at >75% peak biomass (**Appendix 8 (4.1)**).

Indicators 2.6.15 - 2.6.17 Farm-level management of downstream nutrient concentrations. **Sub-scope:** only farms releasing effluents to Type B (sensitive lotic) receiving waters.	
Indicator 2.6.15	*Indicator scope: point source effluent release only* Using the ASC water quality calculator, the UoC shall annually estimate the percentage farm effluent flow contribution to the receiving water (RW) flow (m^3/sec)[32] (**Appendix 8 (1.3)**).
Indicator 2.6.16	*Indicator scope: point source effluent release only* If the "farm effluent flow" contribution to the "RW flow" estimated in Indicator 2.6.15 is >10%, the UoC shall quarterly, and concurrently, measure RW flow, TN, TP and TSS at inflow (**RWFI**) and effluent outflow (**RWFE**) sites (**Appendix 8 (2.3.5)**).
Indicator 2.6.17	*Indicator scope: point source effluent release only* If the "farm effluent flow" contribution to the "RW flow" estimated in Indicator 2.6.15 is >10%, the UoC shall annually demonstrate, using the ASC water quality calculator, that TN, TP or TSS (**Appendix 8 (2.3.5)**) indicates <25% increase between upstream and downstream sample sites of the farm.

[32] If the UoC can reliably demonstrate that the maximum contribution of farm effluent to RW flow is consistently <1% at RW low flow, this Indicator does not apply. This should be based on hydrographic data collected at a minimum over the past five years with no evidence of subsequent production expansion.

Indicators 2.6.18 – 2.6.20 Farm level management of DO at impacted downstream sites	
Indicator 2.6.18	The UoC shall demonstrate, through daily monitoring of DO concentration and saturation immediately downstream of the farm (diffuse-source effluent release) (**Appendix 8 (4.2)**) or **RWFA** (point-source effluent release) (**Appendix 8 (4.3)**), that the weekly average of daily DO saturation is ≥65% in freshwater and ≥70% in seawater[33].
Indicator 2.6.19	The UoC shall annually demonstrate, using the DO measurements from Indicator 2.6.18, that ≤5% of the weekly averages of daily DO concentrations are 2mg/l.
Indicator 2.6.20	*Indicator scope: point source effluent release only* The UoC shall demonstrate, through monthly DO monitoring at RWFA (**Appendix 8 (4.3)**), that daily diurnal DO (DDDO) fluctuation is ≤65% saturation level.

Requirements on disclosure and reporting	
Indicator 2.6.21 	*Indicator scope:* ***Type A*** The AMA focal point shall annually report to ASC (**Appendix 8 (2.1 and 2.2)**): ○ A map of the WUM identifying its boundary and farm site locations. ○ The 12- or 24-month WUM level water quality monitoring data. This shall be provided by the focal point of the WUM (**Appendix 8 (2.3.2)**).
Indicator 2.6.22 	*Indicator scope:* ***Type A*** The UoC shall annually report to ASC the farm-level water quality monitoring results (**Appendix 8 (2.3.1)**), in accordance with ASC data submission procedures.

[33] Waterbodies with salinity levels 30-49 ppt (parts per thousand) shall be considered as seawater for this Indicator.

Criterion 2.7 – Salinisation

Rationale – Salinisation is the increase of salt concentration in soil or freshwater (either surface or **groundwater**). Salinisation may be natural or caused by human activities. Salinisation can affect both agricultural land and natural ecosystems; its effects are expected to be exacerbated by climate change. Affected agricultural lands may have reduced crop yields or see crop growth inhibited altogether as the salt affects a plant's root system and its ability to uptake water. These impacts can drive poverty by reducing farmers' incomes and can force communities to abandon areas in search of more arable land. The rising global population is expected to require a 70% increase in food production by 2050, most of which needs to come from areas most affected by salinisation. Salinisation is, therefore, a global food security issue. In natural systems, fauna can be directly impacted through the loss of habitat or food sources. Likewise, fauna may be affected if the **salinity** range falls outside their osmoregulation tolerance. This can lead to a reduction in biodiversity and ecosystem function.

Aquaculture activities can cause salinisation through seepage from saline waterbodies (e.g., aquaculture ponds), discharge of saline water into freshwater, intrusion of saline water into groundwater, or dumping of **biosolids**. The dumping of biosolids is particularly relevant for coastal regions as its effects can be further amplified by rising sea-levels and land subsidence as a result of climate change.

ASC's approach to salinisation is to implement best practices such as pond liners and to avoid discharge of saline water to minimise a farm's contribution towards the global issue of salinisation of soil and freshwater.

Intent – The farm ensures low risk of salinisation of soil and freshwater resources from the farm's activities.

Indicators:	
Indicator 2.7.1	The UoC shall use low permeable liners[34] in case of brackish or saltwater pond culture[35]. This requirement does not apply where culture ponds are within a naturally saline environment.
Indicator 2.7.2	The UoC shall only discharge water of a salinity level equal to or lower than the salinity level[36] of the receiving water body (or land), unless this is a waterbody with natural periodic varying salinity levels[37]; in this case the

[34] This includes liners made from: plastic, imported clays, ripping and re-compaction of in situ clays, mixing with bentonite, geo-membranes and composite liners.
[35] Salinity levels >0.5 ppt.
[36] Freshwater (limnetic; <0.5 ppt), slightly saline (oligohaline; 0.5-4.9 ppt), moderate saline (mesohaline; 5-17.9 ppt), highly saline (polyhaline; 18-29.9 ppt), seawater (euhaline; 30-34.9 ppt).
[37] I.e. river estuaries and other waterbodies subject to periodic shifts in salinity level. Also referred to as poikilohaline water bodies.

	salinity level of the discharge water shall be within range of the natural variation of the waterbody.
Indicator 2.7.3	The UoC shall not discharge brackish water or saltwater over land.
Indicator 2.7.4	The UoC shall monitor and record that used freshwater wells do not exceed a specific conductance of 1,500 mhos/centimetre or chloride concentration or 300 milligrams per litre. Where well-monitoring is legally not allowed to be conducted by the UoC, regulatory records must be obtained to demonstrate salinity levels.

Criterion 2.8 – Biosolids

Rationale – Discharge and unregulated disposal of biosolids into the environment can cause negative impacts, including eutrophication, salinisation, spreading of disease and residues, and sedimentation of aquatic habitats. When handled appropriately, biosolids can be re-used. Well managed handling, re-use and disposal of biosolids is an important element of responsible farm management.

Prevention of impacts from biosolids on water quality is captured in Criterion 2.6, salinisation of freshwater and soil is captured in Criterion 2.7, and pollution/disposal is captured in Criterion 2.11.

Intent – The farm prioritises re-use, ensures responsible disposal where necessary, and avoids contamination of water bodies and soil through biosolids.

Indicators:	
Indicator 2.8.1	The UoC shall re-use biosolids where possible, and if uncontaminated, for any of the following purposes: • Use as fertilisers in agriculture • Maintenance and building of dykes • Maintenance of roads or infrastructure • Biogas
Indicator 2.8.2	The UoC shall, if biosolids can't be re-used, dispose of biosolids responsibly.
Indicator 2.8.3	The UoC shall ensure, through written commitment from the entity, that third-parties who re-use or dispose of biosolids off-site do so in conformance with Indicator 2.8.1 and Indicator 2.8.2.
Indicator 2.8.4	The site shall, where biosolids are held on site[38], ensure that biosolids remain contained within farm boundaries to the extent that there would be no runoff during anticipated recurring **extreme weather events** such as a tropical storm or flooding.
Indicator 2.8.5	The site shall calculate and record the volumes of biosolids produced on site in m^3, categorised into re-use, on-site containment, and disposal.

[38] This applies when biosolids are removed from e.g. culture systems, canals, treatment systems.

Criterion 2.9 – Freshwater Use

Rationale – Freshwater is limited and demand for it is increasing. Water use in aquaculture has direct impacts on the availability of water for other users and biological processes. It is important that all aquaculture operations are aware of their water use and act to improve the water efficiency of their farming processes. The source of fresh water (i.e., **surface water**, groundwater), the local conditions (e.g., rainfall, sensitivity of ecosystems) and the intensity of abstraction determine whether the utilisation of resources is detrimental to the natural environment. Water stress varies across regions but is an emerging crisis globally, therefore conservation in all systems is vital. Due to its relatively small volume, measurement of domestic water use is not required within this Criterion.

Intent – The farm is aware of its water use for production and uses water efficiently to maintain critical ecosystem services of the water source.

Indicators:	
Indicator 2.9.1	The UoC shall, in areas of "high" or "extremely high" water stress[39], effectively implement a Water Efficiency Management Plan (WEMP) with the intent to reduce water consumption.
Indicator 2.9.2	The UoC shall review and where needed revise the WEMP. This shall occur on a regular basis as well as when changes in activities or events require an additional review.
Indicator 2.9.3	The UoC shall monitor and record water levels in groundwater wells, where legally allowed. Where well-monitoring is legally not allowed to be conducted by the UoC, regulatory records shall be obtained to demonstrate recording of water levels.
Indicator 2.9.4	The UoC shall not use freshwater to reduce salinity or use salt to increase the salinity of used freshwater, unless it can be demonstrated that the discharged water is desalinated.
Indicator 2.9.5	The UoC shall not divert more than 50% volume of used flowing fresh surface water, unless Vital Flow Calculation (through scientific study or regulatory requirements) indicates a different diversion level (whichever is stricter).
Indicator 2.9.6	The UoC shall return >90% of the diverted fresh surface water to its natural waterbody

[39] To be checked via: https://www.wri.org/applications/aqueduct/water-risk-atlas/#/?advanced=false&basemap=hydro&indicator=w_awr_def_tot_cat&lat=-14.4453969428377 44&lng=-142.85354599620152&mapMode=view&month=1&opacity=0.5&ponderation=DEF&predefined=false&projection=absolute&scenario=optimistic&scope=baseline&timeScale=annual&year=baseline&zoom=2

Criterion 2.10 – Energy Use and Greenhouse Gas Emissions

Rationale – Climate change is the most pressing global environmental challenge and is driven by emissions of carbon dioxide (CO_2) and other **greenhouse gases (GHGs)**. Globally, **GHG emissions** have risen continuously throughout the past century with roughly one sixth of total cumulative emissions occurring in the decade from 2010-2019, leaving a very limited budget for future GHG emissions if global warming is to be kept within 1.5 or even 2 degrees Celsius. (IPCC, 2023[40]). In addition to their contribution to global warming via radiative forcing in the atmosphere, emissions of GHGs contribute to global ocean acidification while consumption of energy also contributes to depletion of limited resources and places strain on national and regional energy networks to satisfy demand.

Food systems account for roughly one third of global GHG emissions, and animal protein sources contribute disproportionately to the climate impact of global food production (Ivanovich et al., 2023[41]; Crippa et al., 2021[42]; Poore and Nemecek, 2018[43]). Aquaculture production is estimated to account for roughly 4% of global GHG emissions from food systems (MacLeod et al., 2019[44]). Aquaculture products range from among the most GHG-efficient sources of animal protein to among the most GHG-intensive depending on the species being produced, the production system, and the source of feed and other inputs (Gephart et al., 2021[45]; Poore and Nemecek et al., 2018). GHG emissions from aquaculture production are especially driven by on-farm use of energy, production and processing of feeds from multiple sources, and deforestation occurring either on-site as in the case of mangrove destruction or upstream in the production of soy, palm, and other feed ingredients. The extent to which each of these drivers contributes to the overall emissions of an aquaculture supply chain varies substantially. For example, energy use contributes heavily to the emissions from recirculating aquaculture systems and other land-based systems while feed is the overwhelming driver of emissions for most fed marine-based farms. Climate-responsible aquaculture production requires the continual measurement and characterisation of emissions associated with energy use, production and use of feed, and avoidance of emissions from land use change on-farm and in crop production.

Opportunities for aquaculture producers and supply chains to reduce their GHG emissions exist not only at the farm but both upstream (in production and transport of inputs) and downstream (in the processing, distribution, sale and use of products). These opportunities include reducing energy demands on-farm, transitioning towards alternatives to **fossil fuel** energy sources including on-site wind and solar, improving feed conversion ratios through better diet formulations, digestibility, and survival, avoiding

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[40] IPCC (2023). Climate Change 2023: Synthesis Report. Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland: IPCC.
[41] Ivanovich, C. C., Sun, T., Gordon, D. R., & Ocko, I. B. (2023). Future warming from global food consumption. *Nature Climate Change, 13(3), 297-302.*
[42] Crippa, M., Solazzo, E., Guizzardi, D., Monforti-Ferrario, F., Tubiello, F. N., & Leip, A. J. N. F. (2021). Food systems are responsible for a third of global anthropogenic GHG emissions. *Nature Food, 2(3), 198-209.*
[43] Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. *Science, 360(6392), 987-992.*
[44] MacLeod, M. J., Hasan, M. R., Robb, D. H., & Mamun-Ur-Rashid, M. (2020). Quantifying greenhouse gas emissions from global aquaculture. *Scientific reports, 10(1), 11679.*
[45] Gephart, J. A., Henriksson, P. J., Parker, R. W., Shepon, A., Gorospe, K. D., Bergman, K., ... & Troell, M. (2021). Environmental performance of blue foods. *Nature, 597(7876), 360-365.*

feed ingredients associated with high emissions production sources or with deforestation or other land use change, maximising product yields at processing, reducing product waste during storage and distribution, and avoiding the use of air freight to transport products to market.

Many aquaculture systems already produce products with relatively low GHG emissions when compared to other sources of animal protein, particularly ruminant animals like beef and lamb. Low-emissions sources of aquaculture-derived animal protein may have the potential to provide replacements for much more GHG-intensive products and contribute to mitigation of climate change if such replacements are achieved (Hoegh-Guldberg et al., 2023[46]). Consistent and transparent communication of both the magnitude and the drivers of energy use and GHG emissions throughout aquaculture supply chains is necessary in ensuring that ASC-certified products fit within climate-sensitive diets and that certified producers are identifying and implementing effective strategies to manage and reduce their climate impact.

Intent – Farms have a greenhouse gas management plan informed by regular measurement and reporting of on-farm energy use and farm- and feed-related emissions, including meaningful actions to reduce emissions from operations and supply chains.

Indicators:	
Indicator 2.10.1	The UoC shall record energy inputs to the farm and calculate annually the energy intensity of production, in MJ per tonne of live-weight farm production, following the method outlined in **Appendix 9**.
Indicator 2.10.2	The UoC shall calculate annually the GHG emissions intensity of production, in kg **CO_2-equivalent (CO_2e) emissions** per kg of edible weight of product, following the method outlined in **Appendix 9**, including emissions associated with: a) On-farm use of energy; b) Production, processing and transport of feed; c) Production of smolts, seed or juvenile inputs; and d) Production of other farm inputs as indicated in **Appendix 9**.
Indicator 2.10.3	The UoC shall set quantitative GHG emission reduction targets to work towards an emissions intensity below the higher of (a) 7.5kg CO_2-e/kg edible weight or (b) the species-specific CO_2e benchmark provided in **Appendix 9**.

[46] Hoegh-Guldberg, O., Northrop, E. et al. (2023) The ocean as a solution to climate change: Updated opportunities for action. Special Report. Washington, DC: World Resources Institute. Available online at https://oceanpanel.org/publication/ocean-solutions-to-climate-change

Indicator 2.10.4	The UoC shall have a GHG management plan including actions to reduce emissions towards the GHG performance targets determined in Indicator 2.10.3 and to maintain those targets thereafter. The UoC shall include in this plan actions which address the identified drivers of GHG emissions in their operations and supply chains as calculated in Indicator 2.10.2, reflecting the unique context of each farm's GHG emissions profile.
Indicator 2.10.5 	The UoC shall annually report to ASC the on-farm energy intensity and GHG emissions as calculated in Indicators 2.10.1 and 2.10.2 in accordance with ASC data submission procedures.

Criterion 2.11 – Material Use, Waste and Pollution Control

Rationale – The construction, operation and decommissioning of aquaculture farms uses materials and generates waste, some of which may be **hazardous**. Copper-based antifoulants are common in many aquaculture operations and can leach into the water and cause harm to marine life in the water column and in sediments below the farm. Therapeutants and chemicals applied to farmed animals must be treated with care to ensure there are no unintended impacts on them, the ecosystem, or staff responsible for handling these items. Material use and waste disposal can negatively impact human health, communities, the environment, wildlife, and farmed animals. Responsible management ensures material resources are used in an efficient manner which includes prioritising **re-use** and **recycling** to reduce the generation of waste. It also ensures that **hazardous materials and waste** disposal do not pollute and cause harm to communities or the environment.

Intent – The farm prevents pollution through responsible handling and disposal of materials.

Indicators:	
Indicator 2.11.1	The UoC shall annually assess the possibilities to reduce, reuse and recycle waste materials.
Indicator 2.11.2	The UoC shall not treat water with pesticides banned or restricted by any of the following conventions or organisations: • The Rotterdam Convention on Prior Informed Consent (PIC),[47] • The Stockholm Convention on Persistent Organic Pollutants (POPs),[48] or • The World Health Organisation (WHO), for products classed as "extremely hazardous" or "highly hazardous" (classes Ia and Ib).[49]
Indicator 2.11.3	The UoC shall hold effluents for at least 48 hours, or as per product specifications (whichever is greater), after culture animals have been treated with hormones.
Indicator 2.11.4	*Indicator scope: Finfish* The UoC shall ensure that all blood water produced during the slaughter process is contained and treated before being discharged. Treatment must ensure that the discharge prevents veterinary or environmental risks.

[47] http://www.pic.int/TheConvention/Chemicals/AnnexIIIChemicals
[48] http://chm.pops.int/TheConvention/ThePOPs/ListingofPOPs/tabid/2509/Default.aspx
[49] https://www.who.int/publications/i/item/9789240005662

Indicator 2.11.5	The UoC shall only use net cleaning facilities which treat effluents, if nets are cleaned on land; effluent treatment includes the capturing of copper if copper treated nets are used.
Indicator 2.11.6	The UoC shall only use antifouling agents containing biocides which are approved according to legislation in Australia, the European Union, Japan or the United States.
Indicator 2.11.7	The UoC shall not treat nets, aquaculture gear or infrastructure with copper, or clean[50] copper treated nets, aquaculture gear, or infrastructure in situ in the environment.
Indicator 2.11.8 	*Indicator scope: UoCs using copper nets or copper-treated nets in marine/brackish waters* The UoC shall carry out sampling of copper levels in the sediment, following the method outlined in **Appendix 7**, to demonstrate copper levels are <34 mg Cu/kg dry sediment weight. In instances where copper levels in sediment exceeds 34 mg Cu/kg dry sediment weight, the UoC shall demonstrate that the levels fall within the range of background concentrations as measured at three reference locations.
Indicator 2.11.9	The UoC shall only use chemicals according to their intended use by the manufacturer.
Indicator 2.11.10	The UoC shall handle, store, use and dispose of chemicals according to Safety Data Sheet (SDS) requirements.
Indicator 2.11.11	The UoC shall store perishable materials (e.g., feed) appropriately to minimise waste through spoilage, contamination or pest damage.
Indicator 2.11.12	The UoC shall ensure hazardous materials remain contained.
Indicator 2.11.13	The UoC shall not discharge any hazardous chemicals including treated water without previous neutralisation.
Indicator 2.11.14	The UoC shall have emergency response measures in place for chemicals, including a spill prevention and response plan.

[50] Light cleaning of nets is allowed. The intent of the Standard is that, for example, the high-pressure underwater washers could not be used on copper treated nets because of the risk of copper flaking off during this type of heavy or more thorough cleaning.

Indicator 2.11.15	*Scope: UoCs sited in any water body* The UoC shall tag or mark substantial aquaculture gear (e.g., floats, cages, nets) and track these on a master list to prevent and allow recovery of Abandoned, Lost or otherwise Discarded Fishing Gear (ALDFG).
Indicator 2.11.16	The UoC shall conduct preventative maintenance on machinery, infrastructure and other aquaculture gear.
Indicator 2.11.17	*Scope: point-source discharge* The UoC shall implement strategies for plastic retention prior to the effluent discharge point.
Indicator 2.11.18	The UoC shall carry out clean-up of receiving shoreline or land in response to loss of gear or waste.
Indicator 2.11.19	The UoC shall dispose of waste[51] responsibly.
Indicator 2.11.20	If waste is disposed of by a third-party, the UoC shall ensure third parties only dispose of waste in conformance with Indicator 2.11.19.

[51] Including human waste, daily mortality removals and mass mortalities.

Criterion 2.12 – Feed

Scope – Every UoC using feed.

Rationale – Most aquaculture operations require feed.

The impacts associated with feed occur at various stages in the supply chain. Impacts may occur via primary raw material production (e.g., agriculture, fishing), at the sites of ingredient and feed manufacturing, or from feed fed to cultured animals (through nutrient release from spilled/uneaten feed or through faeces). Efficient use of feed is a means to limit use of a limited resource.

ASC addresses the impacts associated with feed in a holistic manner. The ASC Feed Standard[52] for feed mills covers the key impacts associated with raw material production and feed manufacturing. The ASC Farm Standard addresses the environmental impacts resulting from the use of feed, as well as efficiency of the use of resources. The limits set for Forage Fish Dependency Ratios (FFDR) for fishmeal and fish oil demand efficient use of marine resources, as well as the need for good feed management and feeding regimes at the farm level.

Intent – The farm uses responsibly produced feed and manages feeding to ensure the efficient use of resources.

Indicators:	
Indicator 2.12.1	*Indicator scope: every UoC using **compound feed**.* The UoC shall only feed ASC compliant product.
Indicator 2.12.2	The UoC shall, if using seaweed as a direct feed source, obtain it from a regulated source.
Indicator 2.12.3	The UoC shall meet the feed efficiency requirements defined for each culture species in **Appendix 3**.
Indicator 2.12.4	The UoC shall not feed protein derived from the same genus as the species being farmed.
Indicator 2.12.5	The UoC shall not feed **wet feedstuffs, moist pellets**, **or uncooked/ unprocessed fish**.
Indicator 2.12.6	The UoC shall feed animals a diet that is formulated in accordance with species and life-stage specific nutritional requirements, based on feed manufacturer specification, unless such diets are not

[52] https://asc-aqua.org/producers/farm-standards/feed-standard/

	available. If not available, the UoC shall feed a diet suitable for animals with similar nutritional needs, and actively collaborate with feed manufacturers to work towards the development of a species/life-stage specific diet.
Indicator 2.12.7	The UoC shall not feed product which has expired or is spoiled. In the case of cleaner fish, where feed blocks might be used, these shall be checked daily for any signs of spoilage or excessive leakage or at the frequency recommended by the feed producer.
Indicator 2.12.8 	The farm site shall annually report to ASC the feed properties, feed use and calculated feed efficiency values, in accordance with ASC data submission procedures.

Criterion 2.13 – Sea Lice

Scope– Cage-culture Salmon

Rationale – Responsible health management on aquaculture farms is vital to ensure healthy stock, to protect the environment and wildlife species around the farm, and to ensure farm viability. Through proper husbandry, monitoring and treatment of farmed stock, disease risks can be managed. Parasites on farms may cause direct harm to farmed and wild species, or they may act as a vector for disease transfer. Improper use of parasiticides can lead to resistance and contamination. In areas where multiple farms coexist, coordinated management is necessary to reduce disease transfer and prevent development of resistance to treatments.

Sea lice on salmon farms are of particular concern, as proliferation on farms may lead to negative impacts on wild salmon or sea trout. There is significant debate in the scientific literature about the extent of the impact, however, it is recognised that there is shared benefit to farm productivity and to minimising potential impacts on wild fish by continually seeking to reduce the sea lice burden on salmon farms. To minimise the risk of transmission to wild salmonids, farms should seek to maintain low levels of sea lice, especially during juvenile out-migration periods.

Intent – The farm minimises sea lice load on-farm and risk to the wider environment.

Indicators:	
Indicator 2.13.1	The UOC shall participate in an Area-Based Management (ABM) scheme for managing disease, parasites and resistance to treatments that includes coordination of stocking, fallowing, therapeutic treatments, and information sharing as outlined in **Appendix 11**.
Indicator 2.13.2	*Scope: areas with wild salmonids*[53] The UoC shall establish, review annually, and revise where needed, a maximum sea lice load for the entire ABM and for the individual site, as outlined in **Appendix 11**.
Indicator 2.13.3	The UoC shall demonstrate commitment[54] to collaborating with NGOs, academics, and governments on areas of mutually agreed research to measure possible impacts on wild fish stocks, including wild salmonid stocks.
Indicator 2.13.4	*Scope: areas with wild salmonids*

[53] Within 75 kilometres of a wild salmonid migration route or habitat. This definition is expected to encompass all, or nearly all, of salmon-growing areas in the northern hemisphere.
[54] At a minimum through providing farm-level data to researchers, granting researchers access to sites, or other similar non-financial support for research activities.

	The UoC shall present data[55] on salmonid migration routes and migration timing in major waterways within 75 kilometres of the farm.
Indicator 2.13.5	*Scope: areas with wild salmonids* The UoC shall present sea lice monitoring data on wild out-migrating salmon juveniles, coastal sea trout and Arctic char, as outlined in **Appendix 12**.
Indicator 2.13.6 	*Scope: areas with wild salmonids* The UoC shall publicly disclose sea lice monitoring data on wild out-migrating salmon juveniles, coastal sea trout, and Arctic char, as outlined in **Appendix 12**.
Indicator 2.13.7	*Scope: areas with wild salmonids* The UoC shall perform on-farm sea lice sampling as outlined in **Appendix 12**.
Indicator 2.13.8 	The UoC shall publicly disclose on-farm sea lice sampling results within seven days of sampling.
Indicator 2.13.9	*Scope: areas with wild salmonids* The UoC shall, during sensitive periods, maintain on-farm sea lice levels below the thresholds outlined in **Appendix 12**.
Indicator 2.13.10	*Scope: areas with wild salmonids* The UoC shall inform the CAB by the next working day after the last day of sea lice sampling if levels thresholds in Indicator 2.13.9 are reached or exceeded.
Indicator 2.13.11	*Scope: areas with wild salmonids* The UoC shall reduce on-farm sea lice levels below the thresholds from Indicator 2.13.9 within 21 days after the last day of sea lice

[55] Farms do not need to conduct research on migration routes, timing and the health of wild stocks under this Standard if general information is already available. Farms must demonstrate an understanding of this information at the general level for salmonid populations in their region, as such information is needed to make management decisions related to minimising potential impact on those stocks. Such evidence would consist of, for example, peer review studies, publicly available government monitoring and reporting.

	sampling. If the reduction is not achieved, product is not eligible to be sold as certified and the certificate shall be cancelled.
Indicator 2.13.12	The UoC shall achieve a WNMT at or below the Entry Level (EL) as outlined in **Appendix 13**.
Indicator 2.13.13	The UoC shall, after achieving Indicator 2.13.12, reduce the WNMT by 25% per two years until the WNMT is at or below the Global Level (GL) as outlined in **Appendix 13**.
Indicator 2.13.14	The UoC shall, when two applications of a treatment have not produced the expected result, conduct a bioassay to determine resistance.
Indicator 2.13.15	The UoC shall, when bioassays determine resistance is forming, use an alternative treatment or immediately harvest all fish on the site.
Indicator 2.13.16	The UoC shall apply treatment rotation, providing the farm has >1 effective medicinal treatment. Every third treatment must belong to a different family of drugs.
Requirement for a site-specific Integrated Parasite Management Plan:	
Indicator 2.13.17	The UoC shall develop and implement a site-specific Integrated Parasite Management Plan (IPMP), with the objective of controlling parasites using multiple prevention and control strategies (e.g., research, coordination, monitoring, treatments). a) The UoC's IPMP shall be signed-off by a veterinarian or **aquatic animal health professional**. b) The UoC shall review and, where needed, revise the IPMP when changes in farming activities or changes in external factors occur, or upon the direction of the veterinarian or aquatic animal health professional.
Indicator 2.13.18 	The UoC shall report to ASC: 1. Weighted Number of Medicinal Treatments (WNMT) for each production cycle; and 2. Parasiticide load for each agent over the production cycle; in accordance with ASC data submission procedures.
Indicator 2.13.19 	The UoC shall publicly disclose the Integrated Parasite Management Plan (IPMP).

Criterion 2.14 – Pre-Grow Out

Indicators:	
Indicator 2.14.1	If receiving stock from pre-grow out[56], the UoC shall map the farms involved in growing ASC product, using the ASC Pre-Grow Out Supply Chain Mapping Template provided on the ASC website.
Indicator 2.14.2	The UoC shall only stock larvae or fish as ASC if the following is complied with (see also Indicator 1.4.2): - the UoC demonstrates that pre-grow out farms involved in growing the ASC product (Indicator 2.14.1) conform with **Appendix 14**, and - the batch of larvae or fish is accompanied by the ASC Stock Status Record (**Appendix 14**, table 2.14.3). Or - the supplying grow-out farm is ASC certified, and - the batch of larvae or fish is accompanied by the ASC Stock Status Record (**Appendix 14**, table 2.14.3).
Indicator 2.14.3	Grow out farms shall pass on GHG data to subsequent grow out farms, using the ASC Greenhouse Gases Data Submission Template.

[56] See Appendix 14, table 2.14.2 for the cut-off lines defining the start of the grow-out phase.

Principle 3 – The UoC operates in a socially responsible manner

Rationale – The aquaculture sector, which includes processing and supply, provides food, jobs and income to millions of people globally. The sector is characterised by a high degree of labour-intensive work, especially on farms and in processing facilities. According to the FAO, an estimated 20.7 million people were engaged in the primary sector of aquaculture in 2020[57]. Aquaculture plays an important role as part of the economic backbone of local (and often rural) communities[58,59,60,61].

Aquaculture often operates in remote regions, or in regions lacking strong regulation. These risk factors can lead to an increased risk of human rights and labour violations, both for those who work on the farms and sometimes people in the communities surrounding them.

In developing the Criteria for this Principle, ASC referenced the ILO Declaration on Fundamental Principles and Rights at Work, several other ILO conventions, the UN Guiding Principles on Business and Human Rights, and documents from the Office of the UN High Commissioner for Human Rights (OHCHR) and Social Accountability International (SA8000).

The intended outcome of Principle 3 is that ASC-certified facilities operate in a socially responsible manner. The impacts on employees are expected to arise from the types of social practices that are part of this Principle. The underlying logic of Principle 3 is that employees will be empowered to help create a workplace that is beneficial to the wellbeing of themselves and their family by:

I. having robust management systems in place that can pro-actively detect and address issues,
II. providing employees with knowledge on their rights through clear policies and procedures, training, and transparent contracts,
III. creating opportunities for dialogue and collective bargaining between employees and management,
IV. presence of accessible and trusted grievance mechanisms for when issues are not resolved through dialogue.

This same logic partially applies to communities. By creating a dialogue between farms and communities, farms become aware of the impacts they have, and communities have ways of addressing their issues. Accessible and trusted grievance mechanisms also play an important role in that process.

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[57] FAO. 2022. *The Stage of World Fisheries and Aquaculture 2022. Towards Blue Transformation.* Rome, FAO. https://doi.org/10.4060/cc0461en
[58] Asian Development Bank. 2005. An Evaluation of Small-Scale Freshwater Rural Aquaculture Development for Poverty Reduction. https://www.adb.org/sites/default/files/publication/27961/fresh-water.pdf
[59] Ceballos, A., Dresdner-Cid, J.D., Quiroga-Suazo, M.A. 2018. Does the location of salmon farm contribute to the reduction of poverty in remote coastal areas? An impact assessment using the Chilean case study. Food Policy, Volume 75, p68-79.
[60] New Zealand Government – Ministry for Primary Industries. 2015. The social and community effects of aquaculture – a case study of Southland aquaculture. ISBN 978-0-908334-49-0.
[61] Highlands and Islands Enterprise and Marine Scotland. 2017. The value of aquaculture to Scotland. https://www.gov.scot/Topics/marine/Publications/TopicSheets/tslist/aquavalue

Criterion: 3.1 – Rights Awareness

Rationale – In 1948, the General Assembly of the United Nations proclaimed the Universal Declaration of Human Rights (UDHR), which is a list of thirty rights and freedoms that belong to every human being, and which are to be universally protected.

Principle 3 is in line with the UDHR and ensures that the rights of employees and members of neighbouring communities are protected. However, employers' and employees' awareness of their rights is critical to their access to these rights and understanding what human rights are enables them to stand up for these rights and form unions to work for improved wellbeing for themselves and their families.

This Criterion focuses particularly on the awareness of human rights of all employees through the development of a human rights policy, and also addresses some more specific human rights issues that employees may come across in their work on the farms.

Intent – The farm ensures the protection of human rights of all employees.

Indicators:	
Indicator 3.1.1	The UoC shall have a written human rights policy, approved by a member of senior management.
Indicator 3.1.2	The UoC shall have at least one named member of management who is responsible for the implementation of the human rights policy, with the involvement of the employee committee (Indicator 3.1.3).
Indicator 3.1.3	The UoC shall allow and facilitate the formation of an employee committee that meets regularly to support the implementation of the human rights policy and the grievance mechanism.
Indicator 3.1.4	The UoC shall ensure that all employees are trained on the human rights policy and information shall be distributed, available, and explained to all employees in a format they can understand.
Indicator 3.1.5 	The UoC shall publicly disclose the human rights policy statement and actively communicate it to all suppliers and stakeholders.

Criterion: 3.2 – Forced, Bonded, Compulsory Labour and Human Trafficking

Rationale – The Universal Declaration of Human Rights (UDHR) recognises that **forced, bonded, compulsory labour** and **human trafficking** are persistent problems in many industries and regions of the world. The aquaculture industry is no exception.

According to recent estimates,[62] 28 million people are victims of forced, bonded or compulsory labour. This includes human trafficking (recruitment, transfer, or harbouring of a person by force, threat or deception), debt bondage (labour demanded as a means of payment of debt), and more subtle forms of forced labour that force employees to remain in their jobs against their will through other means of threat.

Poverty, inequality, discrimination and unfair labour practices are key drivers of forced labour, which usually impacts the most vulnerable and least protected. The use of unregulated labour brokers or recruitment agencies sending **migrant workers** has been identified as a major factor in human trafficking and forced labour in the seafood and other sectors, especially for migrant workers.[63]

This Criterion focuses on the prohibition of forced and bonded labour, in line with four ILO conventions,[64] oversight of recruitment agencies and the responsible recruitment of workers, and effective remediation should forced or bonded labour be found. However, the protections outlined in all other labour rights Criteria in this Standard are also critical in both identifying and preventing forced and bonded labour, which is often accompanied by workplace violations in other areas. Protections, including limiting working hours, preventing workplace discrimination, ensuring decent wages and transparency in contracting, maintaining an effective grievance mechanism and others, are essential in addressing underlying drivers of forced and bonded labour and human trafficking by creating a more ethical workplace and sustainable industry.

Intent – The farm prevents forced, bonded, compulsory labour and human trafficking. If any such issues are found, the farm implements effective remediation measures.

Indicators:	
Indicator 3.2.1	The UoC shall not engage in or support forced, bonded, compulsory labour or human trafficking. This includes: - work that is exacted from any person under the threat of any penalty; - work for which the person has not offered himself or herself voluntarily; - the use of deception or other forms of coercion, for the purpose of exploitation.

[62] https://www.walkfree.org/global-slavery-index/
[63] Human Rights Watch. 2018. Hidden chains - Rights abuses and forced labor in Thailand's Fishing Industry.
[64] ILO Forced Labour Convention, 1930 (No. 29), ILO Abolition of Forced Labour Convention, 1957 (No. 105), ILO Protection of Wages Convention, 1949 (No 95), ILO Private Employment Agencies Convention, 1997 (No. 181).

	- the use of exploitative loans to prevent employees from leaving their jobs.
Indicator 3.2.2	If forced, bonded, compulsory labour or human trafficking is identified, the UoC shall implement, monitor, and document remediation procedures, in accordance with **Appendix 15**, to conform with Indicator 3.2.1, that put the best interest of the person first.
Indicator 3.2.3	If forced, bonded, compulsory labour or human trafficking is identified, the UoC shall implement corrective actions that prevent recurrence, and ensure that these actions are monitored for effectiveness and documented.
Indicator 3.2.4	The UoC shall ensure that any employment/recruitment agencies used are screened and monitored to ensure that they: - are licenced or certified by the competent national authority, where such licensing/certification exists; - comply with relevant regulations, as set out in Criterion 1.1.
Indicator 3.2.5	The UoC, or if applicable the agencies involved in recruitment, shall not retain any original identity documentation such as IDs, visas, passports, without which the employee would not be able to freely terminate the employment, travel or leave the country. If a secure storage option for personal documents and valuable possessions is provided, it shall be ensured that: - it is the choice of the worker to utilise the storage; - storage is documented; - workers have free access to their possessions.
Indicator 3.2.6	The UoC, or if applicable the agencies involved in recruitment, shall allow employees to terminate their employment according to the terms and conditions defined within employment agreements.
Indicator 3.2.7	The UoC, or if applicable the agencies involved in recruitment, shall not withhold any part of the employee's salary, property, or benefits. The only situations where withholding is permitted is when required by law.
Indicator 3.2.8	The UoC, or if applicable the agencies involved in recruitment, shall not charge employees any fees for recruitment[65] or during employment. This includes any costs or deposits associated with the processing of official documents including work visas. For migrant workers, this includes any costs, or deposits, associated with travel and repatriation.

[65] For migrant workers, evidence shall include recruitment/employment cost incurred by the UoC; costs shall be summarised by year as well as by country from which employed migrant workers originate.

Indicator 3.2.9	The UoC shall, if providing loans and advances, have a policy that is clear and understandable to all employees.
Indicator 3.2.10	The UoC shall allow employees to freely move around the workplace to use sanitary facilities and have access to drinking water during their work **shift**.
Indicator 3.2.11	The UoC shall not keep employees involuntarily on site outside of a work shift.
Indicator 3.2.12	The UoC shall offer employees accessible and safe transportation to leave the premises when the workplace is not easily accessible and allow employees to leave the site once their shift is over.
Indicator 3.2.13	The UoC shall not require employees to reside in employer-operated accommodation as a condition of employment for non-remote, readily accessible, operations.
Indicator 3.2.14	The UoC, or if applicable the agencies involved in recruitment, shall not engage in prison labour.
Indicator 3.2.15	The UoC shall not require spouses, children, or any other family members of owners and employees to work. Where family members are allowed to work, they shall be separately and voluntarily contracted in accordance with the Standard's Requirements.
Indicator 3.2.16	The UoC shall not require employees to purchase from employer-operated stores or services as a condition of employment; where alternative stores or services are not available due to the remote location, cost must be reasonable and the UoC may not make a profit from stores and services provided to employees.

Criterion: 3.3 – Child Labour

Rationale – The OHCHR Convention on the Rights of the **Child**, as well as ILO Conventions 138[66] and 182[67] have established that all children have the right to be protected from work that is dangerous or harmful to their education, health or development. Although SDG 8.7 calls for the elimination of child labour in all forms by 2025, it is estimated that 152 million children worldwide are child labourers.[68] Child labour is driven by economic and cultural pressures on the poorest, most vulnerable and least educated families. Children and **young employees** are particularly vulnerable to economic exploitation due to their inherent age-related limitations in physical development, knowledge, experience and lack of independence. They are also more likely to become victims of child labour when their parents are not paid a fair wage and where there is not adequate access to schooling in their community.

Employment and exploitation of children and young workers occurs globally and in many (if not all) industries,[69] including the aquaculture sector.[70] Child labourers are deprived of healthy childhood play and are commonly forced to leave school prematurely, combine attendance with excessively long and heavy work, or are deprived of the opportunity to attend school altogether. This contributes to a cycle which perpetuates poverty and child labour in subsequent generations.

However, limited and non-harmful forms of participation in work can contribute to a child's development, and, within some contexts, to the welfare of their families; providing them with skills and experience to prepare them to become productive members of society during their adult life.[71]

This Criterion focusses on the prevention of child labour, ensuring safe conditions for young workers and effective remediation should any instance of child labour be found. The protections outlined in other labour rights Criteria in this Standard, including decent wages, limited working hours and transparency in contracting, also protect against the risk of child labour by creating economic security for families.

Intent – The farm prevents child labour. If child labour is found, the farm implements effective remediation measures.

[66] ILO Minimum Age Convention, 1973 (No. 138).
[67] ILO Worst Forms of Child Labour Convention, 1999 (No. 182).
[68] https://endchildlabour2021.org/child-labour/
[69] https://www.ilo.org/ipec/areas/Agriculture/WCMS_172348/lang--en/index.htm
[70] ILO. 2017. Global estimates of child labour: Results and trends, 2012-2016. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_575499.pdf
[71] https://www.ilo.org/ipec/facts/lang--en/index.htm

Indicators:	
Indicator 3.3.1	The UoC shall not engage in child labour. Child labour is work that: - is mentally, physically, socially or morally dangerous and harmful to children; - interferes with their schooling.
Indicator 3.3.2	If child labour is identified, the UoC shall implement, monitor and document remediation procedures, in accordance with **Appendix 15**, to conform with Indicator 3.3.1, that put the best interest of the child first.
Indicator 3.3.3	If child labour is identified, the UoC shall implement corrective actions that prevent recurrence and ensure that these actions are documented and monitored for effectiveness.
Indicator 3.3.4	The UoC may employ children from the age of 15, or above the age of completion of mandatory schooling (whichever is higher), only if the child conducts non-hazardous work for limited hours (Indicators 3.3.8, 3.3.9, 3.3.14-3.3.17).
Indicator 3.3.5	The UoC may employ children aged 13 and 14 years old to conduct **light work** only and shall ensure that: - the work is non-hazardous, defined based on a risk assessment (Indicator 3.5.2); - the work takes place during limited hours (Indicators 3.3.8-3.3.13); - the child receives appropriate training prior to work; - the child receives appropriate supervision; - work does not jeopardise schooling; - parental/guardian consent is given.
Indicator 3.3.6	The UoC shall facilitate school attendance for any children living on-site.
Indicator 3.3.7	The UoC shall implement an age verification mechanism for all employees.
Indicator 3.3.8	The UoC shall ensure that all employees under the age of 18 have at least 48 consecutive hours (two days) of rest within a seven-day period.
Indicator 3.3.9	The UoC shall not allow overtime hours for employees under the age of 18.
Indicator 3.3.10	*Indicator scope: children aged 13 or 14 or below the age of completion of mandatory schooling.*

	The UoC shall ensure that children permitted to engage in light work do not work more than three hours per day on a non-school day and two hours per day on a school day, and 14 hours in a week (excluding breaks); with combined school, work and transportation time (to/from school and work totalling less than eight hours per day.
Indicator 3.3.11	*Indicator scope: children aged 13 or 14 or below the age of completion of mandatory schooling.* The UoC shall ensure that children permitted to engage in light work have a break of at least 0.5 hours within three hours of work.
Indicator 3.3.12	*Indicator scope: children aged 13 or 14 or below the age of completion of mandatory schooling.* The UoC shall ensure that children permitted to engage in light work have a daily rest period of at least 14 consecutive hours within a 24-hour period.
Indicator 3.3.13	*Indicator scope: children aged 13 or 14 or below the age of completion of mandatory schooling.* The UoC shall not allow children permitted to engage in light work to work between 8pm and 6am.
Indicator 3.3.14	*Indicator scope: young employees aged 15 or above and above the age of completion of mandatory schooling.* The UoC shall ensure that working hours for young employees do not exceed eight hours per day and 40 hours in a week (excluding breaks) and combined school, work and transportation time (to/from school and work) do not exceed a total of 10 hours per day.
Indicator 3.3.15	*Indicator scope: young employees aged 15 or above and above the age of completion of mandatory schooling.* The UoC shall ensure that young employees have a break of at least one hour within eight hours of work, with at least 0.5 hours rest within any 4.5 hours of work.
Indicator 3.3.16	*Indicator scope: young employees aged 15 or above and above the age of completion of mandatory schooling.* The UoC shall ensure that all young employees have a daily rest period of at least 12 consecutive hours within 24 hours.
Indicator 3.3.17	*Indicator scope: children aged 15 or above and above the age of completion of mandatory schooling.* The UoC shall not allow young employees to work between 10pm and 6am.

Criterion: 3.4 – Discrimination

Rationale – Discrimination is a pervasive global problem, despite the statement of the first article of the Universal Declaration of Human Rights: 'All human beings are born free and equal in dignity and rights.'[72] Millions of people around the world face discrimination for a variety of reasons. It is addressed by three ILO Conventions (100[73], 111[74] and 156[75]).

Discrimination may cause negative impacts to individuals at home, in the workplace, or within the wider society. Unequal treatment can perpetuate poverty, stifle development, productivity and competitiveness, and, on a larger scale, can ignite political instability.[76]

A cross-cutting issue that can be found in every aspect of human life, including in the workplace, discrimination manifests itself in multiple areas and issues, including race, gender, nationality, legal status, age, ethnicity and many more. While some discrimination can be obvious and clear, other issues can be difficult to detect and consequently hard to address. Working to decrease discrimination against all groups, and improve equality, 'will have wide-ranging benefits for society as a whole and help to ensure that the benefits of development are felt by all.'[77]

One common area of discrimination is gender discrimination, which the UN defines as 'any distinction, exclusion or restriction made on the basis of sex which has the effect or purpose of impairing or nullifying the recognition, enjoyment or exercise by women.[78]' The impacts of gender discrimination are far-reaching, with implications for the home, education, the workplace and wider society in general. Through this Criterion, ASC works for the promotion of gender equality in certified farms.

To promote a peaceful, just, and effective society, discrimination must be addressed in all its forms, visible and invisible. It can be addressed through programmes to improve diversity and facilitate groups who are often discriminated against, to participate more fully and equally in society and the workplace. ASC Standards take significant steps to bring an end to discrimination in the workplace.

Intent – The farm prevents discrimination in its operations.

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[72] https://www.un.org/en/about-us/universal-declaration-of-human-rights
[73] ILO Equal Remuneration Convention, 100.
[74] ILO Discrimination (Employment and Occupation) Convention, 111.
[75] ILO Workers with Family Responsibilities Convention, 156.
[76] ILO. 2011. Equality at work: the continuing challenge. https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---declaration/documents/publication/wcms_166583.pdf
[77] FAO, 2020. The State of World Fisheries and Aquaculture 2020. Sustainability in action. Rome. https://doi.org/10.4060/ca9229en, p.128
[78] United Nations, 1979. 'Convention on the Elimination of all forms of Discrimination Against Women, Article 1.

Indicators:	
Indicator 3.4.1	The UoC shall ensure equal treatment of, and opportunities, for all employees and applicants for employment, including recruitment process and conditions, pay and benefits, working conditions, job assignment, training, promotion and other career opportunities, disciplinary practices, termination, and retirement.
Indicator 3.4.2	The UoC or, if applicable, the agencies involved in recruitment, shall not test for pregnancy or virginity, nor practice or encourage forced contraception.
Indicator 3.4.3	During the recruitment process, the UoC or, if applicable, the agencies involved in recruitment, shall only require medical tests if required for the function of the job or required by national law.
Indicator 3.4.4	The UoC shall only require medical tests if justified by a health and safety or food safety risk assessment.
Indicator 3.4.5	If the UoC requires medical tests (Indicators 3.4.3, 3.4.4), employees must understand the reasons for the tests, their data must be protected, and they must have access to their test results.
Indicator 3.4.6	If the UoC requires medical tests (Indicators 3.4.3, 3.4.4), employees have the right to use a medical professional of their own choosing, if preferred.
Indicator 3.4.7	The UoC shall not engage in or tolerate violence or **harassment** in any form (including sexual harassment or abuse, or any other form of mental, physical or verbal harassment or abuse).
Indicator 3.4.8	The UoC shall have effective communication procedures and monitoring in place to ensure harassment, bullying, and abusive or exploitative behaviour does not occur.

Criterion: 3.5 – Health and Safety

Rationale – A safe and healthy work environment ensures that workers are protected from accidents, injuries and illness arising from their employment. The basic right and principle that workers should be protected in their workplace and work environment is universally agreed. It is set out by the United Nations in the Universal Declaration of Human Rights, promoted by the World Health Organisation and set forth by the ILO through various Conventions: 14[79], 155[80], 161[81], 170[82], 174[83] and 190[84].

Despite the stated global protections, unsafe work is the reality for millions. The ILO estimates[85] that 2.78 million people die each year from occupational accidents and work-related diseases. A further 374 million people suffer non-fatal work-related injuries and illnesses each year, many of these resulting in extended absences from work. It is estimated that 3.94% of the world's annual GDP is lost as a consequence of occupational diseases and accidents.

Health and safety within the global aquaculture industry, including processing, is still widely overlooked, according to the UN FAO.[86] The world's estimated 19 million aquaculture workers regularly contend with **hazardous conditions**. Workplace risks include injuries relating to machinery, tools, boats, vehicles, drowning, fall, electrocution and bites.

The risks of accidents or incidents can remain unaddressed due to gaps in knowledge, limited independent analyses of prevention measures or a lack of investment in risk reduction strategies. Health and safety problems in a workplace can result in additional costs due to early retirement because of injury, loss of skilled staff, absenteeism, and higher insurance premiums. Yet many work-related accidents and diseases are preventable through proper health and safety management. Part of ASC's mission is social responsibility in aquaculture, which includes ensuring that ASC certified farms provide a healthy, safe and secure workplace for their employees.

Intent – The farm provides a safe and healthy workplace and work environment.

[79] ILO Weekly Rest (Industry) Convention, 14.
[80] ILO Occupational Safety and Health Convention, 155.
[81] ILO Occupational Health Services Convention, 161.
[82] ILO Chemicals Convention, 170.
[83] ILO Prevention of Major Industrial Accidents Convention, 174.
[84] ILO Violence and Harassment Convention, 190.
[85] https://www.ilo.org/global/topics/safety-and-health-at-work/lang--de/index.htm
[86] http://www.fao.org/blogs/blue-growth-blog/despite-advances-in-health-and-safety-operations-fisheries-remainsa-dangerous-sector/en/

Indicators:	
Indicator 3.5.1	The UoC shall ensure that any person working on the farm receives health and safety training as required to carry out the duties and responsibilities of the job. Training shall be: - Free for employees; - Provided in a timely manner; - Repeated on a regular basis; - Paid or conducted during regularly remunerated working hours; - Updated as necessary based on new procedures or equipment.
Indicator 3.5.2	The UoC shall log accidents and near misses.
Indicator 3.5.3	The UoC shall carry out a site-specific health and safety risk assessment, approved by a member of senior management, according to the following: - Covering all farm activities; - Incorporating all steps of the risk management matrix in **Appendix 4.2**; and - Incorporating all topics in **Appendix 4.2**.
Indicator 3.5.4	The UoC shall implement the following: - Contingency measures/plans for all risks identified; - Preventative measures for risks determined to be medium or high.
Indicator 3.5.5	The UoC shall review and where needed revise the risk assessment (Indicator 3.5.3) and respective measures (Indicator 3.5.4), with the following frequency: - Prior to starting a new farm activity; - Following feedback on major issues from employees (Indicators 3.1.3, 3.12.1, 3.12.8); - Following accidents or near misses; and - Annually.
Indicator 3.5.6	The UoC shall provide well maintained and appropriate Personal Protective Equipment (PPE) free of charge.
Indicator 3.5.7	The UoC shall ensure that health and safety notices, instructions, and warning signs are visibly displayed in the workplace, where necessary.

Indicator 3.5.8	The UoC shall provide adequate First Aid (including supplies) in the event of a work-related injury; this includes access to professional support such as an ambulance.
Indicator 3.5.9	The UoC shall maintain records of farm diving operations and a list of all personnel involved. If contract divers are hired, their contracts shall adhere to ASC requirements for diving activities.
Indicator 3.5.10	The UoC shall log all diving operations using dive computers and ensure that records are kept electronically.
Indicator 3.5.11	The UoC shall verify diver certification for each person involved in diving operations. Divers shall be certified through an accredited national or international organisation for diver certification.
Indicator 3.5.12	The UoC shall ensure that divers undergo annual medical exams certifying they are fit to dive, as well as monitoring of hips, shoulders, and thorax by x-rays every three years.
Indicator 3.5.13	The UoC shall ensure that people who handle or contact hazardous substances have access to changing and washing facilities.
Indicator 3.5.14	Where not provided by a state/national social security/health system, the UoC shall provide and pay for insurance[87] for all employees for work-related accidents or injuries; this includes as a minimum the cost for transport and medical treatment/medication needed to treat the accident or injury, the cost for transport and medical treatment/medication needed for recovery, compensation for lost working hours, as well as the cost for any required repatriation in case of migrant workers.
Indicator 3.5.15	The UoC shall allow employees the freedom to remove themselves from an unsafe situation without seeking permission and without fear of retribution.
Indicator 3.5.16	The UoC shall provide access to adequate and clean sanitary facilities, with adequate privacy.

[87] Where no suitable insurance is available, the UoC may have a system to cover these costs directly.

Indicator 3.5.17	The UoC shall provide access to free, clearly labelled, potable water for all employees.
Indicator 3.5.18	The UoC shall provide access to a designated, hygienic area to prepare food and eat during breaks.
Indicator 3.5.19	The UoC shall conduct a risk assessment on people with underlying medical conditions, or who are pregnant, to ensure that they do not conduct hazardous work.
Indicator 3.5.20	The UoC shall ensure structural integrity of all buildings and structures within the UoC, including construction, maintenance, and repair.
Indicator 3.5.21	The UoC shall ensure that machinery and equipment is compliant with national or other recognised health and safety standards, is safely installed, maintained, and safeguarded, and only operated by trained employees.
Indicator 3.5.22	The UoC shall ensure that emergency and fire safety procedures are in place, and employees understand this information.
Indicator 3.5.23	The UoC shall ensure that fire exits, escape routes, firefighting equipment and fire alarms are properly marked and regularly checked for operationality. Fire exits and escape routes are accessible and clear of obstacles.

Criterion: 3.6 – Collective Bargaining and Freedom of Association

Rationale – The rights to freedom of association and collective bargaining are critical to the achievement of workers' rights.

The right to freedom of association is the right to join a formal or informal group to take collective action towards the employer. Collective bargaining provides a means for workers and employees to address conflict in mutually beneficial ways, with greater balance of power. Areas of negotiation may include wages or working conditions. Collective bargaining promotes peaceful and inclusive participation of representative workers' and employers' organisations. The ASC Farm Standard requires farms to protect employees' rights to freedom of association and collective bargaining. Where national law and regulation do not permit these rights, the Standard requires farms provide alternatives for employees. These rights are important for the promotion and realisation of decent conditions at work, especially when those conditions are not mandated by local law, and can build relationships and trust between employer and employee.[88]

Intent – The farm allows and enables employees to engage in collective bargaining and provides the right to freedom of association.

Indicators:	
Indicator 3.6.1	The UoC shall inform all employees that they are free to join or form workers organisations (i.e., trade unions or other organisations that represent their labour concerns and interests), of their own choosing.
Indicator 3.6.2	The UoC shall inform all employees that they are free to bargain collectively in accordance with applicable national legal requirements.
Indicator 3.6.3	The UoC shall not interfere in any way with the establishment, functioning, or administration of workers' organisations or collective bargaining. This includes not interfering in the election of representatives, allowing representatives access to employees and workplaces during working hours, and the UoC engaging in meaningful negotiations when approached by worker organisations.
Indicator 3.6.4	The UoC shall, in areas where the right to freedom of association is restricted by law, accept comparable means for freedom of association and collective bargaining.

[88] https://www.ilo.org/declaration/principles/freedomofassociation/lang--en/index.htm

Criterion: 3.7 – Transparent Contracts

Rationale – Employment agreements consist of terms and conditions that address aspects of the employment such as the respective responsibilities of employer and employee. Agreements are designed to give both parties clarity, trust, assurance and protection, through the clear and understandable explanation of the obligations of both the employer and employee. Mutual signatures of the contracts lead to trust and assurance by both parties.

If the terms and conditions of employment contracts are not clearly understood by the employee, confusion and disagreements may result. Contracts that lack transparency can create uncertainty with regard to the rights of the employee and their protection.[89]

Contracting employees in a transparent manner increases accountability, and building a positive relationship between employer and employee can increase effectiveness of the work, with both parties working towards the same clear goals. ASC's Requirements ensure that employees clearly understand the terms and conditions of their employment. This understanding contributes to transparency and accountability at a workplace level.

Intent – The farm provides contracts with clear terms and conditions to all employees and ensures that they understand them.

Indicators:	
Indicator 3.7.1	The UoC shall ensure that all employees have received, understood and agreed upon, written and understandable information about their employment terms and conditions before starting employment and, where applicable, prior to migration. This information shall include, at a minimum: - a description of the role and any responsibilities; - the type of contract (e.g., permanent, fixed-term, contractor); - working hours, including allowance for breaks; - paid annual leave and allowance for days off on public holidays; - sick leave; - wages; - any agreed wage deductions (e.g., accommodation, meals); - compensation for overtime; - social benefits (e.g., insurances); - termination terms and conditions, notice period; - access to relevant human rights and labour-related policies; - access to information on labour rights as per Indicator 1.1.3.

[89] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32019L1152

Indicator 3.7.2	The UoC shall provide all employees with all information on pay, advances, loans, hours worked, and the calculation of any deductions, and shall store this information within the facility and ensure that employees understand it.
Indicator 3.7.3	The UoC shall not use **family-contracting** or **false-apprenticeships**.
Indicator 3.7.4	The UoC shall not use **labour-only contracting**, sub-contracting or home working unless: - The UoC fulfils obligations to employees under applicable national labour and social security laws; - The UoC pays social security for all employees according to national legal requirements.

Criterion: 3.8 – Wages

Rationale – The Universal Declaration of Human Rights[90], states that "everyone who works has the right to just and favourable remuneration ensuring for himself/herself and his/her family an existence worthy of human dignity, and supplemented, if necessary, by other means of social protection." In other words, every worker deserves a decent reward for their efforts. This reward should be set in a transparent manner and safeguarded through company management.

Many countries have a national **minimum wage**, but these minimum wages are often too low to provide a decent standard of living, leaving workers in poverty. Wages that support immediate needs but do not cover additional or unexpected costs, such as healthcare or emergency expenses, still risk families going into debt. Wages that are insufficient to support families can result in poor health, lack of education, and more need for social support.

It is essential for farms to pay their employees a sufficient wage in a transparent manner to contribute to the reduction of poverty. ASC's requirements around **living wage**, where the worker is able to support themselves and their family's needs, including food, water, housing, education, health care, transportation, clothing, as well as a provision for unexpected events, are intended to support farms in progressing towards payment of a living wage for employees.

The Criterion also includes a requirement on maternity and paternity protection, in line with ILO Convention 183 (Maternity Protection Convention) to support paid maternity leave to protect families' health and financial security through childbirth.

Intent – The farm works towards the continuous improvement of wages, while paying all employees at or above the legal minimum wage.

Indicators:	
Indicator 3.8.1	The UoC shall set wages (before overtime and bonuses) at or above the legal minimum wage; if a minimum wage has not been established by law, the UoC calculates wages in consultation with workers or their representative worker organisations.
Indicator 3.8.2	The UoC shall monitor remuneration of all employees according to the methodology outlined in **Appendix 16** and assess this remuneration against living wage benchmarks (according to the benchmark list on the ASC website) on at least an annual basis.

[90] http://www.un.org/en/universal-declaration-human-rights/index.html

Indicator 3.8.3	The UoC shall develop and implement a wage improvement plan, in cases where remuneration is below the living wage benchmark for any type of employee.
Indicator 3.8.4 	The UoC shall report annual employee wage data to ASC, in accordance with ASC data submission procedures.
Indicator 3.8.5	The UoC shall pay wages directly to employees in **legal tender** at regular intervals but at a minimum monthly. Wages shall not be delayed, deferred or in any way withheld.
Indicator 3.8.6	The UoC shall document wage payment and receipt by all employees, including information on pay, advances, loans, hours worked, and the calculation of any withholdings, and make this information available to employees.
Indicator 3.8.7	The UoC shall ensure that employees are entitled to maternity leave of a minimum 14 weeks that includes a guarantee of return to the job. Payment during this period shall be a minimum of two thirds of previous earnings.

Criterion: 3.9 – Working Hours

Scope– Every UoC, for all employees aged 18 and over.

Rationale – Limited working hours have been declared a human right in the Universal Declaration of Human Rights (UDHR) and the International Covenant on Economic, Social and Cultural Rights. The first ILO convention (1919) limited working hours and called for adequate rest periods for workers. Despite the regulation of working time being one of the oldest labour concerns,[91] excessive working hours are still a widespread issue.

In many parts of the world, there is a significant link between low wages and excessive working time. An inability to decline excessive overtime, due to wage pressures or fear of dismissal, can result in forced labour and to higher levels of fatigue-related accidents.

ASC requires farms to follow ILO Conventions (1[92], 14[93], 132[94], 171[95], 184[96], 116[97]) on working time, which provide the framework for regulating hours of work, daily and weekly rest periods, and annual holidays and which serve to promote higher productivity while safeguarding workers' physical and mental health.

Intent – The farm does not subject employees to excessive working hours.

Indicators:	
Indicator 3.9.1	The UoC shall conform with collective bargaining agreements (if applicable) on premium rates, working hours, shift patterns, breaks, daily rest, weekly rest, and health assessments for night work.
Indicator 3.9.2	The UoC shall keep records of the hours worked by every employee.
Indicator 3.9.3	The UoC shall not exceed 8 working hours per day and 48 working hours in a normal week (excluding breaks). The UoC may allow averaging of work hours over a maximum of a 17-week reference period, as long as the average over the period is less than 48 working hours a week and the following conditions are met: - The hours are in line with national legal requirements; - The hours are in line with collective bargaining agreements; - The hours are clearly set out and agreed to by employees in their contracts;

[91] ILO. 2007. Working time around the world: trends in working hours, laws and policies in a global comparative perspective. https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/-publication/wcms_104895.pdf
[92] ILO Hours of Work (Industry) Convention, 1919 (No. 1).
[93] ILO Weekly Rest (Industry) Convention, 1921 (No. 14).
[94] ILO Holidays with Pay Convention (revisited), 1970 (No. 132).
[95] ILO Night Work Convention, 1990 (No. 171).
[96] ILO The Safety and Health in Agriculture Convention, 2001 (No. 184).
[97] ILO Recommendation Reduction of Hours of Work (Recommendation 116).

	- Appropriate safeguards are taken to protect the employee's health and safety.
Indicator 3.9.4	The UoC shall ensure that overtime hours are voluntary and are not requested regularly.
Indicator 3.9.5	The UoC shall ensure that, if overtime is requested, appropriate safeguards are taken to protect the employee's health and safety.
Indicator 3.9.6	The UoC shall ensure that overtime is not more than 12 hours per week, beyond the working hours outlined in Indicator 3.9.3.
Indicator 3.9.7	The UoC shall ensure that overtime hours are paid at a premium rate as defined by applicable law, collective bargaining agreements (if applicable) or industry standards. If not defined, a premium rate of a minimum 125% of the agreed salary is applied to overtime hours.
Indicator 3.9.8	The UoC shall allow for additional workday breaks for pregnant and breast-feeding women in suitable locations; nursing breaks shall be counted as working time and remunerated accordingly.
Indicator 3.9.9	The UoC shall ensure that all employees have at least one hour of break time within 8 hours of work.
Indicator 3.9.10	The UoC shall ensure that all employees have at least 11 consecutive hours of rest within a 24-hour period.
Indicator 3.9.11	The UoC shall ensure that all employees have at least 24 consecutive hours of rest within a 7-day period.
Indicator 3.9.12	The UoC shall ensure that all employees have a paid period of annual leave of a minimum of three weeks, pro rata.

Criterion: 3.10 – Workplace Conduct Response

Rationale – Effective work environments have procedures in place to resolve any issues that occur. Several UN agreements (UN Declaration of Human Rights, International Covenant on Civil and Political Rights, and Declaration on the Protection of All Persons from Being Subjected to Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment) establish an international norm for workplace performance procedures. While employers may need to course-correct the behaviour or performance of employees, there is a risk that this could be done in an unfair or degrading manner.

Most UN member states have ratified the aforementioned agreements, indicating their commitment to abolish any practice that may compromise or damage an individual's physical and mental well-being. In addition, many countries have specific national legislation making abuse in the workplace a criminal offense. Aiming to protect the dignity and the physical and mental health of employees, these instruments strive to deliver an effective and consistent method of dealing with performance matters.

Intent – The farm responds to breaches of company rules in a manner that respects the dignity and health of the employee.

Indicators:	
Indicator 3.10.1	The UoC shall have a written policy in place to respond to breaches of company rules, apply clear levels of escalation, and ensure dignity and respect towards the employee.
Indicator 3.10.2	The UoC shall ensure that all employees are aware of, and understand, the workplace conduct response policy.
Indicator 3.10.3	The UoC shall maintain records of actions taken in response to breaches of company rules.
Indicator 3.10.4	The UoC shall not deduct from wages or benefits for the purpose of disciplinary action.

Criterion: 3.11 – Employee Accommodation

Rationale – The Universal Declaration of Human Rights (UDHR) recognises that everyone has the right to a standard of living (including housing) which is adequate for the health and well-being of themselves and their family, while the ILO addresses this through its Workers' Housing Recommendation (115). In many sectors, including aquaculture, employees may reside for a period of time in accommodation provided by their employer. This is especially the case when workplaces are remote or where employees cannot commute between shifts due to distances or other logistical challenges.

When employee housing is provided by employers, it must meet standards to ensure the health, safety and wellbeing of employees.

Intent – The farm provides safe, decent, and hygienic accommodation for employees, if required.

Indicators	
Indicator 3.11.1	The UoC shall ensure that any accommodation facilities provided for employees or their family are safe and in accordance with local laws and regulations; this includes provision of safety systems, emergency/escape routes, fire safety procedures, ventilation, reasonable protection from heat and cold, as well as adequate privacy, including separation by gender if appropriate.
Indicator 3.11.2	The UoC shall ensure that any dormitory facilities provided for employees, or their family are clean and hygienic.
Indicator 3.11.3	The UoC shall ensure that any accommodation facilities provided for employees or their family are decent and meet their **basic needs**.
Indicator 3.11.4	The UoC shall ensure that any rent is reasonable and is in line with average local rental rates.
Indicator 3.11.5	The UoC shall provide access to appropriate sanitary facilities that are clean and that provide adequate privacy, including separation by gender if required, and are sufficient for the number of people
Indicator 3.11.6	The UoC shall arrange for annual meetings between employees or their representatives and management to discuss any maintenance or reasonable improvements required to housing. These meetings shall be recorded and actions taken where necessary.
Indicator 3.11.7	The UoC shall ensure that all employees working in remote locations have access to a free, real-time communication link to communicate externally.

Criterion: 3.12 – Grievance Mechanism

Rationale – Internal and external stakeholders, including employees and communities, may be negatively affected by a company's actions. In such cases, grievance mechanisms and processes to provide remediation are needed. **Grievance** mechanisms can help to provide remedy or can serve as early warning systems for human rights issues, and provide information for due diligence processes.

The company's responsibility to provide a grievance mechanism for employees, communities and other stakeholders is recognised in the UN Guiding Principles on Business and Human Rights (UNGP) and in the ILO's Examination of Grievances Recommendation (130). Grievances and conflicts are an inevitable part of employment and business relationships, and when they are not addressed, they can lower morale, decrease productivity, allow worker and human rights violations to continue or reduce the company's social licence to operate. **Grievance mechanisms** may be referred to as dispute, complaint, or accountability mechanisms; they offer a system in which the parties effectively address a problem together.

As outlined in UNGP Pillar 31, well-functioning grievance mechanisms are transparent, fair, predictable, accessible to all stakeholder groups, and engender trust among participants. Mechanisms should be rights-based, based on dialogue and engagement, and be a source of continuous learning.[98] Employee and stakeholder awareness of the grievance mechanism and their rights within it, including the right to external redress, is essential to proper functioning. Further, the mechanism should include a process for engagement and dialogue to address concerns or give input on potential issues before they reach the level of a dispute.

Intent – The farm facilitates dialogue to prevent disputes and provides accessible employee and community grievance mechanisms.

Indicators:	
Indicator 3.12.1	The UoC shall have a system, which all employees are familiar with, to proactively facilitate dialogue between employees and management with the intent of preventing grievances from occurring.
Indicator 3.12.2	The UoC shall have a grievance mechanism which is accessible and applicable to all employees.
Indicator 3.12.3	The UoC shall train all employees on the grievance mechanism procedures.

[98] https://www.businessrespecthumanrights.org/en/page/349/remediation-and-grievance-mechanisms

Indicator 3.12.4	The UoC shall have a grievance mechanism which is easily accessible and applicable to Indigenous and tribal peoples, and local communities.
Indicator 3.12.5	The UoC's grievance mechanisms shall include provisions for non-retaliation.
Indicator 3.12.6	The UoC shall address all grievances within a 90-day timeframe of submission.
Indicator 3.12.7	The UoC shall document all grievances, responses and remedy, where required.
Indicator 3.12.8	The UoC shall convene a grievance decision-making committee, for each grievance mechanism, which includes members representing the diversity of the respective population and that ensures consideration for vulnerable groups.
Indicator 3.12.9	The UoC shall ensure that dialogue between parties is facilitated, and grievances are processed fairly, and result in an effective outcome.
Indicator 3.12.10	The UoC shall provide for a confidential grievance process, if preferred by the person/entity submitting the grievance, and the grievance committee shall only share information necessary to investigate the grievance.

Criterion: 3.13 – Community Engagement

Rationale – Aquaculture operations can form an important part of the economic backbone in the communities in which they are located. However, they can also create negative impacts and/or infringe on legal and customary rights of Indigenous and tribal people and local communities. This may include Indigenous and tribal peoples residing long distances away. In many parts of the world, Indigenous people continue to suffer from discrimination and marginalisation, resulting in poverty and poor health, and threats to their cultures, languages and ways of life. ILO Convention 169[99] and the United Nations Declaration on the Rights of Indigenous Peoples recognises Indigenous peoples' right to land and natural resources and their right to define their own priorities for development and participate in decision-making that affects their lives.

Potential conflicts between aquaculture operations, Indigenous people and local communities may revolve around siting of operations on lands or in waterbodies that are considered of significant cultural value, negative environmental impacts, or impacts from farm operations on the living environment; for example, noise, dust or odours, or impacts from increased traffic.

Constructive and continuous engagement, effective grievance mechanisms and remediation, and involving local community members and Indigenous people in business ventures as owners, suppliers, contractors and employees are potential mechanisms by which businesses can create positive relationships and embed businesses in the local community.

Intent – The farm minimises negative impacts on communities and engages with them in a constructive manner.

Indicators:	
Indicator 3.13.1	The UoC shall not restrict or negatively affect Indigenous and tribal peoples', or local communities' rights and access to sites which are of special cultural, ecological, economic, religious or spiritual significance, and for which the Indigenous and tribal peoples or local communities hold legal or **customary rights**.
Indicator 3.13.2	The UoC shall not restrict or negatively affect Indigenous and tribal peoples, or other community members' rights to food security, or access to resources including land and water.
Indicator 3.13.3	The UoC shall, to the extent possible, source goods and services, including employment, from Indigenous and tribal peoples, and local communities.
Indicator 3.13.4	The UoC shall demonstrate the right to use the land and water. Where applicable, this shall include documentation of transfer of ownership or

[99] ILO Indigenous and Tribal Populations, 1989 (No. 169).

	usage of land from local people, Indigenous and tribal peoples or other stakeholders to the UoC.
Indicator 3.13.5	The UoC shall proactively engage with Indigenous and tribal peoples, and the local community to identify, avoid, or mitigate significant negative social impacts resulting from activities of the UoC (Indicator 3.12.4).

Principle 4 - The UoC operates responsibly with respect to animal health and welfare

Rationale – Animal health and welfare stand as foundational pillars in the context of sustainable and responsible aquaculture, aligning seamlessly with the vision of the Aquaculture Stewardship Council (ASC). This commitment is not just an isolated objective but a central theme that addresses a myriad of contemporary global challenges, including food security, ecosystem resilience, carbon emissions, ocean pollution, overfishing, and threats to public health. Recognising the connection between these issues, animal welfare in aquaculture emerges as a critical element, offering a multidimensional approach to safeguarding humans, animals, and the environment.

The ASC certification programme addresses, mitigates and prevents poor animal health and welfare resulting in a comprehensive multifaceted approach that encompasses ethical, economic, environmental, and regulatory considerations.

ASC supports an operational definition of welfare defined by the physical and mental state of an animal in relation to the conditions in which it lives and its capacity to cope with the environment providing opportunities for animals to "thrive", not simply survive. This is linked to the concept of positive animal welfare (PAW), which can be defined by four features: positive emotions, positive affective engagement, quality of life, and happiness. These are summarised in five welfare aims that complement the classical five freedoms approach.

By adopting and promoting high standards of animal health and welfare, ASC enhances its sustainability, meets consumer expectations, and contributes to the responsible and ethical production of aquatic food resources.

The intended outcome of Principle 4 is that ASC-certified facilities operate in an animal health and welfare responsible manner, by ensuring:

I. responsible and humane practices in food production
II. disease prevention and biosecurity
III. economic responsibility
IV. ethical treatments
V. responsive use of therapeutants
VI. positive animal welfare

Criterion: 4.1 – Animal Health and Welfare

Rationale – Animal health and welfare are highly interrelated concepts. For the purpose of this Criterion, good health is understood as the lack of disease or injury, and the ability of an animal to perform its physiological functions at normal levels. Welfare is the physical and mental state of an animal in relation to the conditions in which it lives and dies, and its capacity to cope with the environment. In this sense, it is important to highlight that welfare is not just the freedom from noxious stimuli and harmful experiences, but the exposure to positive ones that improve experiences for animals.

If certain farming principles are not met, the commercial rearing of animals can jeopardize their health and welfare (e.g., poor health, the inability to express important natural behaviour, and unnecessary suffering) as well as that of wild species living in the vicinity of the farm (e.g., via disease transmission – covered in Criteria 4.1 and 4.2), and the actual environment where the farm is set (e.g., overuse of chemicals – covered in Criteria 4.1 and 4.3).

Good health and welfare can be achieved if responsible farming practices are followed at all times. These include monitoring of health and welfare, the application of site-specific biosecurity plans, implementation of disease prevention schemes, adherence to good welfare practices, and responsible use of veterinary therapeutants when needed, amongst other requirements.

ASC is providing a health and welfare framework that enables farmers to continuously monitor and evaluate their farming systems and their stocks. Rather than setting generic metric limits that may not reflect varied production realities, ASC has established a series of requirements that cover the main health and welfare practices upon which farms can build their own robust site-specific health and welfare management plans with the supervision of a veterinarian. These management plans are living documents and working tools that assist farmers in managing the health and welfare of their animals on a day-to-day basis.

A relevant example of how management plans can be used to actively manage health and welfare is the case of stocking density. In this Standard, ASC requires the assessment of stocking density through various operational welfare Indicators (OWIs) (morphological scoring, behavioural scoring, water quality and mortality) that can be used as proxies. If a downward trend is observed on these Indicators, then the farm should be assessing its farming operations, including stocking density, and modifying them accordingly. This approach is more suitable than setting a metric limit as accurate and reliable density figures are hard to obtain in aquaculture, and they vary between species, life stage and farming systems.

Intent – The farm maintains good animal health and welfare to minimise detrimental effects on the environment, wildlife and cultured animals.

4.1.1 Scope: Finfish

Indicators:	
Indicator 4.1.1.1	The UoC shall ensure that all employees are informed and aware of the importance of animal health and welfare, according to **Appendix 10**.
Indicator 4.1.1.2	The UoC shall ensure that all employees and subcontracted personnel involved in animal husbandry and handling operations are trained on animal health and welfare, according to **Appendix 10**.
Indicator 4.1.1.3	The UoC shall have a vaccination plan in place overseen and signed-off by a veterinarian if vaccines are available in the country.
Indicator 4.1.1.4	*Indicator scope: salmonids in cages* The UoC shall, when stocking an individual site, only stock single year class fish.
Indicator 4.1.1.5	The UoC shall monitor[100] production daily for mortality.
Indicator 4.1.1.6	Mortality shall be removed[101] at least every second day.
Indicator 4.1.1.7	The UoC shall collect moribund daily[102] and cull them following responsible stunning and killing according to Criterion 4.3.
Indicator 4.1.1.8	The UoC shall adhere to species-specific limits on mortality, survival and recovery rates as per **Appendix 3**.
Indicator 4.1.1.9	The UoC shall test[103] every batch[104] of animals for diseases of regional concern prior to stocking.
Indicator 4.1.1.10	The UoC shall have a designated veterinarian or aquatic animal health professional who performs regular site visits, at least annually for all finfish species and quarterly for salmon, as well as in cases of fish health or welfare concerns.
Indicator 4.1.1.11	*Indicator scope: every UoC using feed* The UoC shall develop and implement a feeding plan which includes at least the following parameters:

[100] The UoC shall keep a record of the situation when daily monitoring was not possible. Possible causes that would justify no daily monitoring of mortality are severe bad weather or a major equipment failure not related to poor maintenance.
[101] The UoC shall keep a record of the situation when daily monitoring was not possible. Possible causes that would justify no daily removal of mortality are severe bad weather or a major equipment failure not related to poor maintenance. All mortality shall be disposed of responsibly as per Indicators 2.11.22 and 2.11.23.
[102] The UoC shall keep a record of the situation when daily monitoring was not possible. Possible causes that would justify no daily removal of moribund are severe bad weather or a major equipment failure not related to poor maintenance.
[103] Testing is understood as the application of diagnostic techniques scientifically recognised as valid to diagnose the disease of interest. Such techniques might include histopathology, microbiology, molecular technology or veterinary inspection (only in the case of pathognomonic diseases).
[104] Organisms in homogeneous developmental stages coming from the same breeder and pre-grow out farm.

	– time and frequency of feeding; – feed rations; – feeding adaptation to fit different life stages; – feeding adaptation to fit different ambient conditions
Indicator 4.1.1.12	*Indicator scope: every UoC using feed* The UoC shall use methods that ensure product fed is well distributed and accessible to all animals in the production unit, in order to minimise competition.
Indicator 4.1.1.13	The UoC shall assess site-specific characteristics and develop, implement and monitor a Health and Welfare Management Plan (HWMP) with the objective of preventing disease outbreaks and ensuring good health and welfare of farmed animals. The HWMP shall include at least the following: a) a site-specific disease monitoring, response and reporting mechanisms (including reporting WOAH-notifiable disease to authorities); b) a site-specific biosecurity mechanism, including risk pathways into/out of and within the farm, to identify and minimise spreading of disease; c) a list of potential predators and any predator control measures needed, to avoid compromising the integrity of the containment system and the health and welfare of the fish; d) the HWMP is overseen and signed-off by a veterinarian; e) a review and where needed a revision of the HWMP when changes in farming activities or changes in external factors occur, following each production cycle[105], or upon the direction of the veterinarian.
Indicator 4.1.1.13.1	The HWMP shall include a water quality monitoring process, including at least the following: – Monitoring frequency (Table 1); – Monitoring parameters (Table 1); – Species-specific limits and monitoring requirements for water quality parameters (**Appendix 10**).
Indicator 4.1.1.13.2	The HWMP shall include a monitoring process for morphological scoring on live animals unless the species does not cope with or allow being sampled[106], including at least the following: – Monitoring frequency[107]: site-appropriate frequency, being at least once a month. – Morphological scoring parameters:

[105] For farms with production cycles shorter than one-year or using continuous stocking/cropping methods – review annually. For farms with production cycles longer than one-year or using all-in-all-out stocking/cropping methods (e.g., salmon) – review following each production cycle.
[106] Until further notice, the UoC must apply this to seabass.
[107] A deviation from monitoring frequency is justified on the following grounds (reason for exemption must be documented):
o Immediately after smolting and stocking;
o Animal health – undergoing a disease event and/or being treated (including treatment for sea lice). In case the reason for the exemption is related to animal treatment, the maximum duration for the exception shall be two weeks;
o During specific environmental events – water temperature, low oxygen, algal bloom.

	– Eye damage – Operculum damage – Skin damage – Fin damage – Deformities – Change of colouration – Emaciation
Indicator 4.1.1.13.3	The HWMP shall include a monitoring process for behavioural scoring on live animals, including at least the following: – Monitoring frequency: daily[108] – Behavioural scoring[109]parameters: site-appropriate types of abnormal behaviour to look out for.
Indicator 4.1.1.13.4	The HWMP shall include a monitoring process for mortality including: – Monitoring frequency: daily – Monitoring parameters: – Classify all recovered mortalities and record them. – Carry out a post-mortem analysis for each mortality event[110] – Investigate mortality events which remain unexplained or unattributed to animal health
Indicator 4.1.1.13.5	The HWMP shall include a traffic light system for water quality, morphological scoring, behavioural scoring, and mortality, identifying ranges of acceptable levels (green), warning levels (amber), and unacceptable levels (red) of health or welfare. Increased monitoring and short-term corrective measures shall occur in the event of transgressing into the amber and red ranges for water quality, morphological scoring, behavioural scoring and mortality.
Indicator 4.1.1.13.6	The HWMP shall include a mechanism for trend analysis to determine declining and improving health or welfare over time, including drivers of such trends, based on the following data: – water quality monitoring outcome (Indicator 4.1.1.13.1); – morphological scoring of live animals (Indicator 4.1.1.13.2); – behavioural scoring of live animals (Indicator 4.1.1.13.3); – mortality classification, post-mortem analysis result for mortality events, outcome of investigations carried out to clarify unexplained mortality events/events unattributed to animal health (Indicator 4.1.1.13.4); – feedback from the processing plant.

[108]A deviation from daily monitoring is justified on the following grounds (reason for exemption must be documented):
o During specific weather events that prevent access to the site.

[109]In the context of this Criterion behavioural scoring refers to verification of swimming activity and poor or erratic swimming.

[110]The mortality event is associated with a likely infectious cause If on-site diagnosis is inconclusive, this Standard requires off-site laboratory diagnosis. A veterinarian, a biologist, or a professional with equivalent qualifications must conduct all diagnosis. One hundred percent of mortality events shall receive a post-mortem analysis, not necessarily every animal. A statistically relevant number of animals from the mortality event shall be analysed.

Indicator 4.1.1.13.7	The HWMP shall include a mortality reduction programme, long-term animal health and welfare improvement measures[111] as well as short-term mitigation measures to react to situations of declining health or welfare as identified in Indicator 4.1.13.5. This programme shall outline measures to reduce annual/production cycle mortality and include defined annual targets for reductions in both total and unexplained mortality.
Indicator 4.1.1.13.8	The UoC shall follow these mortality related requirements: – Report to the veterinarian or aquatic animal health professional all mortality events[112]; – Report to the veterinarian or aquatic animal health professional if a health or welfare problem is suspected during mortality classification e.g., observation of physical damage on the animal
Indicator 4.1.1.14	The UoC shall, if a WOAH-notifiable disease is confirmed: a) report to the authorities and apply the measures required as per the national regulations; b) immediately notify farms within the ABM (UoCs farming salmon only); c) increase disease- monitoring in other batches of animals; d) coordinate oversight by the veterinarian or aquatic animal health professional.
Indicator 4.1.1.15 	The UoC shall annually report to ASC stocking densities, in accordance with ASC data submission procedures.
Indicator 4.1.1.16 	The UoC shall report to ASC mortality data at the end of each production cycle, in accordance with ASC data submission procedures.

[111]This shall include considering the adjustment of stocking densities, modification of the feeding system, improvement of water quality, improvement of handling, modification of enclosure characteristics, providing environmental enrichment, amongst others. A table including recommendations for density can be found in the Interpretation Manual.
[112]A mortality event is marked by a significant increase in daily mortality which can be sudden or occur over a prolonged period of time.

4.1.2 Scope: Cleaner Fish[113]

Indicators:	
Indicator 4.1.2.1	The UoC shall ensure that the Indicators 4.1.1.1.; 4.1.1.2.; 4.1.1.3; 4.1.1.5; 4.1.1.6; 4.1.1.7; 4.1.1.9; 4.1.1.10; 4.1.1.13; 4.1.1.13.1 to 4.1.1.13.8 and 4.1.1.14 are applied to cleaner fish.
Indicator 4.1.2.2	The UoC shall only use cleaner fish species that are native to the salmon farming area.
Indicator 4.1.2.3	The UoC shall carry out a risk assessment prior to stocking cleaner fish, including at least the following: – disease history to avoid cross contamination; – environmental characteristics according to species needs; – current lice situation and planned delousing treatments, to verify effectiveness and avoid additional cleaner fish handling; – net mesh size suitable to contain cleaner fish; and – salmon size in relation to cleaner fish size
Indicator 4.1.2.4	The UoC shall carry out the transfer of cleaner fish according to the following practices: – during daylight; – below the waterline; – close to hides and refuges; – in calm weather; – after salmon have been fed; and – avoiding forced removal in the case of lumpsuckers.
Indicator 4.1.2.5	The UoC shall provide hides and refuges for the cleaner fish. These shall be designed and placed according to species needs and in sufficient numbers for the amount of animals stocked.
Indicator 4.1.2.6	The UoC shall develop and implement a feeding plan which includes at least the following parameters: – time and frequency of feeding; – feed rations; – feeding adaptation to fit different life stages; – feeding adaptation to fit different ambient conditions; – feeding occurs around day break.
Indicator 4.1.2.7	The UoC shall make sure that cleaner fish have daily access to feed and that feed is not withdrawn for reasons such as enhancing sea lice control.

[113] In the context of this Criterion, cleaner fish include wild-caught wrasse, farmed ballen wrasse or lumpfish.

Indicator 4.1.2.8	The UoC shall annually report to ASC stocking densities[114], in accordance with ASC data submission procedures.
Indicator 4.1.2.9	The UoC shall report to ASC the survival[115] rates of cleaner fish at the end of each production cycle, in accordance with ASC data submission procedures.

4.1.3 Scope: Shrimp

Indicators:	
Indicator 4.1.3.1	The UoC shall ensure that all employees are informed and aware of the importance of animal health and welfare, according to **Appendix 10**.
Indicator 4.1.3.2	The UoC shall ensure that all employees and subcontracted personnel involved in animal husbandry and handling operations are trained on animal health and welfare, according to **Appendix 10**.
Indicator 4.1.3.3	*Indicator scope: every UoC using feed* The UoC shall monitor production daily for mortality.
Indicator 4.1.3.4	*Indicator scope: every UoC using feed* Mortality shall be removed when spotted.
Indicator 4.1.3.5	*Indicator scope: every UoC using feed* Moribund[116] shrimp shall be removed when spotted and culled following responsible stunning and killing according to Criterion 4.4.
Indicator 4.1.3.6	The UoC shall adhere to species-specific limits on mortality, survival and recovery rates as per **Appendix 3**.

[114] The UoC shall report to ASC cleaner fish stocking in relation to salmon stocking.
[115] Survival rates includes fish that survive until the end of the salmon production cycle, plus culled fish. Culling reasons shall be identified e.g., culls when sick, culls when size is big.
[116] For the purpose of this Criterion, moribund shrimp refers to individuals lethargic, ceasing feeding, aggregated near the water surface or at the edge of the pond or tank.

Indicator 4.1.3.7	The UoC shall test[117] every batch[118] of animals for diseases of regional concern prior to stocking.
Indicator 4.1.3.8	The UoC shall have a designated veterinarian or aquatic animal health professional[119], who performs regular site visits, at least annually, as well as in cases of health or welfare concerns.
Indicator 4.1.3.9	*Indicator scope: every UoC using feed* The UoC shall develop and implement a feeding plan which includes at least the following parameters: – time and frequency of feeding; – feed rations; – feeding adaptation to fit different life stages; – feeding adaptation to fit different ambient conditions.
Indicator 4.1.3.10	*Indicator scope: every UoC using feed* The UoC shall use methods that ensure product fed is well distributed and accessible to all animals in the production unit, in order to minimise competition.
Indicator 4.1.3.11	The UoC shall assess site-specific characteristics and develop, implement and monitor a Health and Welfare Management Plan (HWMP) with the objective of preventing disease outbreaks and ensuring good health and welfare of farmed animals. The HWMP shall include at least the following: a) a site-specific disease monitoring, response and reporting mechanisms (including reporting WOAH-notifiable disease to authorities). b) a site-specific biosecurity mechanism, including risk pathways into/out of and within the farm, to identify and minimise spreading of disease. c) a list of potential predators and any predator control measures needed, to avoid compromising the integrity of the containment system and the health and welfare of the fish. d) the HWMP is overseen and signed-off by a veterinarian. e) a review of the HWMP annually and when changes in farming activities or changes in external factors occur, or upon the direction of the veterinarian or aquatic animal health professional
Indicator 4.1.3.11.1	The HWMP shall include a water quality monitoring process, with at least the following: – Monitoring frequency (**Appendix 10**, Table 2 of Criterion 4.1); – Monitoring parameters (**Appendix 10**, Table 2 of Criterion 4.1); – Species-specific limits and monitoring requirements for water quality parameters (**Appendix 10**).

[117] Testing is understood as the application of diagnostic techniques scientifically recognised as valid to diagnose the disease of interest. Such techniques might include histopathology, microbiology, molecular technology or veterinary inspection (only in the case of pathognomonic diseases).
[118] Organisms in homogeneous developmental stages coming from the same breeder and pre-grow out farm.
[119] Staff with proof of training competencies to perform the assessment shall be accepted.

Indicator 4.1.3.11.2	*Indicator scope: every UoC using feed* The HWMP shall include a monitoring process for morphological scoring on live animals, including at least the following: – Monitoring frequency[120]: site-appropriate frequency, being at least once a week. – Morphological scoring parameters: – Exoskeleton damage (including eyes, antennas, appendages and rostrum); – Hepatopancreas colouration and size; – Gill colouration; – Size dispersion/variation; – Shell blisters and necrosis; – Full/empty digestive tube and colouration; – Loss of appendages[121].
Indicator 4.1.3.11.3	*Indicator scope: every UoC using feed* The HWMP shall include a monitoring process for behavioural scoring on live animals from feeding trays or similar structures, including at least the following: – Monitoring frequency: daily[122]; – Behavioural scoring[123]parameters: site-appropriate types of abnormal behaviour to look out for.
Indicator 4.1.3.11.4	*Indicator scope: every UoC using feed* The HWMP shall include a monitoring process for mortality including: – Monitoring frequency: when spotted; – Monitoring parameters: – Record mortalities; – Carry out a post-mortem analysis for each mortality event[124]; – Investigate mortality events which remain unexplained or unattributed to animal health.
Indicator 4.1.3.11.5	*Indicator scope: every UoC using feed* The HWMP shall include a traffic light system for water quality, morphological scoring, behavioural scoring, and mortality, identifying ranges of acceptable levels (green), warning levels (amber), and unacceptable levels (red) of health or welfare.

[120] A deviation from monitoring frequency is justified on the following grounds (reason for exemption must be documented):
o Animal health – undergoing a disease event and/or being treated. In case the reason for the exemption is related to animal treatment, the maximum duration for the exception shall be two weeks;
o During specific environmental events – water temperature, low oxygen, algal bloom, rainy season.
[121] Loss of appendages shall be segregated according to potential causes e.g., bacterial infection or cannibalism.
[122]A deviation from daily monitoring is justified on the following grounds (reason for exemption must be documented):
o Animal health – undergoing a disease event and/or being treated. In case the reason for the exemption is related to animal treatment, the maximum duration for the exception shall be two weeks;
o During specific weather events that prevent access to the site.
[123]In the context of this Criterion behavioural scoring refers to verification of activity and poor or erratic behaviour.
[124]The mortality event is associated with a likely infectious cause. If on-site diagnosis is inconclusive, this Standard requires off-site laboratory diagnosis. A veterinarian, a biologist, or a professional with equivalent qualifications must conduct all diagnosis. One hundred percent of mortality events shall receive a post-mortem analysis, not necessarily every animal. A statistically relevant number of animals from the mortality event shall be analysed.

	Increased monitoring and short-term corrective measures shall occur in the event of transgressing into the amber and red ranges for water quality, morphological scoring, behavioural scoring and mortality.
Indicator 4.1.3.11.6	*Indicator scope: every UoC using feed* The HWMP shall include a mechanism for trend analysis to determine declining and improving health or welfare over time, including drivers of such trends, based on the following data: – water quality monitoring outcome (Indicator 4.1.3.11.1); – morphological scoring of live animals (Indicator 4.1.3.11.2); – behavioural scoring of live animals (Indicator 4.1.3.11.3); – mortality classification, post-mortem analysis result for mortality events, outcome of investigations carried out to clarify unexplained mortality events/events unattributed to animal health (Indicator 4.1.3.11.4); – feedback from the processing plant.
Indicator 4.1.3.11.7	*Indicator scope: every UoC using feed* The HWMP shall include a mortality reduction programme, long-term animal health and welfare improvement measures[125] as well as short-term mitigation measures to react to situations of declining health or welfare identified in Indicator 4.1.3.11.5. This programme shall outline measures to reduce annual/production cycle mortality and include defined annual targets for reductions in both total and unexplained mortality.
Indicator 4.1.3.11.8	*Indicator scope: every UoC using feed* The UoC shall follow these mortality related requirements: – Report to the veterinarian or health aquatic animal health professional all mortality events[126]; – Report to the veterinarian or health aquatic animal health professional if a health or welfare problem is suspected during mortality classification e.g., observation of physical damage on the animal.
Indicator 4.1.3.12	The UoC shall, if a WOAH-notifiable disease is confirmed: a) report to the authorities and apply the measures required as per the national regulations; b) increase disease- monitoring in other batches of animals; c) coordinate oversight by the veterinarian or health manager aquatic animal health professional.

[125]This shall include considering the adjustment of stocking densities, modification of the feeding system, improvement of water quality, improvement of handling, modification of enclosure characteristics, providing environmental enrichment, amongst others. A table including recommendations for density can be found in the Interpretation Manual.
[126]A mortality event is marked by a significant increase in spotted mortality which can be sudden or occur and prolong over a period of time.

Indicator 4.1.3.13 	The UoC shall annually report to ASC stocking densities, in accordance with ASC data submission procedures.
Indicator 4.1.3.14 	The UoC shall report to ASC mortality data at the end of each production cycle, in accordance with ASC data submission procedures.
Indicator 4.1.3.15	*Indicator scope: Penaeus vannamei and Penaeus monodon* The UoC shall demonstrate that the pre-grow out supplies nauplii, larvae or post-larvae (PL) originated from ablation free (AF)[127] female broodstock.

4.1.4 Scope: Bivalves and Abalone

Indicators:	Requirements
Indicator 4.1.4.1	The UoC shall ensure that all employees are informed and aware of the importance of animal health and welfare, according to **Appendix 10**.
Indicator 4.1.4.2	The UoC shall ensure that all employees and subcontracted personnel involved in animal husbandry and handling operations are trained on animal health and welfare, according to **Appendix 10**.
Indicator 4.1.4.3	The UoC shall adhere to species-specific limits on mortality, survival and recovery rates as per **Appendix 3**.
Indicator 4.1.4.4	The UoC shall test[128] every batch[129] of animals for diseases of regional concern prior to stocking.
Indicator 4.1.4.5	The UoC shall have a designated veterinarian or aquatic animal health professional who performs regular site visits, at least annually, as well as in cases of animal health or welfare concerns.

[127]The following timelines shall apply to *Penaeus vannamei*: 1) Date the Standard is effective (October 2025): 25% of the production to originate from AF broodstock. 2) Two years from the date the Standard is effective (October 2027): 50% of the production originates from AF broodstock. 3) Four years from the date the Standard is effective (October 2029): 100% of the production originates from AF broodstock. The following timelines shall apply to *Penaeus monodon*: 1) Two years from the date the Standard is effective (October 2027): 25% of the production to originate from AF broodstock. 2) Four years from the date the Standard is effective (October 2029): 50% of the production originates from AF broodstock. 3) Six years from the date the Standard is effective (October 2031): 100% of the production originates from AF broodstock. Other crustaceans are not included within the Indicator scope.
[128] Testing is understood as the application of diagnostic techniques scientifically recognised as valid to diagnose the disease of interest. Such techniques might include histopathology, microbiology, molecular technology or veterinary inspection (only in the case of pathognomonic diseases).
[129] Organisms in homogeneous developmental stages coming from the same breeder and pre-grow out farm.

Indicator 4.1.4.6	The UoC shall assess site-specific characteristics and develop, implement and monitor a Health and Welfare Management Plan (HWMP) with the objective of preventing disease outbreaks and ensuring good health and welfare of farmed animals. The HWMP shall include at least the following: a) a site-specific disease monitoring, response and reporting mechanisms (including reporting WOAH-notifiable disease to authorities). b) a site-specific biosecurity mechanism, including risk pathways into/out of and within the farm, to identify and minimise spreading of disease. c) a list of potential predators and any predator control measures needed, to avoid compromising the integrity of the containment system and the health and welfare of the fish. d) the HWMP is overseen and signed-off by a veterinarian. e) a review and where needed a revision of the HWMP when changes in farming activities or changes in external factors occur, following each production cycle130, or upon the direction of the veterinarian.
Indicator 4.1.4.7	The UoC shall, if a WOAH-notifiable disease is confirmed: a) report to the authorities and apply the measures required as per the national regulations. b) increase disease-monitoring in other batches of animals. c) coordinate oversight by the veterinarian or health manager aquatic animal health professional.

[130] For farms with production cycles shorter than one year or using continuous stocking/cropping methods – review annually. For farms with production cycles longer than one year or using all-in-all-out stocking/cropping methods (e.g., salmon) – review following each production cycle.

Criterion: 4.2 – Animal Health and Welfare - Handling

Rationale - Fish and decapod crustaceans are sentient beings, able to feel and experience pain, stress and anxiety. Handling operations[131] have the potential to inflict suffering on the animals being handled if not carried out appropriately and with care. Impacts of handling on surrounding wildlife and environment (e.g., through escapes) are covered in Criterion 2.4. This Criterion addresses handling only, namely operations that involve direct physical contact with the animals and/or taking them out of their normal rearing environment.

In order to ensure good health and welfare, ASC requires that farmers continuously assess and evaluate their handling operations. Rather than setting generic metric limits that might not reflect the multiple and varied production realities, ASC established a series of requirements that cover all of the main health and welfare practices, upon which farms can create their own robust, site-specific handling management plans. Management plans are living documents and working tools that assist farmers in managing the health and welfare of their animals during handling operations. ASC requires that management plans include consideration of all steps, mitigation strategies to be implemented in the event that primary processes break down, and conscientious training of staff (covered in Criterion 4.1).

Intent – The farm prioritises the wellbeing of animals during handling.

4.2.1 Scope: Finfish

Indicators:	
Indicator 4.2.1.1	The site shall assess site-specific characteristics and develop a Handling Management Plan (HMP). The site shall implement and monitor the HMP for its effectiveness with the objective of ensuring good health and welfare of farmed animals.
Indicator 4.2.1.2	The HMP shall include a separate process for each type of handling that may occur on the site or between sites i.e., live transport (including loading, transfer and unloading), vaccination, treatments, crowding.
Indicator 4.2.1.3	The HMP shall include contingency plans for processes described in Indicator 4.2.1.2 in case of system failure, including at least the following: – Immediate emergency response; – Emergency culling response measure according to responsible stunning and killing requirements (Indicator 4.3.1); – Mass mortality event response.
Indicator 4.2.1.4	The HMP shall include suitable conditions necessary to perform handling, e.g., weather or tidal conditions.

[131] Handling operations include grading (active or passive), vaccination (by immersion or injection), application of treatments (therapeutants or physical), any operation involving crowding of the animals and any operation involving removal of the animals from their rearing water.

Indicator 4.2.1.5	The HMP shall include the use of anaesthesia during handling as required by the veterinarian or aquatic animal health professional.
Indicator 4.2.1.6	The HMP shall include a fitness assessment[132] of the animals prior to handling, approved by a veterinarian or aquatic animal health professional, as follows: – within a two week period prior to treatment[133] or transport; in the case of serial, repeated treatments, the fitness assessment should be carried out at least once a month. – within a two week period prior to net change and passive grading. – handling related to carrying out a health examination (e.g. health assessment, parasite counting) is exempt.
Indicator 4.2.1.7	Crowding shall be carried out gradually (partial crowding), with an appropriate crowding intensity and for a maximum crowding time of two hours. This shall not be exceeded unless the veterinary or aquatic animal health professional demonstrates that this does not negatively impact fish welfare.
Indicator 4.2.1.8	The HMP shall follow species-specific limits on maximum time out of water[134] (**Appendix 10**, Table 1 of Criterion 4.2).
Indicator 4.2.1.9	The HMP shall include minimum/maximum fasting duration specific to the species being handled, the life stage or size of fish, and the type of handling (**Appendix 10**, Table 1 of Criterion 4.2).
Indicator 4.2.1.10	The HMP shall include biosecurity measures specific to the type of handling, following the parameters in Indicator 4.1.1.11b) to avoid the transfer of disease.
Indicator 4.2.1.11	The HMP shall include predator control measures specific to the type of handling, following the parameters in Indicator 4.1.1.11c).
Indicator 4.2.1.12	The HMP shall include water quality monitoring and corrective actions in line with the HWMP, including at least the following: – Description of monitoring equipment; – Monitoring frequency: prior to, during, and post handling. In the case of live transport, this means monitoring at the point of departure/arrival and during live transport unless this could cause detrimental impact; – Monitoring parameters; at least temperature, pH, and oxygen level.
Indicator 4.2.1.13	The HMP shall include visual inspection and corrective actions, in line with the HWMP, including at least the following: – Visual inspection frequency: during handling; – Visual inspection parameters: abnormal behaviour specific to the type of handling.

[132] A fitness assessment shall include at least the revision of production data (e.g. mortality, feeding rates), the examination of a random sample of healthy animals, which shall include morphology and behavioural parameters, and the examination of moribund and dead animals if present.
[133] Oral treatments are excluded.
[134] Applies only to fish that are not anaesthetised.

Indicator 4.2.1.14	The HMP shall include post-handling monitoring and mitigation measures, including at least the following: – Abnormal behavior related to the handling event; – Compromised morphological scores related to the handling event; – Moribund animals related to the handling event; – Mortalities related to the handling event.
Indicator 4.2.1.15	The HMP shall include acclimatisation measures prior to stocking in grow-out enclosures, to avoid mortality due to sudden changes in water chemistry.
Indicator 4.2.1.16	The UoC shall inspect the nets for folds during handling operations to avoid fish getting trapped.

4.2.2 Scope: Cleaner Fish

Indicators:	
Indicator 4.2.2.1	The UoC shall ensure that the Indicators 4.2.1.1. to 4.2.1.7 and from 4.2.1.10 to 4.2.1.16 are applied to cleaner fish.
Indicator 4.2.2.2	The HMP shall follow species-specific limits on maximum time out of water[135] (**Appendix 10**, Table 2 of Criterion 4.2).
Indicator 4.2.2.3	The HMP shall include minimum/maximum fasting duration specific to the species being handled, the life stage or size of fish, and the type of handling (**Appendix 10**, Table 2 of Criterion 4.2).
Indicator 4.2.2.4	The UoC shall segregate cleaner fish in advance of any salmonid-specific treatments.
Indicator 4.2.2.5	The UoC shall make sure that during segregation, cleaner fish are retained in an enclosure that meets their needs (e.g., feed, hides).

4.2.3 Scope: Shrimp

Indicators:	
Indicator 4.2.3.1	The site shall assess site-specific characteristics and develop a Handling Management Plan (HMP). The site shall implement and monitor the HMP for its effectiveness with the objective of ensuring good health and welfare of farmed animals.

[135] Applies only to fish that are not anaesthetised.

Indicator 4.2.3.2	The HMP shall include a separate process for each type of handling that may occur on the site or between sites i.e., live transport (including loading, transfer and unloading), crowding.
Indicator 4.2.3.3	The HMP shall include contingency plans for processes described in Indicator 4.2.3.2 in case of system failure, including at least the following: – Immediate emergency response; – Emergency culling[136] response measure according to responsible stunning and killing requirements (Indicator 4.3.1); – Mass mortality event response.
Indicator 4.2.3.4	The HMP shall include suitable conditions necessary to perform handling, e.g., weather or tidal conditions.
Indicator 4.2.3.5	*Indicator scope: every UoC using feed* The HMP shall include pond preparation measures prior to stocking, including at least the following: – Ponds must be dried, and areas that cannot be dried must be disinfected; – Any dead or alive animals must be removed from the pond; – Excess organic matter must be removed, and acidic pH adjusted with agricultural lime; – Surface of earthen ponds must be tilled for oxygenation and UV exposure.
Indicator 4.2.3.6	The HMP shall include acclimatisation measures prior to stocking in grow-out enclosures, to avoid mortality due to sudden changes in water chemistry.
Indicator 4.2.3.7	The HMP shall include grow-out pond release[137] conditions and verifications.
Indicator 4.2.3.8	*Indicator scope: every UoC using feed* The HMP shall include morphological and behavioural verification immediately after transfer to grow-out enclosures, within some hours after transfer and the day after transfer as a minimum.
Indicator 4.2.3.9	The HMP shall include biosecurity measures specific to the type of handling, following the parameters in Indicator 4.1.3.11b) to avoid the transfer of disease.
Indicator 4.2.3.10	The HMP shall include predator control measures specific to the type of handling, following the parameters in Indicator 4.1.3.11c).
Indicator 4.2.3.11	The UoC shall inspect the nets for folds during handling operations to avoid shrimp getting trapped.

[136] In the extreme circumstances of culling whole ponds for disease control a suitable strong solution of chlorine is allowed in a concentration that ensures that death occurs rapidly. Only applicable to every UoC using feed.
[137] Shrimp shall be released in a small area of the pond "hapa" or net enclosures in the grow-out pond itself for a risk assessed period to evaluate the capacity of the PL to adjust to the pond conditions.

Criterion: 4.3 – Fish Health and Welfare - Slaughter

Rationale - Slaughter[138] is an inherently stressful event. Harm can result from the absence, or the improper use, of stunning, from the use of inadequate killing methods, and from the absence or inadequacy of backup systems to ensure that adequate stunning and killing occurs.

Best practices in fish slaughter include the implementation of both stunning (preferably mechanical or electrical) and responsible killing methods, ensuring there is rapid loss of consciousness which is not regained before killing. In order to promote these methods, ASC has created a stepwise approach to improving slaughter techniques. The first step requires farms to eliminate the use of killing methods proven to be highly aversive to fish. The second step makes stunning compulsory. Further, ASC has laid out a series of requirements to guarantee that stunning and slaughter are effective, that backup systems are in place, and that staff are properly trained in welfare and slaughter practices (covered in Criterion 4.1).

Intent – The farm adheres to slaughter processes which ensure welfare is preserved and fish do not suffer unnecessarily.

4.3.1 Scope: Finfish

Indicators:	
Indicator 4.3.1.1	The UoC shall ensure all fish are stunned[139] prior to killing[140] , using permitted methods only, and within the timelines indicated in **Appendix 10**, Table 1 of Criterion 4.3.
Indicator 4.3.1.2	The UoC shall ensure fish stunned lose consciousness immediately[141], and that unconsciousness persists until death sets in.
Indicator 4.3.1.3	The UoC shall ensure that fish are stunned effectively[142], monitoring stunned fish for the absence of all of the following: opercular (gill)

[138] For the purpose of this Criterion slaughter refers to the act of stunning and killing, but does not include the pre-slaughter (fasting, crowding, removal from water, transportation) and post-slaughter (processing) stages. Pre-slaughter is covered in Criterion 4.2 and post-slaughter is out of the scope of the ASC Farm Standard

[139] Stunning methods can be irreversible or reversible. If irreversible, the stunning acts as the killing method at the same time.

[140] In other words, pre-slaughter handling must not lead to the death of fish, defeating the intention of using permitted killing methods; only live fish stunned are eligible for ASC certification.

[141] Stunning methods are required to induce immediate or rapid (less than one second) unconsciousness. When using an overdose of anaesthetic this might take longer than one second. Ice-slurry is not an approved stunning method but can be used as a killing method after immediate or rapid (less than one second) unconsciousness (Species-specific welfare aspects of the main systems of stunning and killing of farmed fish, Scientific Opinion of the Panel on Animal Health and Welfare, 2009, EFSA).

[142] For this version of the Standard, ASC considers a stunning efficiency of 95% (i.e., at least 95% of the fish stunned immediately lose consciousness) to be effective. Checks shall be carried out on a minimum of 100 individuals per harvest. 50 at the beginning (check at the start/ beginning of the slaughter) and the other 50 at any other point during the slaughter.

	movements[143], eye movements, body movements, reaction to a painful stimulus (e.g., tail-prick or eye corner tap).
Indicator 4.3.1.4	The UoC shall not use the following methods to kill fish: – asphyxia in air; – CO_2; – salt baths; – ammonia baths; or – evisceration.
Indicator 4.3.1.5	The UoC shall ensure fish are killed effectively[144] by monitoring fish for the absence of all of the following: opercular (gill) movements, eye movements[145], body movements, reaction to a painful stimulus (i.e., tail-prick, eye corner tap).
Indicator 4.3.1.6	The UoC shall have immediate mitigation measures in place to respond to ineffective stunning or killing, including the presence of a back-up system such as manual percussive stunning.
Indicator 4.3.1.7	The UoC may, for fish not destined for human consumption, use an overdose of anaesthetic to stun and kill fish.
Indicator 4.3.1.8	The UoC shall appoint a staff member who is responsible to look after fish welfare during slaughter activities.
Indicator 4.3.1.9	The UoC shall have a slaughter log, which captures all the harvest monitoring parameters above for each harvest event.

[143] The use of body movement as an Indicator for the effectiveness of stunning or killing can be misleading as muscular spasms might occur in unconscious or dead fish. Body movements indicating struggling, a swimming activity or efforts to remain upright or regain equilibrium (adapted from FAWC) are relevant movements to watch out for and that indicate consciousness. Opinion on the Welfare of Farmed Fish at the Time of Killing, Farm Animal Welfare Committee (FAWC), DEFRA, London, May 2014.

[144] For this version of the Standard, ASC considers a killing efficiency of 100% (i.e., at least 95% of the fish stunned and 100% killed) to be effective. Checks shall be carried out on a minimum of 100 individual fish per harvest. 50 at the beginning (check at the start/ beginning of the slaughter) and the other 50 at any other point during the slaughter.

[145] The use of body movement as an Indicator for the effectiveness of stunning or killing can be misleading as muscular spasms might occur in unconscious or dead fish. Body movements indicating struggling, a swimming activity or efforts to remain upright or regain equilibrium (adapted from FAWC) are relevant movements to watch out for, and that indicate consciousness. Opinion on the Welfare of Farmed Fish at the Time of Killing, Farm Animal Welfare Committee (FAWC), DEFRA, London, May 2014.

4.3.2 Scope: Cleaner Fish

Indicators:	Requirements
Indicator 4.3.2.1	The UoC shall ensure that the Indicators 4.3.1.1. to 4.3.1.9 are applied to Cleaner Fish.
Indicator 4.3.2.2	The UoC shall reuse cleaner fish only once, either within the same farm or by moving them to another site[146].
Indicator 4.3.2.3	The UoC shall re-use cleaner fish where possible, or slaughtered, at the end of the production cycle. Release into the wild is not allowed.
Indicator 4.3.2.4	The UoC shall only reuse cleaner fish upon completion of a successful risk assessment that takes into account at least: – health status of the salmon and cleaner fish at the origin and destination sites; – health assessment of the cleaner fish by a veterinarian or an aquatic animal health professional carried out no longer than two weeks before reuse. This shall include screening for diseases that are relevant to cleaner fish and salmonids in the corresponding farming region; – presence of cleaner fish at sites located in a radius of 5km.
Indicator 4.3.2.5	The UoC shall segregate cleaner fish destined for reuse at the UoC.

[146] This shall only be possible if the destination site is able to coordinate a synchronised fallow with neighbouring sites upon completion of the production cycle.

Criterion: 4.4 – Shrimp Health and Welfare - Slaughter

Intent – The farm adheres to slaughter processes which ensure shrimp welfare is preserved.

Indicators:	Requirements
Indicator 4.4.1	The UoC shall ensure shrimp are killed[147] immediately after harvest, by immersion in an ice slurry bath, or through an electrical device followed by immersion in an ice slurry bath.
Indicator 4.4.2	The UoC shall monitor and control the ice slurry bath (Indicator 4.4.1) at ≤4 °C, and ensure shrimp are immersed for a suitable length of time for an effective killing.
Indicator 4.4.3	The UoC shall ensure electrical devices are used according to the manufacturer's recommendations.
Indicator 4.4.4	The UoC shall ensure shrimp death has set in before applying sodium metabisulfite.
Indicator 4.4.5	The UoC shall ensure that shrimp are killed effectively[148] by assessing the absence of coordinated legs and body movements.
Indicator 4.4.6	The UoC shall not use the following methods to kill shrimp: – asphyxia; – CO_2; – salt baths; – ammonia baths; – boiling or steaming alive; or – dismemberment.
Indicator 4.4.7	The UoC shall have immediate mitigation measures in place to respond to ineffective killing, including the presence of a back-up system such as extra ice or another electrical device.
Indicator 4.4.8	The UoC may, for shrimp not destined for human consumption, use an overdose of anaesthetic to kill.
Indicator 4.4.9	The UoC shall appoint a staff member who is responsible to look after shrimp welfare during slaughter activities.
Indicator 4.4.10	The UoC shall have a harvest log, which captures all the harvest monitoring parameters above for each harvest event.

[147] In other words, pre-slaughter handling must not lead to the death of shrimp, and live shrimp must not be packed alive, defeating the intention of using permitted killing methods

[148] Checks shall be carried out on a minimum of 100 shrimp per harvest. 50 at the beginning (check at the start/ beginning of the slaughter) and the other 50 at any other point during the slaughter.

Criterion: 4.5 - Veterinary therapeutants

Rationale – Veterinary therapeutants are chemicals used to treat or improve health conditions in animals. Therapeutants include antibiotics, antiparasitics, antifungals, antivirals, hormones, anaesthetics and vaccines. The use of therapeutants has provided many benefits to the aquaculture industry, including improved aquatic animal health and welfare and increased survival, as well as economic gain and production efficiency for farmers. Despite these benefits, overuse and misuse of therapeutants creates risks associated with the release of drugs or their metabolites to the environment, the presence of drug residues in final products for human consumption, and the development of resistance.

Intent - The farm controls the use of therapeutants to mitigate the risk to human, animal, and environmental health.

Indicators:	
4.5.1	The UoC shall only use therapeutants[149] as prescribed and directed by a registered veterinarian.
4.5.2	The UoC shall not use hormones or antibiotics stimulating growth.
4.5.3	The UoC shall only use hormones (e.g. methyltestosterone or ethyl testosterone) for sex-reversal, to induce and coordinate spawning, or to produce single-sex stock. Each hormonal treatment shall be recorded.
4.5.4	The UoC shall not use antibiotics prophylactically[150].
4.5.5	The UoC shall retain prescriptions for each application of therapeutants including the following minimum information: – the name, address and telephone number of the person prescribing the product; – the qualifications enabling the person to prescribe the product (e.g. relevant title or number of affiliation to a relevant veterinary college); – the name and address of the owner or keeper of the animals; – the identification (including the species) of the group of animals to be treated; – the premises at which the animals are kept if this is different from the address of the owner or keeper; – the date of the prescription; – the signature or other authentication of the person prescribing the product; – the name and amount of the product prescribed; – the reason to treat; – the dosage and administration instructions; – any necessary warnings; – the withdrawal period.

[149] In the context of this Criterion, therapeutants include antibiotics, antiparasitics, antifungals, antivirals, hormones, anesthetics, and vaccines.
[150] The metaphylactic use of antibiotics is allowed.

4.5.6	The UoC shall only use non-therapeutants[151] registered or approved by local regulations and as per manufacturer instructions.
4.5.7	The UoC shall register and maintain the source and strain of all probiotic[152] batches to monitor for antimicrobials resistance.
4.5.8	*Indicator scope: every UoC using antibiotic treatments.* The UoC shall monitor for antibiotic resistance; this shall be done carrying out antibiotic sensitivity testing before or during each antibiotic treatment, or through regular monitoring of in-house strains[153].
4.5.9	*Indicator scope: every UoC using antibiotic treatments.* The UoC shall monitor antibiotic treatment efficacy and investigate the causes behind any treatment failure[154].
4.5.10	*Indicator scope: every UoC using antiparasitic treatments except for salmonids in grow-out cages.* The UoC shall monitor for antiparasitic resistance; this shall be done carrying out bioassays before or during each antiparasitic treatment, or through regular monitoring of in-house parasites[155]. If no methods exist to determine resistance, then monitoring of treatment efficacy is sufficient.
4.5.11	*Indicator scope: every UoC using antiparasitic treatments* The UoC shall monitor antiparasitic treatment efficacy and investigate the causes behind any treatment failure.
4.5.12	*Indicator scope: every UoC using antibiotic and antiparasitic treatments* The UoC shall apply treatment rotation[156] except for salmonids in grow-out cages in the case of antiparasitic treatments, if resistance has been determined in Indicators 4.5.6/8, or resistance is suspected as a cause of treatment failure in Indicators 4.5.7/9, and there is more than one effective antibiotic or antiparasitic available.

[151] In the context of this Criterion, non-therapeutants include but are not limited to, probiotics, prebiotics, phytobiotics, organic acids, enzymes, lysozymes, antimicrobial peptides, and bacteriophages.
[152] Probiotics are living microbial cells that help improve the natural immunity level and positively impact animal growth and reproduction. They can be administered via the feed or to the rearing water, benefitting the host in many ways. The proper guidelines for their correct use should be followed.
[153] In the case of recurring bacterial infections, the site might show evidence that work has been carried out to isolate the problematic bacterial strains, characterise them, and periodically (at least on a cycle basis) test them for antibiotic sensitivity.
[154] For this purpose, treatment failure is defined as persistent symptoms or signs of diseases, or continued detection of the infectious agent causing the diseases being treated. In many cases, this will be in the form of sustained mortality that does not decrease in response to treatment.
[155] In the case of recurring parasitic infections, the site might show evidence that work has been carried out to identify the problematic parasites, characterise them, and periodically (at least on a cycle basis) test them for antiparasitic resistance.
[156] In the context of this Criterion, treatment rotation means using an active ingredient belonging to a different family of antibiotics or antiparasitics.

4.5.13	The UoC shall not use[157] antimicrobials listed as Critically Important Antimicrobials for Human Medicine by the World Health Organisation (WHO), unless the following Criteria are fulfilled: – the veterinarian or aquatic animal health professional has provided reasoning why the Critically Important Antibiotic is the only possibility[158] for treatment; – previous monitoring has not determined resistance to the active ingredient.
4.5.14	The UoC shall adhere to species-specific limits on antibiotic[159]treatments (**Appendix 3**).
4.5.15	The UoC shall adhere to species-specific limits on parasiticide treatments (**Appendix 3**).
4.5.16	The UoC shall reduce[160] the antibiotic load[161] per year or per production cycle[162]. In the event of not meeting this Indicator, the UoC shall demonstrate actions or measures taken to reduce antibiotic usage.
4.5.17	The UoC shall ensure that at the time of harvest, residue levels of therapeutants used are below the Maximum Residue Limits (MRL) as defined by all countries where the product is going to be sold or the limits set by the European Union.
4.5.18	The UoC shall comply with the withdrawal period of the country where the products are being sold.
4.5.19	The UoC shall have a risk-based residue testing plan in place to corroborate products are below MRL if needed.

[157] Batches treated with antimicrobials listed as Critically Important Antimicrobials for Human Medicine are not eligible for ASC certification.
[158] The only two accepted justifications are the following: resistance to all other available antibiotics, or no availability of other antibiotics than CIA.
[159] Shrimp treated with antibiotics are no longer eligible for ASC certification.
[160] This applies to UoCs dependent on the use of antibiotics i.e. where there is systematic use. The requirement to reduce antibiotic load or the number of treatments does not apply to UoCs with on-off use of antibiotics i.e. treatment after several years or production cycles without treatment.
[161]Antibiotic load is calculated as the sum of the antibiotic active ingredient (mg) divided by the sum of the harvested biomass (Kg). Where: mg of active ingredient is the sum of all the antibiotic treatments that have taken place in a farm during a production cycle or a year; Kg of harvested biomass is the total biomass harvested at the end of the production cycle or year. Reduction in antibiotic load shall be looked at by assessing the six years previous to the audit or the six previous cycles. For the first six audits comparison should only be done against one, two, three, four, or five years or production cycles previous to the audit. The target would be to decrease usage until a situation is reached where treatments are only sporadic (by sporadic ASC understands not happening every year or cycle).
[162] For farms with production cycles shorter than one year or using continuous stocking/cropping methods - calculate per year. For farms with production cycles longer than one year or using all-in-all-out stocking/cropping methods (e.g. salmon) - calculate per production cycle.

4.5.20 	The site shall annually or within a month of concluding a production cycle publicly disclose: – the antibiotic load per production cycle or year; – use of antimicrobials listed as Critically Important Antimicrobials for Human Medicine by the WHO and the justification to use them.
4.5.21 	The site shall annually report to ASC: 1. the antibiotic load per production cycle or year; 2. use of antimicrobials listed as Critically Important Antimicrobials for Human Medicine by the WHO; 3. Full treatment records; in accordance with ASC data submission procedures.
4.5.22	The UoC shall guarantee that in the case of a diseases outbreak, sick animals receive treatment or are humanely killed to the extent possible.

Appendix 1 - Acronyms

Acronym	Term
AB	Accreditation Body
ABM	Area-based management
AF	Ablation free
ALDFG	Abandoned, lost, or otherwise discarded fishing gear
AMA	Area management agreement
AMBI	AZTI's Marine Biotic Index
ASC	Aquaculture Stewardship Council
ASI	Assurance Services International
ATE	Adverse turnover events
AWQAC	Ad-hoc Water Quality Advisory Committee
BOD	Biochemical oxygen demand
BHQ	Benthic Habitat Quality
BQI	Benthic Quality Index
CAB	Conformity Assessment Body
CAR	Certification and Accreditation Requirements
CFA	Continuous flow analysis
Chl-a	Chlorophyll-a concentration
CO_2e	Carbon dioxide equivalent
CoC	Chain of Custody
CRM	Certified reference material
DDDO	Daily diurnal dissolved oxygen
DO	Dissolved oxygen
DOM	Dissolved organic matter
EEMP	Energy efficiency management plan

Eh	Redox potential
EIA	Environmental impact assessment
EL	Entry level
EQS	Ecological quality status
ERA	Environmental risk assessment
ES	Enrichment Stage
FAWC	Farm Animal Welfare Committee
FHWMS	Fish health and welfare management plan
FIA	Flow Injection Analysis
FFDR	Forage fish dependency ratio
FPIC	**Free, Prior and Informed Consent**
GHG	Greenhouse gas
GL	Global level
GLWC	Global living wage committee
GM	Geometric means
GMO	Genetically modified organism
HAB	Harmful algal bloom
HCVA	High conservation value area
HIE	Hydrodynamically isolated embayment
H_2O_2	Hydrogen peroxide
HRT	Hydraulic retention time
HSRA	Health and safety risk assessment
IBA	Important bird area
ICCA	Indigenous and community conserved areas
IPA	Indigenous protected area
ILO	International Labour Organisation

IPMP	Integrated parasite management plan
IUCN	International Union for Conservation of Nature
ISEAL	International Social and Environmental Accreditation and Labelling Alliance
OAD	Other area designations
ORP	Oxidation reduction probe
OWI	Operational welfare Indicators
M-AMBI	Multi-variate AMBI
MLWS	Mean low water springs
MP	Management plan
MPL	Metric performance levels
MRL	Maximum residue limits
MSC	Marine Stewardship Council
MSCI	Marine Stewardship Council Licensing Team
N	Nitrogen
NH_3	Un-ionized ammonia
NH_{4+}	Ammonium ion
NQI	Norwegian Quality Index
NSI	Norwegian Sensitivity Index
OECM	Other effective area-based conservation
OHCHR	Office of the UN High Commissioner for Human Rights
P	Phosphorus
PA	Protected area
PEF	Product environmental footprint
PIC	The Rotterdam Convention on Prior Informed Consent
PL	Post-larvae
PPE	Personal protective equipment

POP	The Stockholm Convention on Persistent Organic Pollutants
Q	Volumetric flow rate
RAS	Re-circulating aquaculture system
RMF	Risk management framework
RMP	Risk management plan
RMT	Risk management tool
RW	Receiving water
RWFA	Receiving water farm afar
RWFE	Receiving water farm effluent
RWFI	Receiving water farm influent
RUoC	Requirements for Unit of Certification
S^{-2}	Free sulphide
SD	Secchi disk
SDG	Sustainable development goal
SDS	Safety data sheet
SLO	Social license to operate
SPL	Species performance level
SUP	Single-use plastic
TAG	Technical Advisory Group
TAN	Total ammonia nitrogen
TMFF	Tropical marine finfish
TN	Total nitrogen concentration
TP	Total phosphorus concentration
TOC	Theory of Change
TSI	Trophic status index
TSS	Total suspended solids

UDHR	Universal Declaration of Human Rights
UoA	Unit of Assessment
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNGP	UN Guiding Principles On Business and Human Rights
UoC	Unit of Certification
WCEP	Water Conservation and Efficiency Plan
WHO	World Health Organisation
WNMT	Weighted number of medicinal treatments
WOAH	World Organisation for Animal Health
WUM	Waterbody unity of management

Appendix 2 - Definitions

Term	Definition
Acoustic deterrent devices	Non-lethal predator management measures that work by introducing noise.
Alien species	A species, subspecies or variety or cultivar or breed, moved intentionally or unintentionally by human activities beyond the limits of its native geographic range, or resulting from breeding or hybridisation and being released into an area in which it does not naturally occur.
Aquatic animal health professional	A person with the relevant veterinary accreditation or authority to carry out formal activities associated with aquatic animal health (such as disease diagnosis, prescription of medications, and approval of fish health plans or other official documentary requirements).
Biosolids	Mixture of organic waste and sediment produced or accumulated through farming activities.
Buffer zone	Protected zones established around sensitive or critical areas to lessen the impacts of human activity and land disturbance of an adjacent land use, whether or not it embodies natural or cultural value itself.
Chemical and Hazardous waste (hazardous materials)	Chemical waste is made from harmful chemicals or has properties that makes it otherwise potentially dangerous or harmful to the human health or the environment (air, soil, water). Hazardous waste is waste that possesses any of the characteristics contained in Annex III of the Basel Convention, or that is considered to be hazardous by national legislation
Child	Every human being below the age of eighteen years unless under the law applicable to the child, majority is attained earlier.
CO_2-equivalent emissions	The amount of carbon dioxide (CO_2) emission that would cause the same integrated radiative forcing or temperature change, over a given time horizon, as an emitted amount of a greenhouse gas (GHG) or a mixture of GHGs. Most typically, the CO_2-equivalent emission is obtained by multiplying the emission of a GHG by its global warming potential (GWP) for a 100-year time horizon.
Compound feed	A mixture of at least two feed materials, which may contain feed additives, for oral animal-feeding in the form of complete or complementary feed.
Corruption	The abuse of entrusted power for private gain.
Critical habitat	Habitat that contains features that meet one, or more, of the below listed attributes: • Presence of IUCN Red List species categorised as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) species, as defined by the IUCN Red List of threatened species and in relevant national legislation.

	• Importance to the survival of endemic or restricted-range species. • Required for the survival of migratory species or congregatory species. • required for the maintenance of biological diversity with significant social, economic or cultural importance to local communities. • required for the maintenance of ecosystem functioning and the provision of key ecosystem goods and services. • key scientific value.
Customary rights	Rights which result from a long series of habitual or customary actions, constantly repeated, which have, by such repetition and by uninterrupted consent, acquired the force of a law within a geography or sociological unit.
Diffuse source	Effluents from open "in-channel" systems e.g., cages in rivers, estuaries, fjords, ocean.
Effluents, releasing effluents	Any movement of culture, treatment system or reservoir water from inside to outside the farm perimeter, regardless of the quality e.g., nutrient loading of the water. This includes point source and diffuse source effluents, land-based closed and open systems such as cages.
Emissions factor	A factor allowing GHG emissions to be estimated from a unit of available activity data (e.g., tonnes of fuel consumed, tonnes of product produced) and absolute GHG emissions.
Employee	An individual who works under a contract of employment, oral or written, usually for wages or salary.
Escape	An unintended loss of stock from the containment system.
Escape event	Any unintended loss of stock in a short timeframe typically with a known cause
Extreme weather event	Unexpectedly severe weather which can disrupt ecosystems, cause damage to human infrastructure, and displace human populations. Events may include hurricanes, floods, droughts, heat waves, or other events.
False apprenticeships	The practice of hiring employees under apprenticeship terms without stipulating terms of the apprenticeship or wages under contract. It is a "false" apprenticeship if its purpose is to underpay people, avoid legal obligations, or employ underage employees. A false apprenticeship is lacking one or more of the following elements: - training plan to acquire new skills and gain new technical knowledge, - gaining practical experience in preparation for a new workplace, - opportunities to practice new skills in an industry context.

Family Contracting	Whereby an employment arrangement is made with a member of a household, however, other family members work for the UoC, without being recognised as employees in their own right. Whereby spouses, children of employees or other family members are pressured into working.
Fish Health Manager	Someone with professional expertise in managing fish health, who may work for a farming company or for a veterinarian, but who does not necessarily have the authority to prescribe medicine.
Forced, bonded or compulsory labour	All work or service that is extracted from any person under the menace of any penalty for which said person has not offered him/herself voluntarily or for which such work or service is demanded as a means of repayment of debt.
Fossil fuels	An energy source formed in the Earth's crust from decayed organic material. The common fossil fuels are petroleum, coal, and natural gas. Burning of fossil fuels for energy is a major contributor to global greenhouse gas emissions.
Free, Prior and Informed Consent	A legal condition whereby a person or community can be said to have given consent to an action prior to its commencement, based upon a clear appreciation and understanding of the facts, implications and future consequences of that action, and the possession of all relevant facts at the time when consent is given. Free, prior and informed consent includes the right to grant, modify, withhold or withdraw approval.
GHG emissions - biogenic	Carbon emissions originating from the oxidation and/or reduction of above-ground biomass by means of its transformation or degradation (e.g. combustion, digestion, composting, landfilling) and CO_2 update from the atmosphere through photosynthesis during biomass growth.
GHG emissions - fossil	Greenhouse gas emissions originating from the oxidation and/or reduction of fossil fuels by means of their transformation or degradation (e.g. combustion, digestion, landfilling, etc.)
GHG emissions - land use change	Carbon uptakes and emissions originating from carbon stock changes caused by land use change and land use. This category includes biogenic carbon exchanges from deforestation, road construction or other soil activities (including soil carbon emissions).
Global warming potential	Global Warming Potentials (GWP) are calculated as the ratio of the radiative forcing of one kilogram greenhouse gas emitted to the atmosphere to that from one kilogram CO_2 over a period of time (e.g., 100-year time horizon).
Greenhouse gas emissions	Gases in the atmosphere such as water vapour, carbon dioxide, methane and nitrous oxide that can absorb infrared radiation, trapping heat in the atmosphere. This greenhouse effect means that emissions of greenhouse gases due to human activity cause global warming.

Grievance	A grievance in the employment context refers to a specific, formal notice of employee dissatisfaction expressed through an identified procedure.
Grievance mechanism	A grievance mechanism is a formal complaint process that can be used by workers to resolve a grievance.
Groundwater	All sub-surface water.
Harassment	Unacceptable behaviours and practices, or threats thereof, whether a single occurrence or repeated, that aim at, result in, or are likely to result in physical, psychological, sexual or economic harm. This includes harassment directed at persons because of their sex or gender, or affecting persons of a particular sex or gender disproportionately, and includes sexual harassment.
Hazard	The inherent potential to cause injury or damage to a person's health (e.g., handling heavy machinery unsafely, and unprotected exposure to harmful chemicals).
Hazardous work	Work that by its nature or the circumstances in which it is carried out, could potentially harm the health, safety or morals of employees, especially if specific skills, experience, or preventive measures are not in place. This includes for example heavy lifting disproportionate to a person's body size, operating heavy machinery, and exposure to hazardous substances. Hazardous work is one example of worst forms of child labour.
Headwaters	The furthest point on each of the tributaries of a river/stream from its mouth/estuary into a lake/sea, or the confluence (where two waterbodies join to form a single channel) with another river.
Human trafficking	The recruitment, transfer, harbouring or receipt of persons, by means of the use of threat, force, deception or other forms of coercion, for the purpose of exploitation.
Labour-only contracting	The practice of hiring employees without establishing a formal employment relationship for the purpose of avoiding payment of regular wages or the provision of legally required benefits, such as health and safety protections.
Legal tender	The money that can be officially used in a country.
Lentic	An aquatic ecosystem with standing or slow flowing water such as lakes, or reservoirs or more enclosed/ less-well flushed marine systems.

Light work	Work conducted by children between the ages of 13 and 14 years old (unless they are the age of mandatory schooling in their country (i.e., 15, 16, 17), in which case they come under the category of light work). This light work is not likely to be harmful to their health or development; and not such as to prejudice their attendance at school, their participation in vocational orientation or training programmes approved by the competent authority or their capacity to benefit from the instruction received.
Living Wage	The remuneration received for a standard work week by a worker in a particular place sufficient to afford a decent standard of living for the worker and her or his family. Elements of a decent standard of living include food, water, housing, education, health care, transportation, clothing, and other essential needs including provision for unexpected events.
Lotic	An aquatic ecosystem with moving water such as streams, rivers, man-made canals and marine systems with stronger tides and currents.
Management system	Set of policies, processes and procedures required for planning and implementation of the ASC requirements. This includes periodic reviews and, when needed, revision of the management system in order to achieve effective conformance with the intention of this standard.
Migrant worker	Person who is to be engaged, is engaged or has been engaged in a remunerated activity in a State of which he or she is not a national.
Moist pellets	Wet pellets with a moisture content of 30 - 50%, typically made of minced whole fish, fishmeal and fish oil.
Natural wetland	Areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters. This includes restored wetlands (or in the process of becoming so).
Non-conforming product	A product that is identified, sold or dispatched as ASC certified but is not traceable to an ASC certified UoC, or does not conform with ASC requirements.
Other Effective Area-based Conservation Measures	Sites outside of protected areas that are governed and managed in ways that deliver the long-term *in situ* conservation of biodiversity
Peak biomass	The-point at which cultured biomass reaches a maximum. This is likely to coincide with the maximum level of feed input.
Point source	“End of pipe” effluents from land-based or closed containment systems.

Protected Area	A clearly defined geographical space, recognised, dedicated and managed through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.
Receiving water body	The first natural water bodies that do not belong to the farm that receive runoff or waste discharges, such as streams, rivers, ponds, lakes and estuaries.
Receiving water farm afar (post mixing zone) (RWFA)	RWFA is a point where the farm effluent has an influence in the receiving waters but is not in the immediate outfall/mixing zone. This location would be downstream in a river, or down the prevailing current pattern in a lake or reservoir or tidal estuary.
Receiving water farm effluent (RWFE)	Farm effluent 'end-of-pipe' outflow, before combining with receiving water in a mixing zone.
Receiving water farm influent (upstream) (RWFI)	RWFI is a reference or source point that ideally is not influenced by the farming operation or is least influenced by the farm. Farms discharging to lotic systems, or cages positioned in lotic systems shall identify a point upstream of farm discharge or activity to serve as the reference point. Residual current patterns should also be considered in tidal settings.
Recycling	Reprocessing of products or components of products that have become waste, to make new materials.
Renewable energy	Energy resources that are naturally replenishing but flow-limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Renewable energy resources include biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.
Re-use	Checking, cleaning, or repairing operations, by which products or components of products that have become waste are prepared to be put to use for the same purpose for which they were conceived.
Risk Assessment	Risk assessment is the overall process or method where one: I. Identifies hazards and risk factors that have the potential to cause harm (hazard identification). II. Analyses and evaluates the risk associated with that hazard (risk analysis, and risk evaluation). III. Determines appropriate ways to eliminate the hazard or controls the risk when the hazard cannot be eliminated (risk control).
Salinity	The amount of dissolved salts in water.
Scope 1 emissions	Direct greenhouse gas emissions occurring from sources that are owned or controlled by a company, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.; emissions from chemical production in owned or controlled process equipment.
Scope 2 emissions	Greenhouse gas emissions from the generation of purchased electricity consumed by a company. These emissions physically occur at the facility where electricity is generated.

Scope 3 emissions	Greenhouse gas emissions occurring as a consequence of the activities of the company, but from sources not owned or controlled by the company. Some examples of scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services.
Sensitive habitat	A habitat whose conservation status, including its extent and the condition (structure and function) of its biotic and abiotic components, is adversely affected by pressures arising from human activities.
Shift work	A method of organization of working time in which workers succeed one another at the workplace so that the establishment can operate longer than the hours of work of individual workers at different daily and night hours.
Surface water	Water collecting on the ground or in a stream, river, lake, wetland, or ocean.
Threatened and Protected Species	Mammals, elasmobranchs, reptiles, birds or amphibians listed as: - Critically Endangered, Endangered, or Vulnerable (i.e. collectively referred to as "threatened") according to the IUCN Red List of Threatened Species; - OR legally protected. For situations where a species is one or the other category, the stricter applies. E.g. if a species is not Red Listed, but legally protected – then this applies.
Traceability	Traceability is the ability to identify and trace the history, distribution, location, and application of products, parts, materials, and services.
Transgenic species	A species containing genes altered by insertion of DNA from an unrelated organism.
Uncooked & unprocessed fish	Raw fish that have not been cooked or processed to safeguard against food safety issues, have not been processed into compound feeds to increase efficiency and to reduce nutrients released into the water column during feeding.
Vermin	Pests or nuisance animals that may spread diseases, harm or prey upon production species, and may vary by region and in time.
Waterbody Unit of Management (WUM)	A management area which reflects a logical geographic scope, such as a lake (or part thereof) and its contributing catchment area. Boundaries should be defined based on coherent characteristics in terms of natural processes and catchment land use and, most fundamentally, the zone in which cumulative impacts are likely to affect ecosystem structure and function.
Wet feedstuffs	Wet, liquid and moist by-products from the food, beverage and fermentation industry including blood, rumen contents, molasses and brewery wastes.

Wildlife Corridors	Connections across the landscape that link up areas of habitat that are for the maintenance of ecological processes including allowing for the movement of animals and the continuation of viable populations.
Young employee	Any employee older than the basic minimum age for work but younger than 18 (or the age of legal adulthood as defined by national law, if higher). All young employees are classified as children; not all children can be classified as young employees.

Appendix 3 - Species Performance Metrics

Metric	Species										
Indicator No.	**Seabass, Seabream & Meagre**	**Tropical Marine Finfish**	**Flatfish**	**Salmon**	**Freshwater Trout**	**Seriola & Cobia**	**Pangasius**	**Tilapia**	**Shrimp**	**Abalone**	**Bivalve**
2.12.3 FFDRm	[163] *D. labrax* & *S. aurata*: ≤1.85 *A. regius* ≤2.5 *P. major*[164] ≤3.5	[165] Barramundi ≤1.8 Grouper & Snapper ≤3.0 Pompano ≤2.4 Yellow Croaker ≤3.2	[166] Halibut ≤2.2 Turbot ≤2.8 Flounder ≤1.9	<1.2	≤1.5	≤2.9		≤0.8	*P. vannamei* 1.3:1 *P. monodon* 1.8:1 *Cherax spp., Procambarus spp., Astacus spp:* 1.4:1 *Macrobrachium spp*: 2.1:1	<0.8	
2.12.3 FFDRo	≤2.95	Barramundi ≤2.3 Grouper & Snapper ≤3.0 Pompano ≤2.3 Yellow Croaker ≤3.8	Halibut ≤3.5 Turbot ≤3.4 Flounder ≤2.2	<2.52 or Max amount of EPA & DHA from whole marine sources <30g/kg feed	≤2.95 or Max level of EPA/DHA content from whole marine sources as a percentage of fatty acids in the feed ≤9%	≤2.9	0.5				
2.12.3 Maximum weighted average of eFCR for the complete production cycle							1.68				

[163] From September 2024 the following values will apply: FFDRm *A. regius* ≤2.35 *P. major* ≤2.5; FFDRo ≤2.9
[164] Other *Pagrus* species included in the scope of this Standard shall follow the requirements for *Pagrus major.*
[165] From July 2025 the following values will apply: FFRDm Barramundi ≤1.4 Grouper & Snapper ≤2.6 Pompano ≤2.0 Yellow Croaker ≤2.9; FFRDo Barramundi ≤2.0 Grouper & Snapper ≤2.6 Pompano ≤2.0 Yellow Croaker ≤3.5

[166] From July 2025 the following values will apply: FFRDm Halibut ≤2.0 Turbot ≤2.5 Flounder ≤1.6; FFDRo Halibut ≤3.0 Turbot ≤3.0 Flounder ≤2.0

2.12.3 Protein Retention Efficiency									*Penaeus spp.*: >30% other species: Records are available		
4.1.1.8 Limits on mortality rates							≤20%				
4.1.1.8 Minimum recovery of fish stocked in production stages after they have attained a size of 100 grams								≥ 65%			
4.1.1.8 Minimum survival rates									1) Unfed and non-permanently aerated pond systems: SR >25% 2) Fed but non-permanently aerated pond82 systems: SR > 45% 3) Fed and permanently aerated pond systems: SR > 60%		
4.1.1.8 Maximum viral disease-related mortality				<10%							
4.1.1.8 Maximum unexplained mortality rate from each of the previous two production cycles, for farms with total mortality > 6%				<40% unexplained (when total mortality >6%)							
4.5.14 Maximum number of antibiotic treatments	Max. 3	Max. 3	Max. 3	Max. 3			Max. 3	Max. 3			
4.5.15. Parasiticide treatments	1 (including hatchery) (not including freshwater, formaldehyde or hydrogen peroxide)	Zero (not including freshwater or hydrogen peroxide)	Zero (not including freshwater or hydrogen peroxide)			Zero (not including freshwater, formaldehyde or hydrogen peroxide)					

Appendix 4 - Risk Management Framework

Regardless of topic or area of concern, every Risk Methodology has the same, conceptual, steps embedded within. These steps are outlined below and form the standardized methodology for the topic-specific assessments listed under **Appendix 4.1** and **Appendix 4.2**.

Step 1 – Determine the Scope

The Scope of the Risk Assessment is defined by the Risk Factors that are evaluated. The UoC shall identify which potential Risk Factors are relevant to their site-specific context.

A Risk Factor is the "issue" that is subject to Risk Assessment (Step 2) and possible measures thereafter (Step 3). Examples of Risk Factors are: 1) negative wildlife interaction or 2) physical harm because of contact with hazardous chemicals.

The UoC shall use the listed Risk Factors in the relevant Appendix as a default starting list but may also include additional Risk Factors as well, depending on the site-specific context.

Step 2 – Risk Assessment

The UoC shall assess the Risk Level[167] for each identified Risk Factor (Step 1).

The Risk Level is determined by using, as a minimum, a 3x3 Risk Matrix (Risk Likelihood * Risk Severity). A simplified example of such a Risk Matrix is presented below:

		Risk Severity		
		Low	**Medium**	**High**
Risk Likelihood	**Low**	Low Risk	Low Risk	Medium Risk
	Medium	Low Risk	Medium Risk	High Risk
	High	Medium Risk	High Risk	High Risk

In this example, the Severity and the Likelihood of Risks are ranked according to a 3-tier scoring system in which individual scores are substantiated by credible evidence. If the evidence of not conclusive enough, a precautionary approach must be chosen (i.e. moving the score up).

Besides a 3x3 Risk Matrix, also a 4x4 or even a 5x5 Risk Matrix can be used. Although these other versions of a Risk Matrix provide more granularity to the possible Risk Level, there is a chance that this results into down-grading of the Risk subsequently. Therefore, if the UoC decides to use a 4x4 or 5x5 Risk Matrix, the expectation is that the provided evidence is tailored to this increased granularity.[168]

In addition to the Risk Level, the UoC shall also list for each Risk Factor the following:

- What or who could be impacted?
- How could the Risk occur (i.e. the Risk Drivers)
- What existing measures are in place to control the risk?

[167] "Risk Level" and "Risk" are considered synonyms.

[168] https://www.undp.org/publications/undps-social-and-environmental-screening-procedure-sesp

Step 3 – Develop and Implement a Risk Management Plan (RMP)

The UoC shall develop and implement a RMP for Risk Factors that score a "medium"/"high" Risk Level under Step 2.

The RMP shall identify effective measures and monitoring Indicators to reduce Risk Levels from "medium"/"high" to "low" within a measure-specific time window:

- Effective measures can deliver:
  - Mitigation; reducing the Risk Level when the drivers cannot be eliminated fully, or;
  - Remediation; reducing the Risk Level to a point where the Risk Factor no longer is relevant for the site-specific context;
- A measure-specific time window for:
  - Risk Factors with a "high" Risk Level would be reduced to "medium" Risk Level within short time period (e.g. 6 months after detection);
  - Risk Factors with a "medium" Risk Level would be reduced to a "low" Risk Level within medium time period (e.g. 12 months after detection);

It is recommended that also Risk Factors with a "low" Risk Level are considered in the RMP to define measures to prevent the Risk from increasing.

Once the identification of effective measures is completed, the UoC shall implement these accordingly.

Step 4 – Monitor

The UoC shall use the monitoring Indicators, and any other additional means, to ensure effectiveness of implemented measures as well as to monitor the overall Risk Levels accordingly.

Step 5 – Review

The UoC shall regularly review the RMP and overall Risk Levels according to the following frequency:

- Review and revise the RMP when triggered by the monitoring outcome;
- Review and revise the RMP when changes occur that influence the relevance of site-specific Risk Factors.

Appendix 4.1 – Risk Management Framework; Specific requirements for Environmental Risks

In addition to the requirements under the Standardized Method, the UoC shall adhere to the following specific requirements for conducting an ERA.

Related to Step 1:
The following minimum list of Risk Factors, based on the ASC Species-Standards, shall be considered:

Habitat-related:

i. The presence of nearby situated Protected Areas (**Appendix 5**) and farm-related Risk Drivers which increase the likelihood of negative impacts upon these.
ii. The presence of nearby situated Areas Belonging to Other Associations (**Appendix 5)** and farm-related Risk Drivers which increase the likelihood of negative impacts upon these.
iii. The presence of nearby situated OECMs (**Appendix 5**) and farm-related Risk Drivers which increase the likelihood of negative impacts upon these.
iv. The presence of nearby situated natural wetlands (including mangroves) and farm-related Risk Drivers which increase the likelihood of negative impacts upon these.
v. The degree to which conversion of natural wetlands (including mangroves) before and after 1999 has occurred.
vi. The distance of buffer zones to the open shoreline, rivers or streams in such a way that seasonal floodings/storms as well as for a "25-year event flooding/storm" do not impact the farm' operation.
vii. The presence of other nearby sensitive habitats and drivers which increase the likelihood of negative impacts upon these. As a minimum the UoC shall review the presence of:
    a. Seagrass beds
    b. Areas containing biogenic structures that are not particularly adapted to sedimentation or organic enrichment (e.g., tubeworm mounds, bryozoans mounds, bivalve beds and reefs or sponge gardens that form a structure for other epifauna)

Wildlife-related:

i. The presence of Threatened and Protected Species near or within the farm boundaries and to what extent the farm has habitat that is critical for these species.
ii. The presence of mammals, elasmobranchs, birds, amphibians or reptiles near or within the farm boundaries and farm-related drivers which increase the likelihood of negative impacts upon these.

Related to Step 2:
Depending on the size of the operation, it is expected that the ERA is either performed by a nationally accredited body (e.g. as part of the license application process) or, where this is not required or exists, by a competent and qualified member of staff or (external) environmental scientists.

It is recommendable that for medium and large size farms, as well as for group or multi-site certification, external professional expertise if contracted to conduct the ERA credibly.

Step 3 – Develop and Implement a Risk Management Plan (RMP)
No additional requirements beyond what is already outlined under the Standardized Method.

Step 4 – Monitor

No additional requirements beyond what is already outlined under the Standardized Method.

Step 5 – Review

No additional requirements beyond what is already outlined under the Standardized Method.

Appendix 4.2 - Risk Management Framework; Specific requirements for Health and Safety Risks

In addition to the requirements under the Standardized Method, the UoC shall adhere to the following specific requirements for conducting a Health and Safety Risk Assessment (HSRA).

Related to Step 1: The following minimum list of Risk Factors, based on the main H&S risks occurring in the aquaculture industry, shall be considered:

Chemical and Biological	Contact with hazardous chemicals
	Food handling
	Drinking water
Diving	Diving
Electricity and Electrical Equipment	Electricity
Equipment	Compressed air/Pressurised Equipment
	Sharpening tools
	Machine guarding
	Knives
	Display screen equipment
Fire	Fire
Mechanical and Manual Handling	Cranes
	Workplace transport
	Conveyors
	Operation of lift trucks
	Moving heavy objects
Natural/Physical disaster/event	Tsunami
	Earthquake
	Typhoon
	Hurricane
	Avalanche
	Landslide
Welfare	Hygiene/comfort/welfare
	Unfamiliarity with the site and/or uncertainty about the job
Workplace	Slips, trips and falls
	Traffic movements/ routes (deliveries etc.)
	Falls from height
	Lone working
	Confined spaces
	Workstation and seating
Workplace Environment	Noise
	Ventilation
	Temperature
	Lighting

Related to Step 2:

Assess each farm activity, considering all Risk Factors listed above, for incidences potentially resulting in acute and chronic injury or damage, and determine the risk, possible preventive measures, and necessary contingency measures/plans. There is an example of a risk matrix scoring table below.

Map your activities	Assess the risk of your activities							Manage your risks							
Farm Activities		Who could be harmed	How could people be harmed	Existing risk prevention measures	Initial Risk Score *likelihood x impact*			Additional preventive measures to further reduce likelihood or impact *at least for all risks rated medium or higher*	Monitoring of preventive measures		Final Risk Score			Contingency measures/ plans *for all risks*	
					L	I	R		who	when	L	I	R		
Lifting 25kg feed bags	*acute*	Person lifting bag	Back strain	none	3	3	9	Manual handling training, jack to lift feed bags to waist height,	Site manager	annually	2	3	6		
	chronic/ cumulative	Person lifting bag	Long term back injuries	none	3	3	9	Repeat manual handling training, jack to	Site manager	annually	2	3	6		

								lift feed bags to waist height,						
	acute													
	chronic/ cumulative													
	acute													
	chronic/ cumulative													
	acute													
	chronic/ cumulative													

Step 3 – Develop and Implement a Risk Management Plan (RMP)
No additional requirements beyond what is already outlined under the Standardized Method.

Step 4 – Monitor
No additional requirements beyond what is already outlined under the Standardized Method.

Step 5 – Review
No additional requirements beyond what is already outlined under the Standardized Method.

Appendix 5 - Allowance for siting in Protected Areas (PAs), Other Area Designations (OADs) and Other Effective Area-based Conversation Measures (OECMs)

Together with IUCN, ASC has developed and published[169] a guidance document regarding the allowance of aquaculture in the various types of conservation areas.

The table below is based on this document and defines what form of aquaculture is permissible under specific circumstances.

Table 1 - Conditions for permissible siting in Protected Areas under ASC Certification

IUCN Category Ia	Type: Strict nature reserve.
	Description: Strictly protected areas set aside to protect biodiversity and possibly geological/geomorphological features, where human visitation, use and impacts are strictly controlled and limited to ensure conservation values.
	Allowance for siting under ASC Certification: Allowance for siting in this Category shall never be permissible.
IUCN Category Ib	Type: Wilderness area.
	Description: Usually, large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition.
	Allowance for siting under ASC Certification: Only permissible if the following conditions are met: 1. The farming operation and its outputs shall not undermine the nature conservation values of the PA, and; 2. The farm shall be sited in locations where small-scale settlement is in place (i.e. does not undermine wildness), and; 3. The PA-management shall apply the '75% rule'.

[169] In peer review at the time of publication of this Draft Standard.

IUCN Category II	Type: National Park.
	Description: Large natural or near natural areas set aside to protect large-scale ecological processes, along with characteristic species and ecosystems, which also provide environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.
	Allowance for siting under ASC Certification: Only permissible if the following conditions are met: 1. The farming operation and its outputs shall not undermine the nature conservation values of the PA, and; 2. The PA-management shall apply the '75% rule'.
IUCN Category III	Type: Natural monument.
	Description: Areas set aside to protect a natural monument, e.g., a landform, sea mount, cavern, geological feature or even a living feature such as an ancient grove.
	Allowance for siting under ASC Certification: Only permissible if the following conditions are met: 1. The farming operation and its outputs shall not undermine the conservation values of the natural monument, and; 2. The PA-management shall apply the '75% rule'. Note - Most category III protected areas are small, protecting a particular feature, and therefore unlikely to contain or be suitable for aquaculture.
IUCN Category IV	Type: Habitat/ species management area.
	Description: Areas that protect particular species or habitats. Many need regular, active interventions to address the requirements of particular species.
	Allowance for siting under ASC Certification: Only permissible if the following conditions are met: 1. The farming operation shall be considered traditional aquaculture practices and is in such a way integrated into the ecology that they have important associated biodiversity values and therefore are themselves part of conservation management, and; 2. The used production method shall be traditional to the area (i.e. not a "tradition" imported from elsewhere).
IUCN Category V	Type: Protected landscape or seascape.

	Description: Areas where the interaction of people and nature over time has produced a distinct character with significant ecological, cultural and scenic value: and where safeguarding this interaction is vital to sustaining conservation values.
	Allowance for siting under ASC Certification: Only permissible if the following conditions are met: 1. The farming operation and its outputs shall not undermine the nature conservation values of the PA, and; 2. The used production method shall be traditional to the area (i.e. not a "tradition" imported from elsewhere), and; 3. The PA-management shall apply the '75% rule'. Allowance for siting in this Category shall never be permissible if mangroves or other biomes have been cleared – even if (any form of) restoration has occurred since.
IUCN Category VI	Type: Protected areas with sustainable use of natural resources.
	Description: Areas, generally large and in mostly natural condition, which conserve ecosystems and habitats, together with associated cultural values and where a proportion are under traditional natural resource management systems.
	Allowance for siting under ASC Certification: Only permissible if the following conditions are met: 1. The farming operation and its outputs shall not undermine the nature conservation values of the PA, and; 2. The PA-management shall apply the '75% rule'.
Non-assigned IUCN Protected Areas	Allowance for siting under ASC Certification: In those instances where protected areas have not been assigned an IUCN management category by the government in question, an assessment shall be made to understand what the management is aiming to do and in effect to decide on a category for purposes of determining what types of aquaculture should be permitted.

Table 2 - Conditions for permissible siting in Areas with Associated Designations under ASC Certification

UNESCO World Heritage Site	Description: A World Heritage Site is a landmark or area with legal protection by an international convention administered by the United Nations Educational, Scientific and Cultural Organization (UNESCO). World Heritage Sites are designated by UNESCO for having cultural, historical, scientific or other forms of significance. The sites are judged to contain "cultural and natural heritage around the world considered to be of outstanding value to humanity".

	Allowance for siting under ASC Certification: For the consideration of aquaculture derogations, all natural World Heritage sites shall be regarded as protected areas.
UNESCO Man and the Bioshere Reserve	Description: Biosphere reserves are 'learning places for sustainable development'. They are sites for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity.
	Allowance for siting under ASC Certification: For the consideration of aquaculture derogations, core zones of biosphere reserves will always be treated as protected areas and refer to government definitions regarding buffer zones, transition zones will rarely be protected areas.
RAMSAR site	Description: A Ramsar site is a wetland site designated to be of international importance under the Ramsar Convention, also known as "The Convention on Wetlands", an international environmental treaty signed on 2 February 1971 in Ramsar, Iran, under the auspices of UNESCO.
	Allowance for siting under ASC Certification: Only permissible if the following conditions are met: 1. The farming operation and its outputs shall not undermine the conservation objectives as defined by the relevant government. For the consideration of aquaculture derogations, the protection status of Ramsar sites should defer to individual government decisions.
Territories and areas conserved by indigenous peoples and local communities (ICCA)	Description: The term "ICCA" is an abbreviation for a phenomenon that has many diverse manifestations and names in cultures and locations around the world. These include *wilayah adat, himas, agdals, territorios de vida, territorios del buen vivir, tagal, qoroq-e bumi, yerli qorukh, faritra ifempivelomana, qoroq,* ancestral domains, country, community conserved areas, territorios autonomos comunitarios, sacred natural sites, locally-managed marine areas, and many others. The ICCA abbreviation may encompass, but should never obscure, the diversity of such terms, which is a value in itself. Local / customary names should always be preferentially used, leaving the term 'ICCA' for general or inter-cultural communication.
	Allowance for siting under ASC Certification: Only permissible if the following conditions are met: 1. The farming operation and its outputs shall not undermine the objectives as defined by the custodians of the area. For the consideration of aquaculture derogations, the use of ICCAs should refer to the custodians of the site with regard to its status.

Indigenous Protected Areas (IPAs)	Description: Indigenous Protected Areas (are areas of land and sea Country managed by First Nations groups in accordance with Traditional Owners' objectives. IPAs deliver biodiversity conservation outcomes for the benefit of all Australians, through voluntary agreements with the Australian Government.
	Allowance for siting under ASC Certification: For the consideration of aquaculture derogations, current IPAs are protected areas.
Key Biodiversity Areas	Description: Defined as 'sites contributing significantly to the global persistence of biodiversity', in terrestrial, freshwater and marine ecosystems, through quantitative Criteria*. Global coverage is incomplete and many sites on the KBA list are Important Bird Areas, defined using similar Criteria but just for birds, which are being assessed against the KBA standard Criteria. The KBA partnership* (a collection of mainly large NGOs) does not suggest that all KBAs should be protected areas, but that they need to be managed in ways that allow the relevant biodiversity trigger elements to remain. But there is a body of opinion that post-2020 biodiversity targets should focus on increasing protection for KBAs, and if an area is a KBA it is likely to be a candidate protected area in at least some peoples' minds. Many KBAs will be or will contain protected areas.
	Allowance for siting under ASC Certification: For the consideration of aquaculture derogations, there must be awareness of KBAs and the necessity to make decisions on a case-by-case basis; any aquaculture activities within KBAs should certainly be subject to a particular duty of care. Additionally, while some KBA trigger elements may have been identified within a KBA the Criteria may not have been applied across all taxonomic groups and care should be made to consider other potential trigger elements also.
AZE sites	Description: Alliance for Zero Extinction, lists sites[170] that are the only known location for a particular species. Most but not all are also protected areas. These are sites where mismanagement can easily lead to extinction.
	Allowance for siting under ASC Certification: 1. Allowance for siting in this Type shall never be permissible. For the consideration of aquaculture derogations, it is advised to avoid such sites; for AZE sites outside protected areas particular precautions may be needed.

[170] https://zeroextinction.org/

High Conservation Value Areas (HCVA)	Description: An area designated on the basis of High Conservation Values which are biological, ecological, social or cultural values considered outstandingly significant at the national, regional or global level.
	Allowance for siting under ASC Certification: Only permissible if the following conditions are met: 1. The area shall not have other designations (i.e. is not also a protected area, in which case refer to the relevant PA category), and; 2. The farming operation shall not undermine any of the determined conservation values of the area, and; 3. Monitoring is in place to ensure that (2) is adhered to.
Natura2000 area	Description: Natura 2000 is a network of nature protection areas in the territory of the European Union. It is made up of Special Areas of Conservation and Special Protection Areas designated under the Habitats Directive and the Birds Directive, respectively. The network includes both terrestrial and Marine Protected Areas.
	Allowance for siting under ASC Certification: The EU regards all Natura 2000 sites as protected areas.
Emerald Network of Areas of Special Conservation Interest	Description: The Emerald Network is an ecological network made up of Areas of Special Conservation Interest. Its implementation was launched by the Council of Europe as part of its work under the Bern Convention, with the adoption of Recommendation No. 16 (1989) of the Standing Committee to the Bern Convention.
	Allowance for siting under ASC Certification: For the consideration of aquaculture derogations, current Emerald Network sites are protected areas.
Important Bird Area (IBA)	Description: An Important Bird and Biodiversity Area (IBA) is an area identified using an internationally agreed set of Criteria as being globally important for the conservation of bird populations. IBA was developed and sites are identified by BirdLife International. Often IBAs form part of a country's existing protected area network, and so are protected under national legislation. Legal recognition and protection of IBAs that are not within existing protected areas varies within different countries. Some countries have a National IBA Conservation Strategy, whereas in others protection is completely lacking.
	Allowance for siting under ASC Certification: IBAs are identified in areas particularly important for birds and many will also be, or will contain, protected areas. But recognition as an IBA is not automatically equivalent to being a protected area.

Conditions for permissible siting in Other Effective Area-based Conservation Measures (OECMs) under ASC Certification

Only permissible if the following condition is met:

1. The aquaculture operation does not negatively impact the biodiversity for which the site has been recognised as an OECM.

Appendix 6 - Additional Requirements for Alien Species resulting from EICAT assessment

Introduction

Depending on the outcome of the EICAT-assessment (Table 1), additional requirements may need to be implemented to minimise the risk of ASC certified farms contributing further to the observed impact. The concept of "the bigger the impact, the stricter the Standard" is applied for this.

The Additional Requirements are defined along the Intended Outcome (Table 2) per Harm Level (Data Deficient, Minimal/Minor, Moderate, Major/Massive). These set the aspirational direction that the actual Requirements (Table 3, 4, 5) seeks to achieve and reflect the escalating nature of the responses given to the observed Harm Level.

Due to the range of factors and the diversity within each requirement (e.g. species, culture system, climate, ecoregion/realm, etc.) a more detailed interpretation of the Additional Requirements will be provided via the Interpretation Manual that will include examples for the various culture systems.

Focus Areas

Although the Impact Mechanisms of Alien Species can vary, they only become a possibility when the species escapes into the surrounding habitat.

Global studies (Jackson et al., 2015; Atalah & Sanchez-Jerez, 2020) on the leading causes of escapes in aquaculture reveal three main reasons:

i. farm infrastructure failure (e.g. cage rupture, net tearing on mooring lines, tank bursting, predator tearing into nets, net biting by fish, etc.)
ii. operational handling errors (e.g. spillage during stocking/grading/harvesting, transport, accidents with boats near cages, screens opening accidentally, etc.)
iii. biological reasons (e.g. breeding within culture units or through nets)

The Additional Requirements are defined to address these main reasons for escapes in an escalating manner. Besides increasing Best Practices, metric limits and Assurance Responses are defined as well. These seek to set limits of escape tolerances and (possible) consequences for the ASC certificate holder when limits are exceeded.

Finally, the Additional Requirements are relevant for producers that culture in escape-prone systems (e.g. cage-culture or land-based systems subject to flooding). Producers that operate systems with a very low likelihood of escapes (e.g., closed RAS-systems) or survival of escapees (e.g. tropical species escaping in cold climate regions) are exempted from the Additional Requirements.

	Eurasia/northern Africa	**Southeast Asia and Oceania**	**North America**	**South America**	**Australia**	**Sub-Saharan Africa**
Biogeographic realm	*Palearctic*	*Indomalayan*	*Nearctic*	*Neotropical*	*Australasian*	*Afrotropical*
Atlantic Salmon	Moderate (confidence 0.35)	Data Deficient	Moderate (confidence 0.31)	Moderate (confidence 0.5)	Data Deficient	Data Deficient
Nile tilapia	Data Deficient	Moderate (confidence 0.5)	Minimal/Minor (confidence 1)	Major/Massive (confidence 0.14)	Data Deficient	Major/Massive (confidence 0.17)
Whiteleg shrimp	Data Deficient	Minimal/Minor (confidence 1)	Data Deficient	Data Deficient	Data Deficient	Data Deficient
Rainbow Trout	Moderate (confidence 0.2)	Data Deficient	Major/Massive (confidence 0.33)	Moderate (confidence 0.5)	Moderate (confidence 1)	Minimal/Minor (confidence 1)
Pangasius	Data Deficient	Data Deficient	Data Deficient	Data Deficient	Data Deficient	Data Deficient
Species ...						

Table 1: *the above table presents the initial findings of EICAT assessments conducted for the species listed on the left side (work in progress for non-listed species). For details on the Methodology, please see the ASC EICAT Assessment Methodology on the ASC-website. The scores reflect the most severe impact observed of a species in a particular realm. The realms delineate large areas of the Earth's surface within which organisms have evolved in relative isolation over long periods of time, separated by geographic features, such as oceans, broad deserts, or high mountain ranges, that constitute natural barriers to migration. As such, biogeographic realm designations are used to indicate general groupings of organisms based on their shared biogeography. Biogeographic realms correspond to the floristic kingdoms of botany or zoogeographic regions of zoology. For more information on realms, please see: https://en.wikipedia.org/wiki/Biogeographic_realm*

EICAT Category	**Intent** of Additional Requirements
DD - Data Deficient	Additional Requirements improve overall escape control and awareness of observed escape risks at farm level, thereby decreasing the chance of minor harm to the native biodiversity.
MC – Minimal Concern	
MN – Minor	
MO – Moderate	Additional Requirements require escape prevention measures that respond to observed escape risks. In addition, accurate counting, and consequences of occurred escapes reflect the harm to the native biodiversity.
MR – Major	Additional Requirements require escape prevention measures that respond to observed escape risks. In addition, accurate counting, and the consequences of occurred escapes reflect the harm to the native biodiversity. Progression towards escape-proof systems and/or the culture of sterile/triploid animals is required within six years upon effective date of the ASC Farm Standard.
MV - Massive	

Table 2: *the table above reflects the Intent that the Additional Requirements seek to achieve. The requirements are escalating in terms of severity, thereby seeking to align with the escalating impact categories.*

<table>
<tr><td colspan="4">Additional Requirements</td></tr>
<tr><td>Realm Risk:</td><td>Data Deficient (DD)</td><td>Minimal Concern (MC)*</td><td>Minor (MN)*</td><td>Assurance response:</td></tr>
<tr><td colspan="5">*Realm risk level Minimal/Minor, or realm risk level Moderate with a confidence score <0.2 (risk is considered unlikely). If the Ecoregion has a confirmed risk level higher then Minimal/Minor, then this shall be followed.

**<u>Exemptions to the Minimal/Minor Category:</u>
o If the Impact Mechanism is Hybridisation, UoCs that culture sterile/triploid stock are exempted from the Additional Requirements.
o UoCs that can demonstrate that their culture system prevents successful escapes (i.e. fish surviving), are exempted from the Additional Requirements.</td></tr>
<tr><td>Indicator 2.4.7**</td><td colspan="3">The UoC shall not exceed the Total Escape Count[171] per production cycle, or year (whichever is stricter), as per below:
- Salmon: 300 pcs
- Other fish species: 6%</td><td rowspan="7">Regular categorization of non-conformities</td></tr>
<tr><td>Indicator 2.4.8**</td><td colspan="3">The UoC shall not have more than one Mass Escape Event per six years, defined as:
- Salmon: >5000 pcs
- Other fish species: >6% Total Escape Count</td></tr>
<tr><td>Indicator 2.4.9**</td><td colspan="3">The UoC shall carry out a site-specific handling and containment risk assessment, approved by a member of senior management, according to the following:
- Incorporating all steps of the risk management matrix in Table 6
- Incorporating all handling steps and parameters ensuring containment in Table 7</td></tr>
<tr><td>Indicator 2.4.10**</td><td colspan="3">The UoC shall train all relevant staff on handling procedures to minimise escapes due to handling errors.</td></tr>
<tr><td>Indicator 2.4.11**</td><td colspan="3">The UoC shall log handling/containment accidents and near misses.</td></tr>
<tr><td>Indicator 2.4.12**</td><td colspan="3">Indicator scope: tilapia producers only
The UoC shall culture all-male or sterile fish.</td></tr>
</table>

Table 3: *Additional Requirements for UoCs that produce species in areas ranked as Data Deficient (DD), Minimal Concern (MC) or Minor (MN) risk.*

[171] Calculated at the end of the production cycle, or year (whichever is greater). Total Escape Count = Known Escapes + Unexplained Losses (= stock count – harvest count - mortality count – known escapes).

Additional Requirements		
Realm Risk:	**Moderate (MO)**	**Assurance response:**
Realm risk level Moderate, or realm risk level Major with a confidence score <0.2 (risk is considered unlikely). If the Ecoregion has a confirmed risk level higher then Moderate, then this shall be followed.* *<u>Exemptions to the Moderate Category:</u>* o *If the Impact Mechanism is Hybridisation, UoCs that culture sterile/triploid stock are exempted from the Additional Requirements.* o *UoCs that can demonstrate that their culture system prevents successful escapes (i.e. fish surviving), are exempted from the Additional Requirements.*		
Indicator 2.4.13**	The UoC shall not exceed the Total Escape Count[172] per production cycle, or year (whichever is stricter), as per below: - Salmon: 300 pcs - Other fish species: 6%	Default non-conformity: - major NC; - in case of repetitive major NCs in the same, or consecutive, certificate cycle – certificate withdrawal
Indicator 2.4.14**	The UoC shall not have more than one Mass Escape Event per nine years, defined as: - Salmon: >5000 pcs - Other fish species: >6% Total Escape Count	
Indicator 2.4.15**	The UoC shall count with a minimum of 98% accuracy.	
Indicator 2.4.16**	The UoC shall carry out a site-specific handling and containment risk assessment, approved by a member of senior management, according to the following: - Incorporating all steps of the risk management matrix in Table 6 - Incorporating all handling steps and parameters ensuring containment in Table 7	
Indicator 2.4.17**	The UoC shall implement measures for the following situations: - Preventive measures risks determined to be Low, - Change of handling process / containment system for risks determined to be Medium or High, and - Contingency measures for any incidence of escape.	Default non-conformity: - major NC
Indicator 2.4.18**	The UoC shall review and where needed revise the risk assessment (Indicator 3.5.2) and respective measures (Indicator 3.5.3), with the following frequency: - Prior to starting a new farm activity,	

[172] Calculated at the end of the production cycle, or year (whichever is greater). Total Escape Count = Known Escapes + Unexplained Losses (= stock count – harvest count - mortality count – known escapes). Stock count, harvest count and larger mortality count shall be counted with ≥ 98% counting accuracy.

	- Following feedback on major issues from employees (Indicators 3.1.3, 3.12.1, 3.12.8), - Following accidents or near misses, and - Annually.	
Indicator 2.4.19**	The UoC shall train all relevant staff on handling procedures to minimise escapes due to handling errors.	
Indicator 2.4.20**	The UoC shall log handling/containment accidents and near misses.	
Indicator 2.4.21**	The UoC shall, where commercially available, use mono-sex culture. For tilapia producers, the UoC shall culture all-male or sterile fish.	
Indicator 2.4.22**	The UoC shall, for relevant species, prevent in-culture spawning.	

Table 4: *Additional Requirements for UoCs that produce species in areas ranked as Moderate (MO) risk.*

Additional Requirements		
Realm Risk:	**Major (MR)/Massive (MV)**	**Assurance response:**
Exemptions to the Major/Massive Category: o *If the Impact Mechanism is Hybridisation, UoCs that culture sterile/triploid stock are exempted from the Additional Requirements.* o *UoCs that can demonstrate that their culture system prevents successful escapes (i.e. fish surviving), are exempted from the Additional Requirements.*		
Indicator 2.4.23**	The UoC shall not exceed the Total Escape Count[173] per production cycle, or year (whichever is stricter), as per below: - Salmon: 300 pcs - Other fish species: 6%	Default non-conformity: - certificate withdrawal
Indicator 2.4.24**	The UoC shall count with a minimum of 98% accuracy.	Default non-conformity: - major NC
Indicator 2.4.25**	The UoC shall carry out a site-specific handling and containment risk assessment, approved by a member of senior management, according to the following: - Incorporating all steps of the risk management matrix in Table 6 - Incorporating all handling steps and parameters ensuring containment in Table 7	
Indicator 2.4.26**	The UoC shall implement measures for the following situations: - Preventive measures risks determined to be Low - Change of handling process/containment system for risks determined to be Medium or High, and - Contingency measures for any incidence of escape.	
Indicator 2.4.27**	The UoC shall review and where needed revise the risk assessment (Indicator 3.5.2) and respective measures (Indicator 3.5.3), with the following frequency: - Prior to starting a new farm activity, - Following feedback on major issues from employees (Indicators 3.1.3, 3.12.1, 3.12.8), - Following accidents or near misses, and - Annually.	
Indicator 2.4.28**	The UoC shall train all relevant staff on handling procedures to minimise escapes due to handling errors.	

[173] Calculated at the end of the production cycle, or year (whichever is greater). Total Escape Count = Known Escapes + Unexplained Losses (= stock count – harvest count - mortality count – known escapes). Stock count, harvest count and larger mortality count shall be counted with ≥ 98% counting accuracy.

Indicator 2.4.29**	The UoC shall log handling/containment accidents and near misses.	
Indicator 2.4.30**	The UoC shall, where commercially available, use mono-sex culture. For tilapia producers, the UoC shall culture all-male or sterile fish.	
Indicator 2.4.31**	The UoC shall, for relevant species, prevent in-culture spawning.	
Indicator 2.4.32**	The UoC shall use triploid or otherwise sterile stock, or, produce in escape-proof systems, within six years upon effective date of the ASC Farm Standard.	

***Table 5**: Additional Requirements for producers that produce species in areas ranked as Major (MR) or Massive (MV) risk.*

Table 6

Assess the risk of your activities						**Manage your risks**						
Assess each farm activity, considering all topics from Table 7	How could animals escape	Existing risk prevention measures	Initial Risk Score (R) *Likelihood (L) x Impact (I)*			Additional preventive measures to reduce likelihood or size of escape event for all risks rated medium or higher	Monitoring of preventive measures		Final Risk Score (R) *Likelihood (L) x Impact (I)*			Contingency measures/ plans
			L	*I*	*R*		*who*	*when*	*L*	*I*	*R*	

Table 7

Handling steps	Transport on-site
	Grading
	Harvest
	Other handling which poses increased risk for escapes
	For cage-culture to consider as well: - Boat handling around structures/nets - Net cleaning - Net changes
	For land-based systems to consider as well: - Water exchange - Screen/barrier cleaning
Parameters ensuring containment	Net/screen/barrier mesh size
	Predator prevention
	For cage-culture to consider as well: - Net strength - Net tightening
	For land-based systems to consider as well: - Likelihood of direct access to open waterbody

Appendix 7 – ASC Benthic Monitoring Programme

Introduction

This Appendix provides the details of the ASC Benthic Monitoring Programme as relates to Criterion 2.5 - Benthic Impacts. It also provides the details of the sampling required for farms using copper nets or copper-treated nets.

The ASC Benthic Monitoring Programme for cages (marine/brackish and freshwater) and suspended marine mollusc systems is based on Ecological Quality Status (EQS) categories to define the health of the benthos. The programme uses a tiered assessment approach in which the number of sampling locations and the complexity of analysis increases based on initial monitoring data. For freshwater systems discharging into rivers, the programme uses faunal surveys in the receiving water body downstream and upstream of the effluent discharge point to assess benthic biodiversity as a measure of aquatic ecosystem health.

1. Cages in marine/brackish waters, cages in freshwater lakes/reservoirs, and suspended marine mollusc systems

1.1 Ecological Quality Status (EQS) categories

For cages in marine/brackish waters, cages in freshwater lakes/reservoirs, and suspended marine mollusc systems, the ASC Benthic Monitoring Programme uses five EQS categories to define abiotic and biotic qualities based on macrofaunal communities. The EQS categories are outlined in Table 1.

Table 1. Descriptions of benthic macrofauna assemblages for each of the five Ecological Quality Status (EQS) categories.

EQS category	Definition
High Status	***No or very minor disturbance***: Species abundance, richness and diversity is high and sensitive taxa dominate. Opportunistic taxa are absent or of negligible abundance. Geochemical quality elements indicate aerobic conditions with low free sulphide toxicity.
Good Status	***Slight disturbance***: The level of diversity and abundance of invertebrate taxa is slightly reduced. Most of the sensitive taxa are present but slightly reduced. Opportunistic taxa are present but negligible. Geochemical quality elements indicate aerobic sediment conditions with a slight increase in free sulphide levels.
Moderate Status	***Moderate disturbance***: The level of diversity and abundance of invertebrate taxa is moderately reduced. Sensitive taxa have negligible abundance or are absent. Tolerant and first-order opportunistic taxa co-dominate in abundance. Geochemical quality elements indicate a

	moderate increase in anaerobic conditions with free sulphide levels known to be lethal to sensitive and indifferent taxa.
Poor Status	***Major disturbance***: Evidence of major alterations to the values of the biological quality elements. Diversity is greatly reduced with sensitive and indifferent taxa showing negligible abundance or are absent. Tolerant taxa are sub-dominant to first-order opportunistic taxa. Geochemical quality elements indicate a major increase in anaerobic conditions and sulphide concentrations lethal to most taxa.
Bad Status	***Severe disturbance***: Evidence of severe alterations to the values of the biological quality elements and in which large portions of the relevant biological communities normally associated with undisturbed conditions are absent. First-order opportunistic taxa dominate but are greatly reduced in abundance. Geochemical quality elements indicate a severe increase in sulphide concentrations that are lethal to all taxa.

1.2 Thresholds for Indicators of organic enrichment and corresponding EQS categories

Thresholds for both biotic and abiotic Indicators of organic enrichment have been established for each of the EQS categories and they are outlined in Table 2.

Table 2. Abiotic and biotic thresholds for each of the five EQS categories.

Indicators of organic enrichment	Indicator thresholds per EQS category				
	High	Good	Moderate	Poor	Bad
Total Free Sulphide (S^{2-}; µM)	0 to 75	75 to 250	250 to 500	500 to 1100	> 1100
Redox potential (Eh_{NHE})	>0		0 to -100	-100 to -150	<-150
pH	>7.5		7.1 to 7.5	6.8 to 7.1	<6.8
Total Ammonia Nitrogen (TAN; mg/L)	NA	NA	1.9[174]	NA	NA
Richness (*S*%; % of max *S*)	>80	50 to 80	35 to 50	15 to 35	<15

[174] At pH 7 and 20°C. For other pH and/or temperature see dependent value in section 1.5, Table 4.

Opportunistic Taxa (*GrV; %*)	<20	20 to 40	40 to 60	60 to 80	>80
Polychaete/Amphipod Ratio (*BPOFA*)	<0.031	0.031 to 0.126	0.126 to 0.187	0.187 to 0.237	>0.237
AZTI's Marine Biotic Index (*AMBI*)	<1.2	1.2 to 3.0	3.0 to 3.9	3.9 to 4.8	>4.8
Multivariate *AMBI* (*M-AMBI*)	>0.83	0.83 to 0.59	0.59 to 0.47	0.47 to 0.35	<0.35
Benthic Habitat Quality (*BHQ*)	8 to 15	6 to 8	4 to 6	2 to 4	<2
Simplified Richness (S_{50})	>16	11.7 to 16	7.5 to 11.7	5.4 to 7.5	<5.4
Benthic Quality Index (*BQI*)	>16.0	12.0 to 16.0	8.0 to 12.0	4.0 to 8.0	<4.0
Benthic Quality Index (*BQI-family*)	>20.8	9.2 to 20.8	5.7 to 9.2	1.9 to 5.7	<1.9
BENTIX	>0.67	0.5 to 0.67	0.42 to 0.49	0.33 to 0.41	<0.33
Norwegian Quality Index (*NQI1*)	>0.86	0.68 to 0.86	0.43 to 0.68	0.20 to 0.43	<0.20
Norwegian Sensitivity Index (*NSI*)	> 27.4	23.1 to 27.4	18.8 to 23.1	10.4 to 18.8	< 10.4
Indicator Species Index (ISI_{2012})	>9.6	7.5 to 9.6	6.2 to 7.5	4.5 to 6.2	<4.5
Enrichment Stage (*ES*)	1	2	3 to 4	4 to 5	6 to 7

1.3 Tiered Sampling Requirements

The monitoring and sampling analysis shall be conducted by personnel that are either independent of the company owning the farm or approved by regional/national regulators. Personnel performing this work are required to undergo training and demonstrate competence and proficiency in the use of all required methodologies and technologies employed under the revised requirements.

1.3.1 Cages in Marine/Brackish Waters

1.3.1.1 Sampling protocol

Tier 1:

- Sediment monitoring sampling (Indicator 2.5.1) shall be conducted in triplicate in each of the three farm monitoring zones outlined in Figure 1 and at the reference monitoring zone: within 30, between 31 to 100, between 101 to 150 and at 500 meters from the edge of the cage array, in the direction of the predominant current.
- Samples shall be analysed immediately on the survey vessel for total free sulphide (S^{2-}; in triplicate [9 analysis in total for each sampling location]) and redox potential (*Eh*: single measure [3 analysis in total for each sampling location]) in surface sediments (0 to 2 cm depth) using the rapid field analysis methods given in section 1.5.
- The mean values of the 9 S^{2-} and the 3 *Eh* analysis shall be compared with Table 2 to determine the EQS category and compared with Table 3 to determine if the EQS categories in all monitoring zones lead to an acceptable benthic status.
- If the results of the sediment sample analysis indicate an acceptable EQS for each monitoring zone, no additional monitoring sampling is required.
- If an unacceptable EQS is determined for any of the monitoring zones, Tier 2 monitoring shall immediately be applied.

Tier 2:

- Sediment monitoring sampling and analysis shall be conducted as for Tier 1 but in three additional transect directions according to Figure 1.
- If the results of the sediment sample analysis of both Indicators and each monitoring zone indicate an acceptable benthic status, no additional monitoring is required.
- If any of the monitoring zones leads to an unacceptable benthic status, the risk for benthic community impacts is estimated to be high, and the UoC shall immediately apply Tier 3 monitoring to further characterise spatial impacts by employing biotic Indicator monitoring.

Tier 3:

- Triplicate samples shall be collected at the sampling locations outlined for Tier 2, at a minimum on the two transects in the direction of predominant current according to Figure 1.
- The samples shall be screened through a 1.0 mm mesh and all organisms preserved for taxonomic analysis.
- The samples shall be analysed for three biotic Indicators from Table 2.
- Results of the three biotic Indicators shall be compared with Table 2 to determine the dominant EQS category per monitoring zone[175] and compared with Table 3 to determine if the EQS categories in all monitoring zones lead to an acceptable benthic status.
- If the dominant EQS category of each monitoring zone indicates an acceptable benthic

[175] For example, if sampling in Tier 3 occurs in four transects, of the 12 EQS categories within a monitoring zone (3 biotic Indicators times 4 sampling locations), the dominant, i.e., 6 or more, determine the EQS category for the monitoring zone. E.g., in the case of 6 Moderate Status EQS and 6 Poor Status EQS, the dominant EQS can be regarded as Moderate Status. In the case of 5 Moderate Status EQS and 7 Poor Status EQS, the dominant EQS is Poor Status.

status, no additional monitoring is required.

Note: In cases where the potential benthic impact of a farm may overlap with another farm (e.g., the reference site falls within 200 m of the adjacent farm), the overlapping transect location or direction may be adjusted to help avoid potential farm interactions. The same applies to any transect/sampling station that would intersect with dry land. Transect directions may also be altered to avoid sampling in areas where water depth changes rapidly along the transect. In all cases, if four sampling transects are used, each should be as close to 90 degrees from each other as possible.

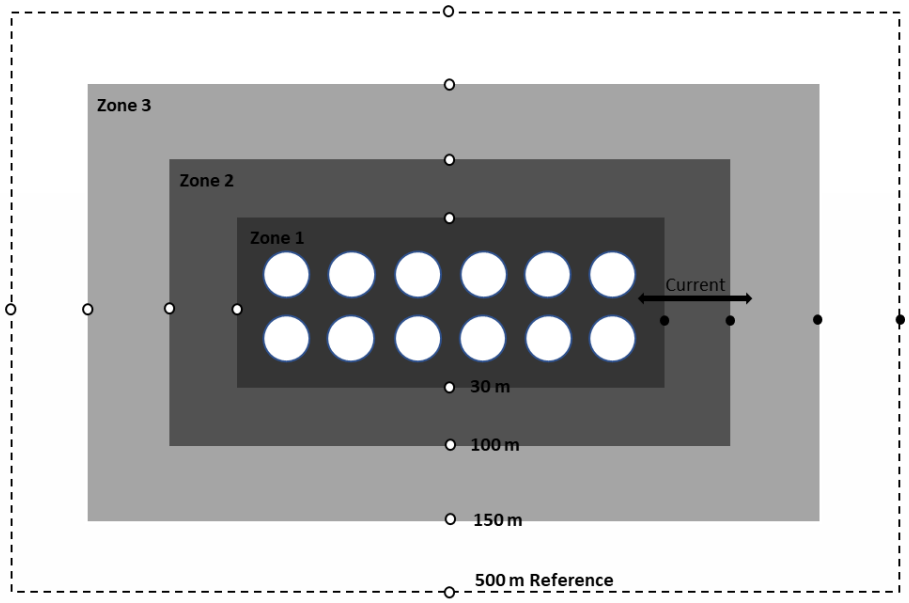

Figure 1. Marine/Brackish Systems: Sampling locations per zone required for Tier 1 (●), 2 (● and ○) and 3 (● and ○) [As a minimum, the two transects in the direction of predominant current].

1.3.1.2 Conformance Framework

The EQS categories determined for each monitoring zone shall be compared with Table 3 to determine the benthic status of the monitoring zone.

Table 3. Monitoring zone EQS categories for “acceptable” benthic status.

Reference Zone EQS Category	Farm Zone	EQS Category for "Acceptable" Benthic Status
High	Zone 1	At least moderate EQS must be achieved by 30 m
	Zone 2	At least good EQS must be achieved by 100 m
	Zone 3	High EQS must be achieved by 150 m
Good	Zone 1	At least moderate EQS must be achieved by 30 m
	Zones 2 and 3	Good EQS must be achieved at 100 and 150 m
Moderate	Zone 1, 2 and 3	At least moderate EQS must be achieved in all zones
Poor or Bad		Not an acceptable category

After three years of demonstrating conformance with Indicator 2.5.2, farms with multiple peaks in feeding/biomass occurring in any year (see section 1.3.1.3) may reduce sampling to once per certification cycle (i.e., every three years) as long as there have been no significant changes to farming practices.

1.3.1.3 Sampling Timing

Sampling shall occur during the period when the benthic impact is expected to be highest. Farms shall provide information on when the maximum impact on the benthos is predicted to occur. Based on this information, one of the following monitoring requirements will apply:

- Sampling shall be conducted during the final year of each production cycle at the facility and within 30 days after peak feeding, after peak biomass, or after maximum water temperature, based on the farm’s prediction of highest benthic impact.
- In the case of multiple peaks in feeding/biomass occurring in any year, sampling shall take place within two weeks of the estimated maximum annual water temperature, regardless of when peak biomass occurs.
- In the case of sustained biomass in the months before harvest, sampling shall take place two weeks prior to the final harvest date.

1.3.2 Cages in Freshwater Lakes/Reservoirs

1.3.2.1 Sampling Protocol

Tier 1:

- Sediment monitoring sampling (Indicator 2.5.1) shall be conducted in triplicate in each of the two farm monitoring zones outlined in Figure 2 and at the reference monitoring zone: within 30, between 31 and 100 and at 150 meters from the edge of the cage array, in the direction of the predominant current.
- Samples shall be analysed immediately for redox potential (*Eh*), pH and Total Ammonia Nitrogen (TAN) (single measure for each of the three Indicators [9 analysis in total for each sampling location]) in surface sediments (0 to 2 cm depth) using the rapid field analysis methods given in section 1.5.
- The mean values of the 3 *Eh*, 3pH and 3 TAN analysis shall be compared with Table 2 to determine the EQS category and compared with Table 4 to determine if the EQS categories in all monitoring zones lead to an acceptable benthic status.
- If the results of the sediment sample analysis for all three Indicators indicate an acceptable EQS for each monitoring zone, no additional monitoring is required.
- If an unacceptable EQS is determined for any of the monitoring zones Tier 2 monitoring shall immediately be applied.

Tier 2:

- Sediment monitoring sampling and analysis shall be conducted as for Tier 1 but in three additional transect directions according to Figure 2.
- If the results of the sediment sample analysis of all three Indicators and each monitoring zone indicate an acceptable benthic status, no additional monitoring is required.
- If any of the monitoring zones leads to an unacceptable benthic status, the risk for benthic community impacts is estimated to be high, and the UoC shall immediately apply Tier 3 monitoring to further characterise spatial impacts by employing biotic Indicator monitoring.

Tier 3:

- Triplicate samples shall be collected at the sampling locations outlined for Tier 2.
- The samples shall be screened through a 1.0mm mesh and all organisms preserved for taxonomic analysis.
- The samples shall be analysed for three biotic Indicators from Table 2.
- Results of the three biotic Indicators shall be compared with Table 2 to determine the dominant EQS category per monitoring zone[176] and compared with Table 4 to determine if the EQS categories in all monitoring zones lead to an acceptable benthic status.
- If the dominant EQS category of each monitoring zone indicates an acceptable benthic status, no additional monitoring is required.

[176] Of the 12 EQS categories within a monitoring zone (3 biotic Indicators times 4 sampling locations), the dominant, i.e., 6 or more, determine the EQS category for the monitoring zone. For example, in the case of 6 Moderate Status EQS' and 6 Poor Status EQS' , the dominant EQS can be regarded as Moderate Status. In the case of 5 Moderate Status EQS' and 7 Poor Status EQS', the dominant EQS is Poor Status.

Note: In cases where the potential benthic impact of a farm may overlap with another farm (e.g., the reference site falls within 100 m of the adjacent farm), the overlapping transect location or direction may be adjusted to help avoid potential farm interactions. The same applies to any transect/sampling station that would intersect with dry land. Transect directions may also be altered to avoid sampling in areas where water depth changes rapidly along the transect. In all cases, four sampling transects are required, with each being as close to 90 degrees from each other as possible.

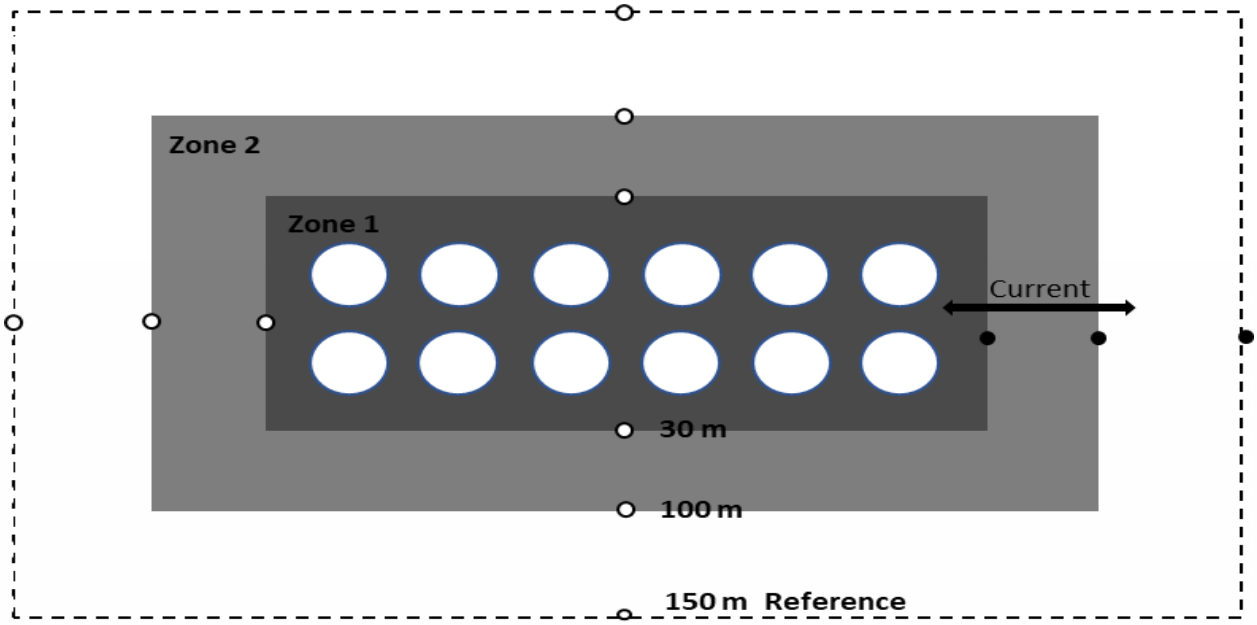

Figure 2. Cage Systems in Freshwater Lakes/Reservoirs: Sampling locations required for Tier 1 (●), 2 (● and ○) and 3 (● and ○).

1.3.2.2 Conformance Framework

The EQS categories determined for each monitoring zone shall be compared with Table 4 to determine the benthic status of the monitoring zone.

Table 4. Monitoring zone EQS categories for “acceptable” benthic status.

Reference Zone EQS Category	Farm Zone	EQS Category for "Acceptable" Benthic Status
Good to High	Zone 1	At least moderate EQS must be achieved by 30m
Moderate	Zone 1 and 2	At least moderate EQS must be achieved in both zones
Poor or Bad		Not an acceptable category

1.3.2.3 Sampling Timing

Sampling must be conducted as per the timing in section 1.3.1.3 - Sampling Timing for Cages in Marine/Brackish Waters.

1.3.3 Suspended Marine Molluscs Systems

1.3.3.1 Sampling Protocol

Tier 1:

- Sediment monitoring sampling (Indicator 2.5.1) shall be conducted in triplicate at each of the seven sampling locations situated 10 m apart along a single transect that runs in the direction of the predominant current (Figure 3).
- Samples shall be analysed immediately on the survey vessel for total free sulphide (S^{2-}; in triplicate [9 analysis in total for each sampling location]) and redox potential (*Eh*: single measure [3 analysis in total for each sampling location]) in surface sediments (0 to 2 cm depth) using the rapid field analysis methods given in section 1.5.
- The mean values of the 9 S^{2-} and the 3 *Eh* analysis shall be compared with Table 2 to determine the EQS category and compared with Table 5 to determine if the EQS categories in both sampling location zones lead to an acceptable benthic status.
- If the results of the sediment sample analysis indicate an acceptable EQS, no additional monitoring is required.
- If an unacceptable EQS is determined, Tier 2 monitoring shall be applied immediately.

Tier 2:

- Sediment monitoring sampling and analysis shall be conducted as for Tier 1 but in three additional transect directions according to Figure 3.
- If the results of the sediment sample analysis of both Indicators indicate an acceptable benthic status, no additional monitoring is required.
- If an unacceptable benthic status is determined, the risk for benthic community impacts is estimated to be high, and the UoC shall immediately apply Tier 3 monitoring to further characterise spatial impacts by employing biotic Indicator monitoring.

Tier 3:

- Triplicate samples shall be collected at the sampling locations outlined for Tier 2.
- The samples shall be screened through a 1.0 mm mesh and all organisms preserved for taxonomic analysis.
- The samples shall be analysed for three biotic Indicators from Table 2.
- The biotic Indicator metrics of each similar sampling location of each transect shall be averaged, and the result compared with Table 2 to determine the dominant EQS category per sampling location zone[177] and compared with Table 6 to determine if the EQS categories in both sampling location zones lead to an acceptable benthic status.

[177] Of the 12 EQS categories within a sampling location zone (3 biotic Indicators times 4 sampling locations), the dominant, i.e., 6 or more, determine the EQS category for the monitoring zone. For example, in the case of 6 Moderate Status EQS and 6 Poor Status EQS in zone 1, the dominant EQS can be regarded as Moderate Status. In the case of 5 Moderate Status EQS and 7 Poor Status EQS, the dominant EQS is Poor Status.

- If the dominant EQS category of each sampling location zone indicates an acceptable benthic status, no additional monitoring is required.

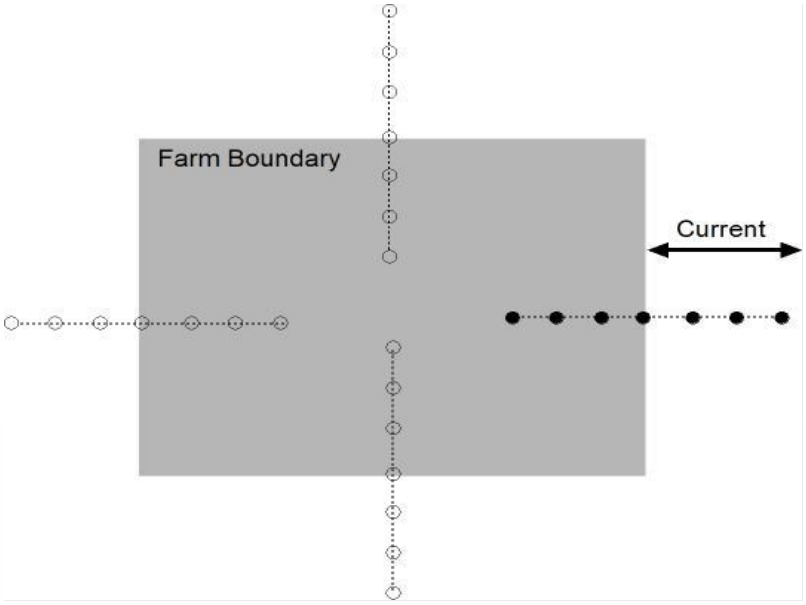

Figure 3. Suspended Marine Molluscs Systems - Sampling locations under Tier 1 (●), 2 (● and ○) and 3 (● and ○) monitoring programmes. Sampling locations on each transect are 10 m apart with the middle station located inside the farm boundary.

1.3.3.2 Sampling Timing

The EQS categories determined for each sampling location zone shall be compared with Table 6 to determine the benthic status of the sampling location zone.

Table 6. Sampling location zones EQS categories for “acceptable” benthic status.

Sampling Location Zones	EQS Category for "Acceptable" Benthic Status
Inside Farm Boundary	At least moderate EQS must be achieved
Outside Farm Boundary	Poor or Bad EQS are not acceptable categories

After three years of demonstrating conformance with Indicator 2.5.2, farms with single or multiple cohorts (see section 1.3.3.3) may reduce sampling to once per certification cycle (i.e. every three years) as long as there have been no significant changes to farming practices.

1.3.3.3 Sampling Timing

- For mollusc farms containing a single cohort, sampling shall be conducted in the final year of production within 30 days after peak biomass.
- For mollusc farms containing more than one cohort (with the potential for multiple peaks in biomass), sampling shall be conducted annually within 30 days from the time of estimated maximum water temperature.

1.4 User-defined Benthic Monitoring Programme

The user-defined Benthic Monitoring Programme allows producers flexibility to defer to a monitoring approach that aligns with regional regulatory requirements, where it can be demonstrated that these programmes have the same capacity to detect the same thresholds for Indicators of organic enrichment across the spatial monitoring zones outlined in Figures 1, 2 and 3. This non-prescriptive approach to monitoring is meant to recognise the in-depth monitoring and regulation of aquaculture in some jurisdictions/countries and to foster innovation. Although ASC does not mandate the use of the ASC Benthic Monitoring Programme, the onus is on the operator to make a highly detailed and convincing case to ASC that their proposed farm monitoring programme meets the following requirements:

The user-defined Benthic Monitoring Programmes shall:

- Clearly outline the operator´s environmental policy and how their monitoring approach is capable of minimising, mitigating or eliminating negative impact on the benthos, biodiversity or ecosystem from organic enrichment.
- Quantify the magnitude and spatial scale of benthic impact adjacent to the farm using proven methodologies, including:
    - Sampling design, locations of samples relative to the farm, sampling methodology, number of replicates.
    - Rationale for selecting reference stations which aligns with the ASC intent of quantifying spatial and annual temporal interactions between the farm and surrounding benthic environment.
    - Provide a rationale for the timing of monitoring that is in line with the maximum potential for benthic impacts.
    - Describe all Indicators to be employed and the sample preparation and analysis procedures.
- Address benthic ecological quality objectives in a manner that is at least as stringent as those described in the ASC Benthic Monitoring Programme.
- Describe the farm-management decision framework used, including quantitative benthic Indicator thresholds that drive decisions and the rationale for selecting thresholds.
- Compare and demonstrate compatibility between the user-defined site impact classifications and the EQS category system, as defined in Tables 1 and 2.

1.5 Standard Operating Procedures for the Field Analysis of Abiotic Indicators Employed in Tier 1 and Tier 2

A. Total Free Sulphide (S^{-2}) Analysis by Direct UV Spectrometry

The methodology includes the field extraction and analysis of porewater in surficial sediments (Cranford et al. (2017) as modified in Cranford et al. (2020)) for core and grab samples.

Materials List

- UV Spectrophotometer suitable for field use (e.g. IMPLEN C40 mobile nanophotometer).
- Quartz cuvette: 200-2500nm spectral range, pathlength 10mm, 1.4ml capacity (e.g. Hellma Analytics No 104-B-10-40). Note that quartz is required.

- 5 cm MacroRhizon porewater extractors (https://www.rhizosphere.com/rhizons/macrorhizons/).
- 10 cc Luer Lock syringes for porewater extraction. Automatic extraction (constant vacuum applied) can be performed with a locking syringe (e.g. VacLok®. www.qosina.com) or by inserting a stainless steel compression springs inside the syringe.
- 100 µL gas-tight syringe (e.g. https://www.hamiltoncompany.com/laboratory-products/syringes/80630).
- 1 mL pipettor or bottle dispenser for rinsing cuvette and for sample dilutions.
- Ammonia hydroxide, 0.44M or similar concentration.
- pH strips for adjusting the dilution water (potable water will suffice) to between 8 and 10.
- Sulphide Certified Reference Material (CRM) for preparing instrument calibration standards prior to field surveys. Sealed ampules containing concentrated sulphide in an inert gas are available from multiple sources (e.g Biopharm Inc. (www.bphchem.com), and NSI Lab Solution). CRM ampules must not contain zinc acetate as that causes the sulphide to precipitate in the ampule.
- 1 and 5 L pipettors and 10 to 20 mL vials for preparing standards.
- Lint-free optical wipes (e.g. Kimwipes) for cuvette cleaning surfaces.

Porewater Extraction

1) Drain water in sampler to sediment surface.
2) Depress syringe plunger, attach to MacroRhizon, and insert the MacroRhizon fully into sediment surface at a 45° angle. Withdraw plunger to create vacuum and start porewater extraction from 0 to 2 cm depth.
3) After approximately 2 min, the syringe should contain sufficient porewater (0.5 to 1 mL).
4) Remove the syringe from the sediment and remove the MacroRhizon. Discard the water in the syringe as this is only used to flush out the MacroRhizon.
5) Insert the 100 µL syringe needle directly into the MacroRhizon and withdraw the 100 µL sample. Luer lock adapters can be connected between the syringe and MacroRhizon to increase the internal sample volume.
6) Rinse any sediment from the syringe and MacroRhizon connectors before reusing.

   Note: The interior of the MacroRhizon is flushed automatically between samples during the extraction procedure.

UV Spectrophotometric Analysis

1) Turn on the UV spectrophotometer and select data output for the 230, 240 and 250 nm wavelengths. Otherwise save the full sample scan.
2) Add small amounts of ammonium hydroxide to 1 L of dilution water until the pH is between 8 to 10. This volume of buffered dilution water is sufficient for daily use.
3) Rinse the quartz cuvette and add 1 mL of the buffered water.
4) Clean the outside of the cuvette with a lint-free wipe and place in instrument. Zero the instrument using this blank solution. Instrument blanking should be performed frequently.
5) Add the 100 µL porewater sample to the cuvette containing 1 mL of buffered water, invert to mix and record the sample absorbance at the three wavelengths.
6) Remove the cuvette, rinse with buffered water and prepare for next sample.

7) Calculate the total free sulphide concentration using the absorbance values and the regression equations determined by the calibration procedure below. Although absorption data are provided for three wavelengths, S^{2-} is only calculated using the lowest wavelength that provides absorbances below 2. If the absorbance at 230 nm is >2, then use the 240 nm absorbance, etc.

Instrument Calibration

The calibration is highly stable and only needs to be conducted once a month to ensure the instrument has not been damaged. A concentrated Certified Reference Material (1000 mg/L) is used as the stock solution for preparing five working standards (1:2, 1:5, 1:10, 1:50 and 1:100 dilutions).

1) Dilute the stock CRM solution to prepare the five known concentrations using pipettors and the buffered water.
2) Blank (zero) the instrument and then analyse the standards using the same procedure as the samples, including dilution with 1 mL of buffered water. Record the results for the three selected wavelengths (230, 240 and 250 nm), omitting any absorbances greater than 2.0.
3) Calculate the three calibration equations (one for each wavelength) using regression analysis (x = absorbance at selected wavelength and y = standard concentration in µM units) while excluding any absorbance values above 2.0.

Note: The following S^{2-} concentration ranges typically apply for the three wavelengths:

- 230 nm: 0 to 2,000 µM (suitable for quantifying all EQS conditions from High to Bad).
- 240 nm: 2,000 to 4,000 µM.
- 250 nm: 4,000 to 15,000 µM.

B. Redox Potential (*Eh*) measurement

Eh can be measured directly in the grab/core using an Oxidation Reduction Potential (ORP) probe that uses a silver/silver chloride or platinum reference electrode. The ORP probe must be calibrated, operated and maintained according to strict manufacturer specifications. ORP measurements (referred to as ORP, $E_{Ag/AgCl}$ or E_{Pt}), are by themselves ambiguous and it is only through specifying the reference scale can the data be interpreted by the user. ORP measurements converted to a hydrogen scale are reported as "*Eh*" and some publications designate the same measurements as Eh_{NHE}. ORP data (mV) obtained in the field with Ag/AgCl or Pt electrodes are converted to the hydrogen scale as follows:

Eh = ORP (mV) + half-cell potential of reference electrode,

where the half-cell potential of the Ag/AgCl or Pt reference electrode is related to the molarity of the filling solution and measurement temperature (see Table 7).

Table 7. Half-cell potential of Ag/AgCl reference electrode

T (°C)	Molarity of KCl (Potassium chloride) filling solution				
	1.5M	3M	3.3M	3.5M	4M
5	254	224	220	219	219
10	251	220	217	215	214
15	249	216	214	212	209
20	244	213	210	208	204
25	241	209	207	205	199
30	238	205	203	201	194

- The ORP probe can be inserted directly into the sediment surface inside the core/grab to ~1 cm depth after mixing the sediment around the probe location to 2 cm depth. Ensure full contact between the ORP electrode tip and wet sediment.
- Record the sample temperature.
- The ORP mV reading should stabilise within 1-2 min. If redox conditions are not controlled by single oxidation-reduction reactions, as in oxic sediments, there is often a slow, continuous drift of electrode potentials. An arbitrary time (3-4 min) can be chosen to record mV readings if they do not stabilise sooner. Potentials in reduced sediments usually stabilise more rapidly.
- Correct the ORP potential (mV) relative to the normal hydrogen electrode as described above using manufacturer information on the electrode filling solution and data on sediment temperature.

C. Total Ammonia Nitrogen Measurement

Total ammonium nitrogen (TAN) consists of the ammonium ion (NH_4^+) and un-ionized ammonia (NH_3). NH_3 makes up a higher proportion of TAN at higher pH and is typically associated with most of the toxic effects of TAN. As with total free sulphide analysis, TAN is measured using porewater samples extracted from surficial sediments (0 to 2cm depth). The extraction procedure is described in this section, part A, and utilises RhizoCera samplers inserted to a depth of 2cm in grab samples. Subsamples should be collected without unnecessary exposure to air. Avoid trapping bubbles of air when filling and capping plastic sample vials.

The Eh, pH and temperature of the sediment sample are measured directly in the grab sample (stirred upper 2cm of sediment) using Oxidation Reduction Potential (ORP), pH and temperature probes while the porewater is being extracted in another section of the grab.

Acceptable methods for TAN analysis include spectrophotometry, fluorometry, and electrochemical detection. Gas sensing via the ISE method (Standard Method 4500-NH3 Nitrogen D and E) is an approved approach, but it can be challenging to perform correctly. The major drawback with this method is that it requires at least 50 ml of sample and collection of that quantity of porewater for routine monitoring is not practical under field conditions. The ISE technology has additional disadvantages including high maintenance, frequent calibration, poor performance at low TAN concentrations, and frequent replacement of the sensor system.

Low sample volumes can be accurately analysed using a variety of manual and automated colourimetric methods. The phenate method (Standard Method 4500-NH3 F and G) reacts alkaline phenol and hypochlorite with ammonia to form indophenol blue. The colour intensity is measured photometrically to determine the final concentration. The salicylate method (EPA 350.1) reacts at pH 12.6 with hypochlorite ions and salicylate ions in the presence of sodium nitroprusside as a catalyst to form indophenol. The amount of colour formed is directly proportional to the ammonia in the sample. Results are read at 690 nm. It is preferred that porewater samples should be analysed as soon as possible after sampling (i.e., within an hour). However, samples can be stored in plastic bottles for up to one month in a freezer at below -18°C. Before determination of ammonia, samples should be allowed to defrost slowly, preferably overnight, in darkness.

Hach® Company gained US EPA Equivalence on a simple salicylate method for use in wastewater based on the TNTplus™ Ammonia platform. This is a simple, cost-effective, 15-min test, requiring no calibration and just 0.5 mL of porewater. Independent analysis (Guadalupe-Blanco River Authority, Seguin, Tx) reported the limit of quantification of this Test-In-Tube 831 kit was 1 mg/L, which is sufficient for detecting TAN concentrations exceeding the EQS threshold (Table 10). During analysis, the pH of the water sample must be between pH 4–8 and the temperature of the water sample and reagents must be between 20–23°C. The equipment required consists of a Hach DR3900 spectrophotometer and Hach TNTplus 831 Low Range (1-12 mg/L NH3-N) reagent kits, which each contain 25 test vials.

The TAN concentration, pH, Eh and temperature reported for sediment collected at each sampling site will be used to assess caged fish farm conformance for lake systems (see Table 4).

Table 8 - Temperature and pH-dependent concentration values for total ammonia nitrogen (mg/L) describing the threshold between Moderate and Poor Ecological Quality Status[178][179].

	Temperature (°C)																							
pH	0-7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	4.9	4.6	4.3	4.1	3.8	3.6	3.3	3.1	2.9	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.6	1.5	1.5	1.4	1.3	1.2	1.1
6.6	4.8	4.5	4.3	4.0	3.8	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1
6.7	4.8	4.5	4.2	3.9	3.7	3.5	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1
6.8	4.6	4.4	4.1	3.8	3.6	3.4	3.2	3.0	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1
6.9	4.5	4.2	4.0	3.7	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0
7.0	4.4	4.1	3.8	3.6	3.4	3.2	3.0	2.8	2.6	2.4	2.3	2.2	2.0	**1.9**	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	0.99
7.1	4.2	3.9	3.7	3.5	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95
7.2	4.0	3.7	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.96	0.90
7.3	3.8	3.5	3.3	3.1	2.9	2.7	2.6	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.97	0.91	0.85
7.4	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.96	0.90	0.85	0.79
7.5	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95	0.89	0.83	0.78	0.73
7.6	2.9	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.6	1.5	1.4	1.4	1.3	1.2	1.1	1.1	0.98	0.92	0.86	0.81	0.76	0.71	0.67
7.7	2.6	2.4	2.3	2.2	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0	0.94	0.88	0.83	0.78	0.73	0.68	0.64	0.60
7.8	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53
7.9	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53	0.50	0.47
8.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0	0.94	0.88	0.83	0.78	0.73	0.68	0.64	0.60	0.56	0.53	0.50	0.44	0.44	0.41
8.1	1.5	1.5	1.4	1.3	1.2	1.1	1.1	0.99	0.92	0.87	0.81	0.76	0.71	0.67	0.63	0.59	0.55	0.52	0.49	0.46	0.43	0.40	0.38	0.35
8.2	1.3	1.2	1.2	1.1	1.0	0.96	0.90	0.84	0.79	0.74	0.70	0.65	0.61	0.57	0.54	0.50	0.47	0.44	0.42	0.39	0.37	0.34	0.32	0.30
8.3	1.1	1.1	0.99	0.93	0.87	0.82	0.76	0.72	0.67	0.63	0.59	0.55	0.52	0.49	0.46	0.43	0.40	0.38	0.35	0.33	0.31	0.29	0.27	0.26
8.4	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53	0.50	0.47	0.44	0.41	0.39	0.36	0.34	0.32	0.30	0.28	0.26	0.25	0.23	0.22
8.5	0.80	0.75	0.71	0.67	0.62	0.58	0.55	0.51	0.48	0.45	0.42	0.40	0.37	0.35	0.33	0.31	0.29	0.27	0.25	0.24	0.22	0.21	0.20	0.18
8.6	0.68	0.64	0.60	0.56	0.53	0.49	0.46	0.43	0.41	0.38	0.36	0.33	0.31	0.29	0.28	0.26	0.24	0.23	0.21	0.20	0.19	0.18	0.16	0.15
8.7	0.57	0.54	0.51	0.47	0.44	0.42	0.39	0.37	0.34	0.32	0.30	0.28	0.27	0.25	0.23	0.22	0.21	0.19	0.18	0.17	0.16	0.15	0.14	0.13
8.8	0.49	0.46	0.43	0.40	0.38	0.35	0.33	0.31	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.19	0.17	0.16	0.15	0.14	0.13	0.13	0.12	0.11
8.9	0.42	0.39	0.37	0.34	0.32	0.30	0.28	0.27	0.25	0.23	0.22	0.21	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.10	0.09
9.0	0.36	0.34	0.32	0.30	0.28	0.26	0.24	0.23	0.21	0.20	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.11	0.11	0.10	0.09	0.09	0.08

2. Freshwater Systems discharging into Rivers

Indicator 2.5.3 requires freshwater systems that discharge into rivers to conduct sampling of the benthic macro invertebrate habitats in the receiving body of water up and downstream of the effluent discharge point. The UoC must demonstrate that the downstream benthic status is similar to or better than, the upstream benthic status.

Minimum requirements for the macro invertebrate sampling:

Classification system

The benthic health classification system must have at least five categories of benthic status (faunal indexes).

[178] From "Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013. U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology Washington, DC.
[179] The underlined value is the threshold that applies to sediments with 7.0 pH and 20oC. The applicable thresholds for measurements taken at other ambient sediment conditions are shown.

Scope of the sampling

Samples must be analysed to determine composition, abundance, diversity and presence of benthic invertebrate fauna in the receiving water body (upstream and downstream from farm outlet). The analysis must focus on key sensitive Indicator species.

Timing and frequency of the sampling

Samples must be collected once every year upstream and downstream from the farm discharge. In case the downstream survey drops a category according to the faunal index, two consecutive faunal sampling must be conducted during the following 12 months, using the same faunal index system.

After three years of demonstrating conformance with Indicator 2.5.3, a farm may reduce sampling to once per certification cycle (i.e., every three years).

Sampling Locations

The samples must be taken from both midstream and near the bank and must also include marginal areas with slacker water flow. All efforts must be made to isolate the impact of the farm, for example by seeking similar conditions, such as type of bottom, water flow and/or substrate types present along the bank, in the upstream and downstream locations.

The location of sampling sites downstream from the farm must reflect a scientific assessment of the most likely area of potential impact from the farm, with consideration to the mixing of water and the minimum and maximum distance from the farm outlet.

Number of samples

Samples must be collected in at least three transects (10 metres apart), with at least four samples in each transect across the river. This must be conducted both upstream and downstream from the farm outlet.

Analysis of the samples

All samples must be analysed by an accredited laboratory.

Further recommendations for sampling

When and how

When collecting macro-invertebrates, consideration should be given to the seasonality of the presence of the macro-invertebrate species, namely insects in their larval stage of the life cycle. It is generally recommended that samples are conducted during summer and/or winter. In geographical regions like Scandinavia, spring and autumn are recommended as the best times for sampling.

Where to sample

Survey results may depend on the type of water body, type of marginal areas, sample method and sampling practice. More standardised data collection is typically needed to assess the relative merits of sampling in midstream or marginal areas although practical considerations (e.g. strong currents), particularly in wide, deep rivers, will favour the use of marginal samples in areas where the water flow is slacker. If samples are only collected near the bank and/or in the marginal areas, it is recommended to sample all available substrate types present along the bank.

Sampling gear

The sampling should be undertaken using standard equipment such as surber sampler, handnet and grab. More detailed sampling guidelines can also be found in the following ISO standards: ISO 8265, 7828 and 9391.

3. Copper levels in the sediment - Sampling Protocol

For cage farms located in marine/brackish waters using copper nets or copper-treated nets, sampling for copper levels in the sediment (Indicator 2.11.7) shall be conducted at the same time as the benthic sampling. Samples shall be taken in duplicate, at 50 metres from the cage edge and at the reference location in three of the transects as required by Tier 2 of the ASC Benthic Monitoring Programme for cages in marine/brackish waters.

Appendix 8 - Water Quality

1.1 Receiving Water Classification

Receiving waterbodies (RW) shall be classified as Type A (sensitive freshwater and marine lentic), B (sensitive lotic) or C (less sensitive freshwater or marine) based on their sensitivity to nutrient enrichment.

- Marine RW will include off-shore and inshore coastal systems and more enclosed water bodies susceptible to seawater intrusion through tidal exchange, storm-surge or other diffusion effects. Most marine systems will fall into Type A or C categories.
- Freshwater and marine systems shall, by default, be considered as Type A, unless the following conditions can be demonstrated:
    - Fully unenclosed systems in off-shore or near-shore oceanic locations shall be classified as Type C, or
    - If their hydraulic residence time (HRT) is less than five days, they shall be classed as Type B unless the following can be demonstrated, in which case they can also be classified as Type C: low flow rate is > 1000m^3/s and/ or total suspended solids (TSS) is >20mg/l at low flow.

1.2 Hydraulic Residence Time (HRT)

HRT can be evaluated using the ASC Water Quality Calculator or steady-state (long-term average) HRT values can be derived from secondary data or calculated as follows:

Mean hydraulic residence time (HRT; days) = (86400 * Q) / (1,000,000 * A * $\bar{z}$)

Where:

- Q (m^3/s) = the steady state (long-term) average flow of water through the WUM outflow (this will require knowledge of residual flow in Type B systems)
- A (km^2) = the average (long-term) area of the waterbody
- $\bar{z}$ (m) = the average (long-term) mean depth of the WUM

If measurements are not available, there are a number of publicly accessible global databases that can be used to obtain annual outflow estimates. Data sources include:

HydroAtlas, accessed November 22, 2023: https://www.hydrosheds.org/hydroatlas

G-RUN: Global Runoff Reconstruction, accessed November 2023: https://doi.org/10.6084/m9.figshare.9228176

1.3 Determination of Flow Rate and Total Suspended Solids (TSS)

For verification of Type C classification, flow rates and total suspended solids (TSS) may be derived from credible secondary sources or measurements.[180]

- A credible secondary source shall include at least five years of daily flows. The low flow is the 25th percentile of the cumulative distribution of the most recent five years for which data are available.
- Measured flow rates can be derived in the following manner:
    - Four (quarterly) flow rate measurements are to be made over the course of a calendar year. Measurements shall be made during periods of intermediate and low flow. The low flow is the lowest of the four flow measurements made over the course of a year.
    - For derogation against cage depth requirements (Indicator 2.6.14), flow-rate can be measured using acoustic doppler current profilers deployed on the seafloor below cages.
- Samples for TSS measurement shall be collected during periods of intermediate and low flow (i.e., can be the same time as flow measurements are made). Analytical methods are described in **Appendix 8 (2.3.5)**.
- When secondary data is used, there shall be a minimum of six TSS observations collected over the course of one year. The TSS used for waterbody classification is the geometric mean[181] of all relevant measurements.

1.4 Identifying Hydrodynamically Isolated Embayments

Hydrodynamically isolated embayments (HIE) are enclosed basins, freshwater or marine having limited flushing[182] and should be treated as a separate WUM for water quality monitoring purposes. Estuaries and lagoons are typical HIEs.

If the farm's local regulator has not already classified the site as a HIE using an appropriate system, the following attributes are to be used for initial scoping:

- poor connectivity to deep offshore waters and/or

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[180] Credible secondary sources for flow rates include government flow monitoring and modelling, as well as publicly available databases, e.g., WWF Risk Filter Suite, accessed November 22, 2023: https://riskfilter.org/ and Water Risk Atlas, accessed November 22, 2023: https://www.wri.org/aqueduct.

[181] Geometric means (GM) shall be calculated as the nth root of the product of n data points. For example, the GM of four numbers: 1, 10, 10 and 100 is calculated as the 4th root of (1 x 10 x 10 x 100)
= 4th root of 10,000
= 10
(**Note:** the GM will always be equal to or lower than an arithmetic mean)

[182] Based on a classification in Rami, A.M., Barry, D.A., Bakhtyar, R., Dantec, N. Le., Dastgheib, A., Lemmin, U. and Wüest, A. (2013) Current variability in a wide and open lacustrine embayment in Lake Geneva (Switzerland). *Journal of Great Lakes Research, 39, 455-465*:http://dx.doi.org/10.1016/j.jglr.2013.06.011.

- sheltered from more energetic conditions e.g., inflows, currents, exposure to onshore or monsoonal winds and
- the hypolimnion (the densest bottom layer in a stratified waterbody or part thereof) is periodically or permanently poorly flushed.

Where a basin appears to share these attributes, onus is on the UoC to demonstrate that a basin is not a HIE using the following approach.

Water quality measurements are made along a transect running from inside an embayment into the main water body (**Figure 1**). Measurements should be conducted as follows:

1. Identify the narrowest point in the embayment opening (red line in Figure 1).
2. Establish two transects of equal length starting at the narrowest point and extending in and out of the embayment (black dashed line in Figure 1).
3. At an equal number of equally spaced sites in each transect, collect epilimnetic (0.5m) water samples.
4. Analyse the water samples, for a conservative tracer (chloride, conductivity or salinity) or a nutrient.
5. Plot concentrations of water quality determinants against their position along the transects.

When embayments are hydrologically isolated, there will be a monotonic trend (either decreasing or increasing) in concentrations from sites 1-7 (within the embayment) to the furthest offshore site in the main water body (site 13). An embayment is not hydrologically isolated when there is no significant monotonic trend. Trend significance can be determined using the linear regression functions in Excel.

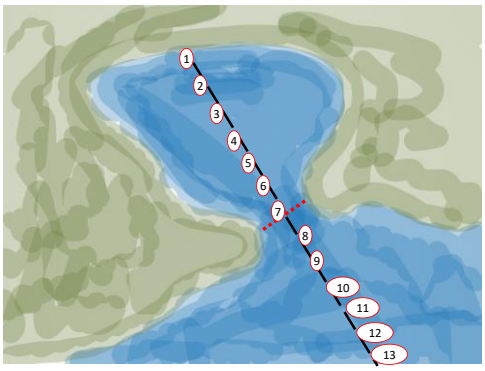

Figure 1. Tracer sampling points along a transect for HIE determination (Futter, M. (2023) *Personal drawing)*.

More complicated assessments using, e.g., three-dimensional modelling could also be conducted by competent third parties.

2.1 Characterisation of a Waterbody Unit of Management (WUM)

Parties to the Area Management Agreement (AMA; **Appendix 8 (2.2)**) shall collectively define a **Waterbody Unit of Management (WUM)** based on the following guidelines. The area covered by the WUM must reflect a logical geographic scope, such as a lake (or part thereof) and its contributing catchment area. Boundaries should be defined based on coherent characteristics in terms of natural processes and catchment land use and, most fundamentally, the zone in which cumulative impacts are likely to affect ecosystem structure and function. Hydro-morphology, bathymetry, water movement and stratification characteristics are of particular importance, i.e., the size, shape and structure of a water body will shape the flow and quantity of water, sedimentation and nutrient retention in the water column. WUM boundary setting should also reflect the ability to realistically manage eutrophication risk within it.

If area-based water quality monitoring and setting of targets for managing good ecological status is already a regulatory requirement of the farm's jurisdiction, then farms will use this definition as the WUM. *This does not apply where boundaries are operationally (e.g., based on administrative jurisdiction), rather than biophysically, defined*.

Where localised risk of adverse impact is elevated due to cumulative effects, e.g., in hydrodynamically isolated embayments (HIE) of larger waterbodies or zones subject to more localised stratification effects (e.g., due to shallow and/ or narrow sills within or at the mouth of an enclosed tidal waterbody), then the HIE equates to the WUM by default. HIEs are defined as enclosed "lake or fjord-like" basins having limited or intermittent flushing[183] , with the following attributes:

- Poor connectivity to deep offshore waters, or
- Sheltered from more energetic conditions, e.g., inflows, currents, exposure to onshore or monsoonal winds, or
- The hypolimnion (the densest bottom layer in a thermally or salinity stratified lake/fjord or part thereof) is periodically or permanently poorly flushed.

A WUM map shall clearly indicate:

- The WUM boundary.
- The distribution of all operational aquaculture facilities releasing effluents into the WUM, including cages and any land-based farms, further differentiating ASC certified/applicant and non-certified farms.
- Any zones earmarked for future farming expansion.
- All farm and WUM-level sampling sites identified following guidance in **Appendix 8 (2.3)**. The map shall be revised on an annual basis to reflect any changes in these

[183] Rami et al. (2013)

parameters. The map shall be accompanied by a written rationale explaining the basis for the boundary setting.

Any UoC discharging effluents to a river or channel flowing into a type A system shall be included within its WUM if it is located <1km upstream of the river/ channel mouth.

2.2 Area Management Agreement (AMA)

All UoCs within Type A (sensitive freshwater and marine lentic) systems shall be parties to an area management agreement for the purpose of managing ecological status of the receiving water body.

Membership shall also include any non-certified farms in the WUM that are owned by existing ASC certificate holders or applicants for ASC certification.

An AMA focal point shall be designated to coordinate collective actions (below) and to implement WUM-level reporting requirements. Ideally, his will be a rotating position, though determination is left to the discretion of the AMA membership.

The AMA shall include commitments to the following collective actions:

1. Defining a Water Body Unit of Management (WUM):

   The AMA shall create a map delineating the boundaries and other characteristics of the WUM (**Appendix 8 (2.1 and 2.3)**).

2. Coordinated environmental monitoring, sharing of data, carrying-capacity planning and response measures within the WUM:

   - **WUM-level environmental monitoring:** implementation of a WUM-level water quality survey, with a baseline to be initiated two years prior to the initial audit in the WUM (**Appendix 8 (2.3)**).
   - **Data sharing:** between members of an AMA, with entities certified under other eco-labels or schemes that address water quality[184], with non-certified farms, and with other stakeholders (sectoral contributors to/impacted by eutrophication, civil society bodies etc.).
   - **Carrying capacity-based planning:** to reduce rates of transition towards TSI breakpoints. An assimilative capacity model with source apportionment to identify all significant upstream nutrient sources will be the collective responsibility of AMA members (**Appendix 8 (2.4)**).
   - **Coordination of corrective response actions**: coordinated management, including a commitment to increase nutrient loading efficiency limits and/or reduce total nutrient loading (e.g., by feed or biomass reductions), to reduce the

[184] For example, the Forestry Stewardship Council: FSC-STD-01-001. FSC Principles and Criteria for Forest Stewardship. Standard (STD). V (5-3). Accessed November 22, 2023: https://connect.fsc.org/document-centre/documents/resource/392

rate of change in receiving water nutrient levels and to prevent an upward transition of trophic status (**Appendix 8 (3.1)**).

3. Outreach to other users contributing to nutrient loading of the WUM to participate in actions under point 2 above. This should, at a minimum, include active sharing of AMA water quality data with relevant stakeholders. Other actions could include:
    - An invitation for third parties to contribute their own environmental and production data for assimilative capacity and source apportionment modelling (**Appendix 8 (2.4)**).
    - Measures to support smallholders, in particular, to improve their nutrient use efficiency and/or minimise nutrient release to the WUM. Evidence of outreach can include copies of correspondence (written and email), agendas and minutes of meetings and third-party stakeholder testimony. Outreach efforts do not need to be reciprocated to meet the intent of Indicator 2.6.2.
4. Polygon data (agreed upon by the members of the AMA) which defines the spatial extent of the WUM is submitted to ASC through the ASC Water Quality Calculator.

2.3 Farm and WUM-level water quality baseline and monitoring surveys – Type A systems

The following requirements apply to Type A systems unless otherwise specified.

2.3.1 Farm Level survey

1. At the initial audit, UoCs located in Type A waterbodies shall present the proposed sampling methodology for collecting farm level baseline data. Where UoCs have 12 months of baseline data at the initial audit, this shall be presented at the initial audit.
2. Replicate farm-level sampling shall be conducted at two sites as follows:
    - **A 'downstream, near-field' farm impacted site:** immediately downstream, at the edge of the farm.
    - **An 'upstream, far-field' reference site:** at a minimum 500m upstream of the farm.
3. Shall, at a minimum, be repeated quarterly, i.e. four times over a 12-month period aiming to capture seasonal variations. In shallower, non-permanently stratified (*holomictic*) freshwater systems measurements should be timed to coincide with, or immediately follow, annual turn-over events[185] subject to safety considerations.

[185] Shallower '*dimictic*' temperate FW systems experience spring and fall turnovers (when light-levels may also limit primary production). '*Polymictic*' tropical/ sub-tropical systems display more erratic patterns, with turnovers often driven by seasonal winds. Deeper FW systems become permanently stratified (meromictic), whilst in marine basins salinity as well as temperature influences water density limiting turnover. The application of a

4. At each site epilimnetic samples (0.5-1.0 m depth below the water surface, above any permanently stratified layer) are to be collected using a VanDorn, Kemmerer or Ruttner type water sampler for laboratory analysis of total phosphorus (TP) and total nitrogen (TN).

At the same time and at the same depth, Chl-a measurements should be made using:

- Ethanol extraction followed by spectrophotometric measurement at wavelengths 665 and 750nm (using accredited methods[186]).
- In-situ measurement using a field spectroflurometer[187]. Probes should be calibrated against manufacturer recommended standards (chlorophyll-a and rhodamine dye) at ambient water temperature and light shielded during operation (e.g., using a perforated tube). Backscattering and absorption of light by suspended particles and dissolved organic matter (DOM) can significantly influence accuracy and should be corrected for during calibration or analysis[188].

On each sampling occasion, for parameters requiring samples for laboratory analysis, three 'field' replicates are to be collected at each site and pooled for analysis.

5. At the same sites Secchi disk (SD) shall be measured and measurements of the depth thresholds at which DO=4mg/l ("zone of oxygen depletion") and DO=2mg/l ("zone of anoxia") are to be reported using a calibrated temperature compensated probe with suitably extended cable length. In the event that a DO threshold is not reached at either 50m depth or 1m off the bottom, this is to be recorded.

2.3.2 WUM level survey

1. If a regulatory body has determined a historical baseline for the water body and its application is consistent with the intent of the ASC Standard, that baseline shall be used.

2. At the initial audit, UoCs located in Type A waterbodies shall present the proposed sampling methodology for collecting WUM level baseline data. Where UoCs have 12 months of baseline data at the initial audit, this shall be presented at the initial audit.

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modified trophic index model for marine inshore waters will be assessed for future application (Vollenweider, R.A., Rinaldi, A. and Montanari, G. (1992) Eutrophication, structure and dynamics of a marine coastal system: results of ten-year monitoring along the Emilia-Romagna Coast (Northwest Adriatic Sea). *Marine Coastal Eutrophication, Proceedings of an International Conference, Bologna, Italy, 21–24 March 1990 1992, Pages 63-106:* https://doi.org/10.1016/B978-0-444-89990-3.50014-6

[186] For example, EPA method 445.0: Method 445.0 In Vitro Determination of Chlorophyll a and Pheophytin ain Marine and Freshwater Algae by Fluorescence, accessed November 22, 2023: https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NERL&dirEntryId=309417

[187] Cost-effective examples include the FluoroSense handheld fluorometer manufactured by Turner Designs and the YSI handheld meter with EXO1 (#599080) or EXO2 (#599201) sondes.

[188] See Hamdhani, H., Eppehimer, D.E., Walker, D. and Bogan, M.T. (2021) Performance of a Handheld Chlorophyll-a Fluorometer: Potential Use for Rapid Algae Monitoring. *Water, 13, 1409*: https://doi.org/10.3390/w13101409 and Kuha, J., Järvinen, M., Salmi, P. and Karjalainen, J. (2020). Calibration of in situ chlorophyll fluorometers for organic matter. *Restoration of Eutrophic Lakes, 847, 4377-4387:* https://doi.org/10.1007/s10750-019-04086-z

The baseline data shall encompass seasonal risk factors linking nutrient input levels and dilution effects considering total system flow patterns over dry and wet seasons (noting leaching may elevate nutrient inputs during rains).

3. The duration should also reflect scoping of the anticipated variability in a system and be extended if the period encompasses any exceptional events (e.g., turnovers, deep water flows). Steady-state equilibria should not be anticipated, as eutrophication is a process subject to ongoing and naturally variable rates of change. Thus, in practice, the baseline state will be a parameter average or rate over a defined period of time for which historic water quality data is available/selected.

4. Each WUM-level sampling event must be conducted at (i) **a minimum of 10 sites** where the WUM surface area is less than 200km^2 **or one (1) site for every 20km^2 of WUM area**. All upstream farm reference sites should be included in this total.

5. Sample sites should be distributed across the WUM and encompass the following attributes:

    - Include locations below major influents at the head of the WUM to locations downstream of all existing farming and zones identified with potential for farm expansion during boundary setting (see **Figure 2**).

Figure 2. Example WUM map showing cage-farm locations and water quality sampling sites:

Tasmanian Salmon Farming Data: Macquarie Harbour, accessed November 24, 2023: https://salmonfarming.nre.tas.gov.au/macquarie-harbour

    - As a check that appropriate sites have been selected, the geometric mean of any monitored parameter must indicate superior water quality at farm-level reference sites compared to impacted sites.

    - All farm-level upstream-reference sites should be included in the WUM baseline sample, with additional sites being added to meet the required quota if needed. Subsequent certification entrants should also be used to expand the baseline survey; however, all the original baseline survey points must be retained, i.e., even where certification of 'baseline farms' ceases.

- Sites also serving as farm reference sites shall be at least 500m upstream from the edge of the net pen array and should not be unduly influenced by other anthropogenic nutrient inputs. Shallow inshore sites, including those close to point sources of nutrients, should be avoided.
- All baseline and expansion sites shall be GPS plotted and differentiated on the WUM map. This shall be submitted to ASC and be available for review at audit.

6. WUM water quality sampling shall follow farm-level requirements (3), (4) and (5) described above.
7. No ongoing monitoring of TN, TP, Chl-a or depths of zones of DO depletion will be required at WUM or farm level, if the WUM geometric mean of SD calculated over any rolling two-year period remains ≥10m.

2.3.3 Frequency of adverse turnover events (ATE) and harmful algal blooms (HABs):

The number of ATE and HABs occurring during the past ten years should be determined by the farm through a review of news media and consultation with relevant stakeholders as part of pre-audit due diligence and at audit through interviews with local stakeholders.

Where evidence of fish kill events or loss of other aquatic fauna can clearly be attributed to natural phenomena (e.g., under ice oxygen consumption, geologic activity, etc.), incidents shall not count against frequency limits for the requirements. Both the total number of ATE and those that are ascribed to natural phenomena are to be recorded.

2.3.4 Determination of trophic status - Type A systems

Trophic status can be calculated using the ASC Water Quality Calculator and WUM level monitoring data. WUM and farm-level trophic status shall be based on the calculation of normalised **trophic status indices (TSI)** for four survey parameters: **Secchi depth** (SD; m), **total phosphorus** concentrations ([TP]; µg/l), **total nitrogen** concentrations ([TN]; mg/l) or **chlorophyll-a** concentration ([Chl-a]; µg/l)[189].

Normalised TSI values range from 0 (ultra-oligotrophic) to 100 (hypereutrophic). A TSI of less than 40 is indicative of oligotrophic conditions, while TSI values greater than 50 are indicative of eutrophic conditions. TSI values between 40 and 50 are indicative of mesotrophic conditions (Table 1).

[189] More information about the equations used for TSI assessment, including the relevant peer-reviewed scientific literature, is provided in Carlson, R.E. and Simpson, J. (1996) A Coordinator's Guide to Volunteer Lake Monitoring Methods. *North American Lake Management Society, 96 p.*

Table 1. Trophic status classes based on Trophic Status Index (TSI; dimensionless), Secchi depth (SD; m), total phosphorus concentration ([TP]; µg/l), total nitrogen concentration ([TN]; mg/l) and chlorophyll-a concentration ([Chl-a]; µg/l).

TSI	Status	SD (m)	[TP] (µg/l)	[TN] (mg/l)	[Chl] (µg/l)
<30	Ultra-oligotrophic	>8	<6	<0.18	<0.9
≥30-<40	Oligotrophic	4-8	6-12	0.18-0.37	0.9-2.6
≥40-<50	Mesotrophic	2-4	12-24	0.37 – 0.73	2.6-7.3
≥50-<60	Eutrophic	1-2	24-48	0.73-1.46	7.3-20
≥60	Hyper-eutrophic	<1	>48	>1.46	>20

2.3.5 Water quality analytical methods – all systems

Parameters requiring water sampling: TP, TN and TSS shall be measured in unfiltered 500 ml samples collected in clear plastic bottles. These should be placed on ice in a cooler and analysed within 48 hours. Analyses shall be done by an accredited third-party laboratory following standard methods (below) or Hach or equivalent field kits can be used.

Total Phosphorus

- ISO 6878:2004 - Water quality - Determination of phosphorus - Ammonium molybdate spectrometric method.
- ISO 15681-2:2018 Water quality - Determination of orthophosphate and total phosphorus contents by flow analysis (FIA and CFA) - Part 2: Method by continuous flow analysis (CFA).
- 4500-P PHOSPHORUS: Standard Methods for the Examination of Water and Wastewater. Standard Methods Committee of the American Public Health Association, American Water Works Association, and Water Environment Federation

  4500-P Phosphorous, accessed November 22, 2023: https://www.standardmethods.org/doi/10.2105/SMWW.2882.093

Total Nitrogen

- ISO 11905-1:1997. Water quality - Determination of nitrogen - Part 1: Method using oxidative digestion with peroxodisulfate.

- ISO 29441:2010 Water quality - Determination of total nitrogen after UV digestion - Method using flow analysis (CFA and FIA) and spectrometric detection.
- 4500-N NITROGEN. Standard Methods for the Examination of Water and Wastewater. Standard Methods Committee of the American Public Health Association, American Water Works Association, and Water Environment Federation.

  4500-N Nitrogen, accessed November 22, 2023: https://www.standardmethods.org/doi/10.2105/SMWW.2882.086

Total Suspended Solids

- ISO 11923:1997. Water quality - Determination of suspended solids by filtration through glass-fibre filters.
- 2540 SOLIDS. Standard Methods Committee of the American Public Health Association, American Water Works Association, and Water Environment Federation.

  2540 Solids, accessed November 22, 2023: https://www.standardmethods.org/doi/abs/10.2105/SMWW.2882.030?role=tab
- Equivalent to 2540 SOLIDS.

Parameters requiring in-situ analysis using a sensor: DO and chl-a should be measured using an **electronic sensor**[190]. The sensor must be maintained and calibrated according to manufacturer's instructions and must meet the Criteria listed below.

Chlorophyll-a (chl-a) sensor

- Measurement range: 0 - 199µg/l chlorophyll-a.
- Resolution: 0.1µg/l chlorophyll-a.
- Accuracy: +/- 2% of reading.

  Secchi disc transparency: guidance on the appropriate use of a Secchi disk is provided here: 'What is a Secchi disk, accessed November 22, 2023: https://www.nalms.org/secchidipin/monitoring-methods/the-secchi-disk/what-is-a-secchi-disk/'

Dissolved Oxygen (DO) sensor

- Must record both % saturation and temperature corrected / compensated concentrations.
- DO readings must be corrected for altitude and salinity where farms are located above sea level and/ or discharge to brackish receiving waters. Correction factors are available

[190] Whilst laboratory analysis is also possible, variability associated with sample maintenance during transit is likely to present significant challenges in many field settings.

here: 'Dissolved oxygen solubility tables, accessed November 22, 2023: https://water.usgs.gov/water-resources/software/DOTABLES/'

- Range (Polarographic DO): 0.00 to 20.00mg/L
- % Saturation Range (Polarographic DO): 0.0 to 200.0 % saturation
- Resolution (Polarographic DO): 0.01, 0.1mg/L

2.4 Assimilative capacity and source apportionment modelling - Type A systems

Assimilative capacity is the maximum mass of limiting nutrient(s) that can be added to a WUM without causing a shift in trophic status. Current trophic status is determined as based on the TSI for the limiting nutrient(s). When a WUM is limited by both N and P, the TSI to use is the higher of the TSI values for nitrogen and phosphorus.

Aquaculture sectoral contribution to WUM limiting nutrient(s) loading (source apportionment)

Using the ASC Water Quality Calculator, the aquaculture sectoral contribution to WUM limiting nutrient(s) shall be assessed and reported as kg N/12-months and/or kg P/12-months averaged over a rolling 24-month period.

Baseline contributions shall be reported, and sectoral contributions updated on an annual basis.

Estimating sectoral inputs to a WUM requires quantification of the following parameters over each successive 24-month rolling two-year monitoring period:

- Analysis of government databases, permits and licences.
- The total number and area of all farms; cage and land-based, certified and uncertified, releasing diffuse or point-source effluents to the WUM (from dialogue with other farms and/ or satellite data) and/ or;
- Estimates of the total mass of fed animals harvested and the total mass of feed used.

This data shall be used to calculate total N and P nutrient inputs to the WUM using the ASC Water Quality Calculator. This includes assumptions regarding the following parameters, though these may be replaced with locally validated data where available.

- N & P content of formulated diets (% weight) to be differentiated by species and life-stage.
- Stocking densities are to be approximated as the average associated with different production systems.

The aquaculture sectoral contribution is determined based on the modelling of total N and P nutrient inputs to the WUM, by using the ASC Water Quality Calculator. The aquaculture sectoral contribution, also called source apportionment modelling, is calculated using data from the previous 24 months.

2.4.1 Options for third-party assimilative capacity assessment

Farms may also elect to use a third-party assessment where this is implemented as part of a wider Environmental Impact Assessment for Type A systems, up to a maximum of 1,000km^{2,} (e.g., [191,192,193,194]). The requirement does not favour one existing model over another, but it is important to outline key elements of a credible assimilative capacity study. At a minimum, the study must do the following:

- Undertake assessment as to the allocation of capacity for the whole water body.
- Undertake assessment as to land use, slope, sewage, other discharges, stream input.
- Account for retention in receiving waterbody and mixing.
- Predict total nitrogen and total phosphorus concentrations and limiting nutrient status.
- Classify trophic status of Type A systems.
- Undertake impact assessment of the UoC and the aquaculture sector.

The study must pay particular attention to the nature and morphology of the lake basin where the farm is established. The study must analyse, at a minimum:

- Mixing of the surface and bottom waters over a 12-month period.
- Whether bottom waters are permanently or seasonally isolated within the water body.
- The naturally occurring oxygen levels in the surface and bottom waters.
- Whether the receiving waterbody forms part of an enclosed basin, or an area with isolated bottom waters.

3.1 Calculation of TN and TP load per tonne of production – All systems

Indicator 2.6.10 limits the quantity of total phosphorus (TP) and nitrogen (TN) that can be released from the farm per unit of production to a receiving water (nutrient load) over a period of 12 months. Limits are species and life-stage specific (and may requirement upward adjustment in Type A systems subject to other water quality performance outcomes.

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[191] Dillon, P.J. and Rigler, F.H., (1975). A simple method for predicting the capacity of a lake for development based on lake trophic status. *Journal of the Fisheries Board of Canada, 32(9), pp.1519-1531*: https://doi.org/10.1139/f75-178
[192] Kirchner, W.B. and Dillon, P.J. (1975). An empirical method of estimating the retention of phosphorus in lakes. *Water Resources Research, 11(1), pp.182-183*: https://doi.org/10.1029/WR011i001p00182
[193] Reckhow, K.H. (1977). Phosphorus models for lake management. *Harvard University*.
[194] Dillon, P.J. and Molot, L.A. (1996) Long-term phosphorus budgets and an examination of a steady-state mass balance model for central Ontario lakes. *Water Research, 30(10), pp.2273-2280*: https://doi.org/10.1016/0043-1354(96)00110-8

The nutrient load shall be calculated as the quantity of nutrients assimilated in fish biomass (outputs; harvested and standing stock) subtracted from inputs (TN and TP in feeds or fertilisers) using the ASC Water Quality Calculator.

The calculation will be made using one of two 'mass balance' methods; A & B below, contingent on production system and receiving water characteristics.

Method A consists of three approaches. **Method A1** applies to farms releasing **diffuse source** effluents e.g., open-cage systems where it is impracticable to measure effluent nutrient concentrations. **Method A2** applies to lower intensive (lower risk) pond systems whilst **Method A3** is further modified, specifically for lower intensive shrimp/crustacean ponds.

Method B: applies to more intensive systems with point-source effluents, posing greater environmental risk and requires measurement of effluent concentrations in influents and effluents. **Methods B1 and B2** are further differentiated by the farms ability to control discharge of effluents and measure effluent volumes.

Nutrient efficiency is calculated as the quantity of nutrients assimilated in fish biomass (outputs; harvested and standing stock) subtracted from inputs (TN and TP in feeds or fertilisers), with the following variations for methods and systems described above.

Method A1 Farms with diffuse source effluents

1. TP released to the receiving water per unit biomass produced (kg/t) =

   (TP in – TP out)/ biomass produced (t)

   Where:

TN or TP in = Total N or P in feed calculated as:

= ∑ (Total amount of each feed type (product) multiplied by content of N or P) 1.....X), where 1.....X represents the number of different feed types (products) used.

- N content can be calculated using the assumption that proteins contain 16% N
- P content can be determined by chemical analyses of feeds or declaration by the feed producer where national legislation mandates declaration of phosphorus content.

TN or TP out = Total N or P in biomass produced

Biomass produced = Biomass of fish produced over the 12-month period calculated as: (biomass harvested + biomass of removed mortalities + remaining standing biomass) – biomass at start of time-period.

TN or TP content in biomass produced = (biomass produced) * (% of N or P in fish)

- The following P percentages will be used for harvested fish or mortalities:

  (a) fish < than 1 kg: 0.43% (b) fish > than 1 kg: 0.4%

Method A2 Semi-intensive and extensive farms with point source effluents

Method A2, adapted for extensive or semi-intensive land-based systems with point-source effluents, provisions for deduction of N & P in sludge removed from culture or settlement ponds.

- N or P content shall be determined through analysis of samples representative of the removed batch.
- *The farm must also demonstrate the sludge was physically removed from the farm site and deposed of*. Any fertiliser inputs should also be accounted for.

Input/output terms in equation (1) above is modified as follows:

[TN or TP input (= Total N or P in feed and/ or fertiliser) **- TN or TP out** (= Total N or P in biomass produced and Total N or P in sludge removed)] / biomass produced (t)

Method A3 For earthen shrimp ponds with daily water exchange of 10% or lower

N and P loads in effluents are assumed to equal 30% and 20% of N and P inputs, respectively (accounting for pond-bottom adsorption, N volatilisation and assimilation in shrimp biomass) allowing for the following simplified calculation:

N load (kg/t) = N input in kg x 0.3 / tonnes produced

P load (kg/t) = P input in kg x 0.2 / tonnes produced

Method B: In this approach, nutrient load will be calculated as the difference between [N] and [P] concentration measured in influent water and farm effluents, multiplied by total effluent volume. Standard analytical methods for determination of [N] & [P] are given in **Appendix 8 (2.3.5)**.

The same data used for estimation of conformance with Indicator 2.6.17 can be used, i.e., collected at a minimum quarterly frequency, including sampling at peak biomass. Estimation of effluent volume should account for all discharge from culture ponds and treatment systems to receiving waters over 12 months prior to audit.

Method B1 Farms that control discharge of effluents and can measure the volume of effluent water:

N or P load (kg/tonne produced) =

(([N or P effluent water] - [N or P supply water]) × (effluent water in m^3)) / 1000/ tonnes produced.

Method B2 Farms that cannot measure the volume of effluent water:

N or P load (kg/tonne produced) =

(([NP effluent] - [NP supply]) x pond m^3 × (production cycles over 12 months) + ([NP effluent] – [NP supply] x pond m^3 x daily water % renewal x (PC/12 months)) / 1000/tonnes of biomass produced over 12 months

Note: intensive farms eligible for these requirements will have monitored N and P inflow and effluent concentrations for modelling downstream rate of change in these concentrations (Indicator 2.6.16).

Conformance with method A or B results shall be assessed against species/system-specific limits shown in Table 2.

Table 2 Feed (and fertiliser) N&P 'nutrient efficiency' metric limits (kg/t fish yield/12-months)

Species	Life Stage	System	TP out (kg/t)	TN out (kg/t)
Salmon	Grow - out	All	≤ 4	<70
Freshwater Trout	Grow - out	Land-Based	≤ 4	<70
		Cages	≤ 5	<75
Pangasius	Grow - out	All	≤ 7.2	≤ 27.5
Tilapia	Grow - out	All	≤ 20	≤ 27.5
Shrimp:				
L. vannamei	Grow - out	Ponds	< 3.9	≤ 25.2
P. monodon	Grow - out	Ponds	< 5.4	≤ 32.4
Cherax spp. Procambarus spp. Astacus spp.	Grow - out	Ponds	<4	< 26.1
Macrobrachium spp	Grow - out	Ponds	< 6.1	< 39.2

3.2: Calculation Methodology for the Percentage of Fines in Feed

Introduction

Fines are dust and fragments in the feed. Excessive fines can reduce nutrient efficiency performance, thereby elevating eutrophication pressure. Testing by the manufacturer is permissible where equivalency with the following methodology can be demonstrated and there is no significant risk of feed deterioration during subsequent handling, storage or application.

Feed sampling protocol

Sampling of feed lots—delivered as material in bulk, big bags or small bags—shall, at a minimum, be sampled as follows:

1. Cut a minimum of six increment samples from the lot, evenly distributed throughout the lot.
2. Each increment sample should have a mass of approximately 500 g.
3. Make a pooled sample from all the increment samples and be sure to use all sampled material (i.e., around 6 kg).
4. Reduce the pooled sample to one analysis sample (for testing), each of approximately 500 g.

Testing procedure

This method determines the fines (dust and small fragments) in **finished fish feed product, which has a diameter of 3 mm or more**. The amount of dust and fragments shall be determined when the feed is delivered to the farming site[195].

The test can be performed either by use of a sieving machine or by a manual test. The sample of feed shall be put through a sieve with a maximum sieve opening of:

- 1 mm when the particle diameter is equal to 5 mm or less
- 2.36 mm when the particle diameter is more than 5 mm

Manual test

1. Put the accumulation box and the sieves on top of each other, with the accumulation box on the lowest part, then the smallest sieve and the biggest on top.
2. Place the sieves on the balance and tare it.
3. Weigh at least 300 g of the feed on the upper sieve, note the weight (m0).
4. Put on the lid & sieve the feed smoothly and carefully for about 30 seconds.
5. Remove the lid and weigh what is left in the accumulation box.
6. Use a brush to remove all the particles from the sieves.
7. The feed particles that have passed through all sieves are called dust (md). If the feed is fatty, or if dust is unevenly distributed, two replicates must be taken.

[195] Feed can be sampled prior to delivery to farm site for sites where there is no feed storage.

Sifting machine

1. Put the accumulation box and the sieves on top of each other, with the accumulation box at the bottom and the biggest sieve on top.
2. Place the sieves on the balance and tare it.
3. Weigh at least 300 g of feed on the upper sieve, note the weight (m0).
4. Place the sieves on the sifting machine and then close the cover properly.
5. Press the 'START' button by holding it for 2-3 seconds, and then run the machine twice (2 x 1 min).
6. Remove the sieves and weigh what is left in the accumulation box.
7. The feed particles that have passed through all sieves are called dust (md).

Calculations

1. Weight of feed before sieving = m0.
2. Weight of feed that has passed through all sieves = md Dust % = (md / m0) x 100.

4.1: Maintenance of open culture systems

The measurement of cage depth shall be measured from the lowest water level, with depth from the waterbody floor measured from the bottom of the cage. Depth is also to be measured from the outer circumference of the floor of the culture containment space, i.e., excluding predator nets or mortality collection chambers as examples. In tidal systems, the depth should be measured at mean low water springs (MLWS).

4.2: Farm-level DO limits - diffuse-source effluent release

Measurements of DO at the farm site shall be used to assess conformance with limits on DO concentration (mg/l) and percent saturation at 5m depth. GPS coordinates of the sampling location shall be recorded, and results corrected for temperature, salinity and altitude. DO, temperature and, where relevant, salinity shall be measured twice daily (one hour prior to sunrise and two hours after sunset.

Weekly average DO concentrations shall be calculated and remain ≥65% in freshwater and ≥70% in seawater. Should a farm not meet the minimum weekly average saturation requirement, the farm must demonstrate one of the following: (a) Continuous monitoring with an electronic probe and recorder for at least a week, always demonstrating a minimum 70% saturation (b) Consistency of percent saturation with the farm reference site.

4.3: Daily Diurnal Dissolved Oxygen (DDDO) fluctuation - point-source effluent release (RWFA)

Using the same measurement protocols as described in **Appendix 8 (4.2)**, the UoC shall record DO concentrations at sampling stations immediately downstream of the zone where mixing is not yet complete (and concentrations of some water quality variables

could be elevated above ambient for the receiving water), i.e., at RWFA which should generally be a least 200m down current from the farm outfall.

Measurements must be made at least twice a month and on a daily basis where high variability is anticipated.

For tidal systems, dates must be chosen such that the measurement time corresponds with high and low tides, to reflect variations related to the tidal regime.

The annual mean daily diurnal DO (DDDO) fluctuation shall be less than 65%.

Farms applying feed or fertilisers that can demonstrate concentrations of total N and total P in discharged effluents are lower than in the receiving water body (i.e., are nutrient sinks) or have not discharged any water (through exchange of culture water or dewatering of water treatment systems) since the last audit date (or for the last 12 months in the case of the initial audit) e.g. through the use of water recirculation techniques or discharge to municipal water treatment systems, would be exempt from conforming to this Indicator.

Appendix 9 - Methodology for calculating energy use and greenhouse gas emissions

1. On-farm energy use (for Indicator 2.10.1)

Energy use intensity of production is communicated in units of megajoules of energy per tonne of net live weight production (MJ/t).

The timeframe of production used for calculating on-farm energy use may be either (a) the most recent completed production cycle, or (b) the three most recent consecutive annual years of production. For initial audits, if three years of energy input records are not available, a single year timeframe may be used, followed by a two-year timeframe in the second year. Table A5.1 defines the scope of inputs and activities to be included in energy use calculations.

Table A5.1 Energy inputs required in energy consumption calculations for Criterion 2.10.1.

Included	Excluded
Fuels used for heating, generators, equipment	Staff vehicles and travel
On-grid electricity used for production	Energy use by staff housing, offices, and other non-production facilities
District heating and cooling used for production	Energy inputs to processing or other downstream (post-production) activities
Fuel inputs to vessels, owned or contracted, including barges, well boats, and vessels servicing farm sites	Energy inputs to feed mills, hatcheries, and other upstream (pre-production) activities

The steps in calculating on-farm energy use are:

1. Calculate the net live weight production of fish or shellfish in tonnes (harvested weight minus smolt/fingerling input).
2. Quantify all energy inputs over the selected timeframe according to the scope defined in Table A5.1 and in units according to Table A5.2.
3. Multiply quantities of each energy input from (2) by the respective energy density value in Table A5.2 to calculate the total MJ of each energy input used. For any inputs not included in Table A5.2, identify an appropriate energy density value and document the source and reasoning for selection.
4. Sum all MJ values from (3) to calculate total energy used across all inputs.
5. Divide the total MJ consumption from (4) by the net production from (1) to calculate energy consumption as MJ/t.
6. Submit energy use data to ASC using following ASC data submission procedures.

Steps 3-5 are facilitated by calculations in the ASC Energy Use Data Submission Template.

Table A5.2 Energy density values for calculation of energy consumption.

Energy input	Units	Energy density (MJ per unit)
Electricity	kWh	3.6
Diesel	L	38.2
Petrol/gasoline	L	34.4
Fuel oil	L	42.6
Natural gas (gaseous)	m^3	39.8
Liquid natural gas	L	22.6
Liquid petroleum gas	L	26.1
Biomass	kg	15.2
Biodiesel	L	30.2
Biogas	kg	19.9

Source: DESNZ (2022)[196]

[196] DESNZ (2022). Greenhouse gas reporting: Conversion factors 2022. United Kingdom Department for Energy Security and Net Zero. Available at https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022

2. Greenhouse gas emissions (for Indicator 2.10.2)

Greenhouse gas (GHG) emissions are calculated following an attributional life cycle assessment approach (Figure A5.1). Emissions are calculated and reported in units of kg carbon dioxide-equivalent (CO_2e) per tonne of live weight production and then converted to kg CO_2e per kg of edible product.

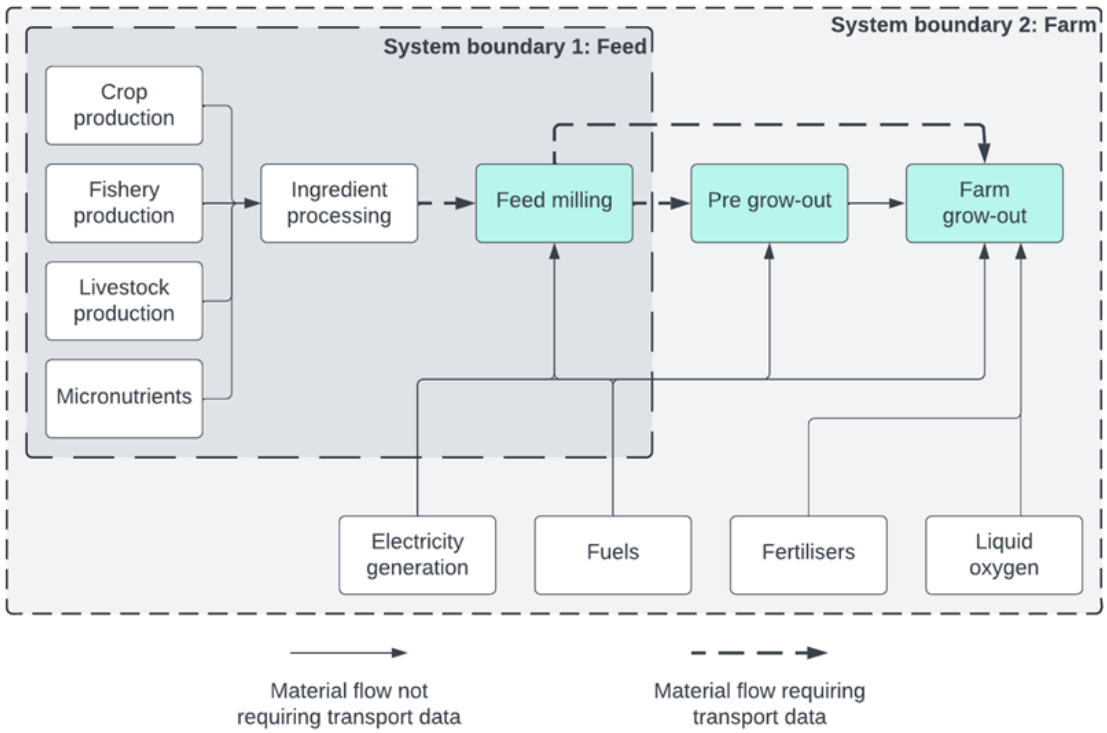

Figure A5.1 System boundaries for calculating greenhouse gas emissions of aquaculture products. System boundary 1 is covered in the ASC Feed Standard and results are provided to farms by their feed suppliers. System boundary 2 includes those life cycle stages for which primary data at the farm level are required.

Multiple GHG accounting frameworks and standards provide specific methodological guidelines for aquaculture producers in calculating and reporting their emissions. These include: Product Environmental Footprint (PEF) in Europe along with product category rules (PEFCR) for marine fish; PAS 2050-2 aquatic foods product category rules for the PAS 2050 standard in the United Kingdom; ISO 22948 and Norwegian Standard NS 9418 product category rules for the ISO 14067 standard; and the Greenhouse Gas Protocol Corporate and Product standards for more general guidelines.

The UoC may choose to adopt one of these specifications but no particular standard is required and farms may use internal or external tools to help with calculations, including ASC's Greenhouse Gas Calculators. GHG assessments must meet the minimum scope requirements outlined here and data submitted to ASC must follow the format of the ASC Greenhouse Gases Data Submission Template.

The timeframe of production for calculating GHG emissions may be either (a) the most recent completed production cycle, or (b) the most recent three consecutive annual years of production. For initial audits, if three years of data are not available, a single year timeframe may be used, followed by a two-year timeframe in the second year and a three year timeframe in consecutive years. Table A5.3 defines the scope of inputs and activities to be included in GHG assessments.

Results are calculated and reported to ASC following two co-product allocation methods to improve transparency and comparability: mass allocation and economic allocation. Data to facilitate calculations with both methods are provided by feed suppliers following the requirements of the ASC Feed Standard. The farm may choose which allocation method to use as the basis for ongoing target setting and management plans, ensuring methodological consistency between calculations, benchmark targets, and quantified reductions over time.

Table A5.3 Included inputs and activities for GHG emissions calculations according to Greenhouse Gas Protocol scope.

Scope 1
Fuels used for heating, generators, equipment
Fuel inputs to vessels, owned or contracted, including barges, well boats, and vessels servicing farm sites
Fuels used during fallow periods
Scope 2
On-grid electricity used for production
District heating and cooling used for production
Electricity and district heating and cooling used during fallow periods
Scope 3
Production of smolts or juveniles[1]
Production and processing of feeds[2]
Transport of feed to farm site
Production and processing of fuels
Production of liquid oxygen (recirculating systems only)
Production of nitrogen and phosphorous fertilizers (pond systems only)

[1]If size of inputs exceeds the cut-off values in Criterion 2.14, necessitating that smolt or juvenile producers calculate and provide GHG data to their grow-out customers

[2]Data to be calculated in accordance with requirements of the ASC Feed Standard and provided by feed suppliers following the resolution of the ASC Feed Standard data submission template.

Quantities of energy inputs used for GHG calculations reflect the same quantities used in Step 2 of energy use calculations. Energy-related GHG emissions are then calculated using the Scope 1 and Scope 3 CO_2e emission factors in Table A5.4. The UoC may use alternative emission factors if they clearly document the source and reason for their use. **Emissions factors** for electricity must be reflective of the national or regional electricity grid within which the farm is located and the source of electricity emission factors must be clearly documented.

Table A5.4 Greenhouse gas intensity (kg CO_2e/unit), according to Greenhouse Gas Protocol scope, for calculation of Scope 1 and Scope 3 emissions from on-farm energy use.

Energy input	Units	Scope 1	Scope 3
Diesel	L	2.71	0.63
Petrol/gasoline	L	2.34	0.60
Fuel oil	L	3.18	0.70
Natural gas (gaseous)	m^3	2.02	0.35
Liquid natural gas	L	1.16	0.40
Liquid petroleum gas	L	1.56	0.18
Biomass	kg	0.06	0.08
Biodiesel	L	0.17	0.39
Biogas	kg	0.01	0.13

Source: DESNZ (2022)[197]

GHG emission profiles of feeds are provided by feed suppliers following the requirements of the ASC Feed Standard. Suppliers provide this data using the ASC Greenhouse Gases Data Submission Template. Along with the quantity of each feed consumed, these profiles are used to calculate feed-related emissions, including emissions in each category within the data template (e.g. soy crop ingredients, land use change emissions, etc.) All feed-related emissions are included as Scope 3 emissions in grow-out calculations and reporting.

Inputs of smolts or juveniles can be accounted for in one of two ways. If the size of juveniles exceeds the species-relevant cut-off for grow-out according to Criterion 2.14, the GHG intensity of juvenile production must be provided by the supplier in the form of a completed ASC Greenhouse Gases Data Submission Template and values are multiplied by the quantity used similar to feed inputs. If juvenile inputs from one or more suppliers do not exceed this cut-off, the mass of inputs may instead be subtracted from the harvested production weight for GHG calculations and excluded from the GHG results. If

[197] DESNZ (2022). Greenhouse gas reporting: Conversion factors 2022. United Kingdom Department for Energy Security and Net Zero. Available at https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022

multiple sources are used for juvenile inputs, the UoC may choose to use an average GHG profile across suppliers for their calculations, particularly in cases where multiple sites may use different quantities of juveniles from different suppliers. Juvenile inputs are included as Scope 3 emissions in grow-out calculations and reporting.

Calculation and inclusion of direct biogenic emissions occurring at the farm (*e.g.*, methane emissions from ponds, emissions related to decomposition of material under cages) is not required.

All GHG calculations for feeds, smolts and juveniles, and grow-out production can be calculated and tracked with the assistance of ASC's Greenhouse Gas Calculators to help with the implementation of these methods and requirements.

3. Greenhouse gas targets (for Indicators 2.10.3 and 2.10.4)

In establishing GHG targets, live weight results are first converted to edible weight results to allow for meaningful comparison between species and broader food systems. Converting from live weight to edible weight GHG values requires allocating emissions to the edible product and accounting for the edible fraction of the product. Table A5.5 provides default values to use for converting from live weight to edible weight assuming no by-products are captured and valorised. Live weight GHG results are divided by the muscle fraction to determine edible weight GHG results.

Table A5.5 Default edible yield conversion values by species.

Species or species group	Muscle fraction
Salmon	.585
Trout	.585
Shrimp	.570
Pangasius	.531
Tilapia	.370
All other fishes	.500
Abalone and bivalves	.203

Source: Gephart et al., 2021[198]

If products are processed and by-products from processing are captured and valorised, a share of emissions may be allocated to by-products when calculating edible weight results, following the equations below. The ASC Greenhouse Gases Data Submission Template facilitates these conversions automatically. Values for bivalves and abalone are calculated directly using the values in Table A5.5 without allocating any portion of emissions to the shell.

Mass allocation

$$GHG_{ew} = \frac{GHG_{lw}}{1000} \times \frac{1}{(M_{ew} + M_{bp}) \times EF}$$

where:

GHG_{ew} is the GHG intensity per kg of edible weight

Economic allocation

$$GHG_{ew} = \frac{GHG_{lw}}{1000} \times \frac{V_{ew}}{M_{ew} \times EF}$$

where:

GHG_{ew} is the GHG intensity per kg of edible weight

[198] Gephart, J. A., Henriksson, P. J., Parker, R. W., Shepon, A., Gorospe, K. D., Bergman, K., ... & Troell, M. (2021). Environmental performance of blue foods. *Nature*, *597*(7876), 360-365.

GHG_{lw} is the GHG intensity per tonne of live weight

M_{ew} is the mass of edible product per kg as a fraction of 1 (default value of 1)

M_{bp} is the mass of valorised byproduct per kg as a fraction of 1 (default value of 0)

EF is the edible fraction of the edible product (default values in Table A5.5)

GHG_{lw} is the GHG intensity per tonne of live weight

M_{ew} is the mass of edible product per kg as a fraction of 1 (default value of 1)

V_{ew} is the share of revenue coming from the edible product per kg as a fraction of 1 (default value of 1)

EF is the edible fraction of the edible product (default values in Table A5.5)

Indicator 2.10.3 requires that the UoC establishes GHG targets for products from certified sites on the basis of kg CO_2e emissions per kg of edible product. Indicator 2.10.4 further requires that the UoC develop, implement, and track the progress of a GHG management plan that takes these targets into account, included:

- An upper target towards which the UoC sets quantitative reductions towards including an expected timeline; and
- A lower target towards which the UoC works using qualitative measures and actions

ASC has identified benchmark values to act as the maximum values for the upper and lower targets in the GHG management plan. These are based on average species-specific estimates of GHG intensity based on analysis by Gephart et al. (2021) as well as a value based on chicken production of 7.5 kg CO_2e per kg edible product. This chicken-based value reflects the median GHG intensity of retail weight chicken reported by Poore and Nemecek (2018)[199] and is broadly in line with the edible weight chicken GHG intensity calculated by Gephart et al. (2018) following both allocation methods. Table A5.6 provides ASC's species-specific benchmark GHG intensities, per kg of edible product, which, in combination with the 7.5 kg CO_2e value for chicken, provide both the upper and lower target GHG values for use in the GHG management plan. Values are provided using both mass and economic allocation. The UoC may select either allocation method as the basis for their target setting and management plan actions, reflecting the different allocation rules of different GHG accounting standards, ensuring that the same method is used consistently to track progress towards targets.

[199] Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. *Science, 360(6392), 987-992.*

Table A5.6. Species-specific benchmarks for setting GHG targets, in kg CO_2e per kg edible weight and equivalent values per tonne live weight assuming no by-product valorisation. If by-products are captured, higher live weight GHG intensities may achieve the same edible weight target values.

	kg CO_2e / kg edible		kg CO_2e / tonne live	
Species group	Mass	Economic	Mass	Economic
Abalone	3.2	3.2	650	650
Bivalves	3.2	3.2	650	650
Flatfish	10.0	6.5	5,000	3,200
Freshwater trout	5.4	3.7	3,200	
Pangasius	7.8	6.1	4,200	3,200
Salmon	5.1	3.0	3,000	1,700
Seabass, seabream, meagre	10.0	6.5	5,000	3,200
Seriola and cobia	10.0	6.5	5,000	3,200
Shrimp	9.5	7.8	5,400	4,400
Tilapia	10.8	8.8	4,000	3,300
Tropical marine finfish	10.0	6.5	5,000	3,200

Appendix 10 - Fish Health and Welfare

Destined to	Level	Refers to criteria	Frequency	Content[200]	Format	Auditability
All employees working at the UoC	Basic	2.13, Principle 4	At least one-off at the time of employment	General fish health and welfare awareness: Employees need to be informed about the importance of fish health and welfare and understand these concepts.	Theory	Certificate of competency (employee understands the concepts and has been adequately informed). Revision of training resources/contents.
Site employees Employees handling live fish Production management	Advanced	2.13, Principle 4 + Parasites + Antibiotics	Annual (refresher shall incorporate advances/ developments on the subject of training)	Basic anatomy and physiology of the species being farmed Advanced fish health and welfare assessment: This shall include all welfare indicators in the standard (morphological, behavioural, water quality, feeding, stocking density, disease recognition, mortality classification and necropsy forms) Handling Slaughter (harvesting) Biosecurity Data collection, logging and reporting systems	Theory & Practice	Certificate of attendance. Revision of training resources/contents. Certificate of competency (signed off by a relevant person, certifying employee has acquired the knowledge, the skills and the abilities). Observation of real operations.
Processing employees Processing management	Advanced	4.5	Annual (refresher shall incorporate advances/developments on the subject of training)	Capacitation on slaughter process Assessment of stunning and killing effectiveness Data collection, logging and reporting systems	Theory & Practice	Certificate of attendance. Revision of training resources/contents. Certificate of competency (signed off by a relevant person, certifying employee has acquired the knowledge, the skills and the abilities). Observation of real operations.

Table 1: Training Requirements

[201] FAOs definition of aquaculture systems applies:

Table 1 of Criterion 4.1: Finfish water quality parameters and their monitoring frequency, per type of culture system.

PARAMETERS	TYPE OF CULTURE SYSTEM							
	FRESHWATER				SEAWATER			
	Ponds	RAS	Net pens	Flow-through	Ponds/Lagoons	RAS	Net pens	Flow-through
Temperature	Daily	Daily	Daily	Daily	Daily	Daily	Daily	Daily
Dissolved oxygen	Daily	Daily	Daily	Daily	Daily	Daily	Daily	Daily
Turbidity	Daily (for intensive[201] systems) Risk assessed (for semi-intensive and extensive systems)	Daily	Daily	Daily	Daily (for intensive systems) Risk assessed (for semi-intensive and extensive systems)	Daily	Daily	Daily
Carbon dioxide	Biweekly (for intensive systems) Risk assessed (for semi-intensive and extensive systems)	Daily		Biweekly	Biweekly (for intensive systems) Risk assessed (for semi-intensive and extensive systems)	Daily		Biweekly
pH	Daily	Daily	Daily	Daily	Biweekly (for intensive systems) Risk assessed (for extensive systems)	Daily	Risk assessed	Biweekly
Salinity		Daily[202]			Risk assessed	Daily	Risk assessed	Risk assessed
Ammonia/nitrite/nitrate	Biweekly	Daily		Biweekly	Biweekly	Daily		Biweekly
Metals	Risk assessed	Risk assessed		Risk assessed	Risk assessed	Risk assessed		Risk assessed
Water flow/velocity			Risk assessed				Risk assessed	
Hydrogen sulphide	Risk assessed	Risk assessed			Risk assessed	Risk assessed		

[201] FAOs definition of aquaculture systems applies:
• Extensive culture systems receive no intentional nutritional inputs but depend on natural food in the culture facility, including that brought in by water flow e.g., currents and tidal exchange.
• Semi-intensive culture systems depend largely on natural food which is increased over baseline levels by fertilisation and/or use of supplementary feed to complement natural food.
• Intensive culture systems depend on nutritionally complete diets added to the system, either fresh, wild, marine or freshwater fish, or on formulated diets, usually in dry pelleted form.

[202] Salt can be added in small quantities in RAS salmoniculture to assist with disease prevention and facilitate smoltification. This should in no case contradict what is outlined in Indicator 2.9.4.

Table 2 of Criterion 4.1: Shrimp water quality parameters and their monitoring frequency, per type of culture system.

PARAMETERS	TYPE OF CULTURE SYSTEM					
	FRESHWATER			SEAWATER		
	Ponds[203]	RAS	Flow-through	Ponds/ Lagoons[204]	RAS	Flow-through
Temperature	Twice a day[205]	Twice a day[205]	Twice a day[205]	Twice a day[205]	Twice a day[205]	Twice a day[205]
Dissolved oxygen	Twice a day[205]	Twice a day[205]	Twice a day[205]	Twice a day[205]	Twice a day[205]	Twice a day[205]
Transparency	Risk assessed	Risk assessed	Risk assessed	Risk assessed	Risk assessed	Risk assessed
Turbidity	Risk assessed	Risk assessed	Risk assessed	Risk assessed	Risk assessed	Risk assessed
Carbon dioxide	Risk assessed	Risk assessed	Fortnight	Risk assessed	Risk assessed	Fortnight
pH	Daily	Daily	Daily	Daily	Daily	Daily
Salinity	Risk assessed	Risk assessed	Risk assessed	Weekly/Daily[206]	Weekly/Daily[206]	Weekly/Daily[206]
Alkalinity and hardness	Weekly	Weekly	Weekly	Risk assessed	Weekly	Risk assessed
Ammonia	Risk assessed	Daily	Fortnight	Risk assessed	Daily	Fortnight
Nitrite	Risk assessed	Daily	Weekly	Risk assessed	Daily	Weekly
Nitrate	Risk assessed	Daily	Fortnight	Risk assessed	Daily	Fortnight
Metals	Risk assessed	Risk assessed	Risk assessed	Risk assessed	Risk assessed	Risk assessed
Minerals *(Ca2+, K+, Mg2+)*	Weekly	Weekly	Weekly	Risk assessed	Risk assessed	Risk assessed
Hydrogen sulphide	Risk assessed	Risk assessed	Risk assessed	Risk assessed	Risk assessed	Risk assessed

[203]For extensive systems water quality parameters and their monitoring frequency apply the required as per the national regulations.
FAOs definition of extensive aquaculture system applies:
• Extensive culture systems receive no intentional nutritional inputs but depend on natural food in the culture facility, including that brought in by water flow e.g., currents and tidal exchange.
[204]For extensive systems water quality parameters and their monitoring frequency apply the required as per the national regulations.
FAOs definition of extensive aquaculture system applies:
• Extensive culture systems receive no intentional nutritional inputs but depend on natural food in the culture facility, including that brought in by water flow e.g., currents and tidal exchange.
[205]At dawn and dusk
[206] During rainy season

Table 1 of Criterion 4.2: Finfish species-specific maximum time out of the water and fasting periods.

	Species								
	Salmon	Trout (FW & SW)	Seabass, seabream, meagre	Pangasius	Tilapia	Seriola	Cobia	Flatfish	Marine Tropical
Maximum time out of the water, unless anaesthetised (seconds)	15	15-20	15	Not defined[207]	15	15	15	15	15
Maximum fasting duration of harvest size fish (degree days)	≤54	≤54	≤ 45° days if water temperature <15°, otherwise maximum 72h	≤ 62		≤ 45° days if water temperature <15°, otherwise maximum 72h	≤ 62		≤45° days if water temperature <15°, otherwise maximum 72h

Table 2 of Criterion 4.2: Cleaner fish species-specific maximum time out of the water and fasting periods.

	Species	
	Wrasse	Lumpsucker
Maximum time out of the water, unless anaesthetised (seconds)	15	15
Maximum fasting duration of harvest size fish (degree days)	≤30	≤50

Table 1 of Criterion 4.3: Species-specific permitted stunning methods and transition periods.

	Species										
Permitted methods of stunning[208]	Salmon	Wrasse	Lumpsucker	Trout (FW & SW)	Seabass, seabream, meagre	Pangasius	Tilapia	Seriola	Cobia	Flatfish	Marine Tropical
Percussion	✓	✓		✓				✓	✓		✓
Electrical	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Overdose Anaesthetic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transition period[209]	Immediate	Immediate	Immediate	1 year	3 years	3 years	3 years	3 years	3 years	3 years	3 years

[207] Pangasius is a facultative air-breather, with a high capacity for both aerial and aquatic respiration.
[208] ASC will review available stunning methods on a yearly basis, to make sure that any new developments that are considered suitable are incorporated into this list.

[209] The requirement to use permitted methods of stunning only applies as of October 2025, giving producers a transition period of 1 or 3 years from the effective date of the ASC Farm Standard. For example, as of October 2025, trout shall only be stunned using percussion or electrical stunning.

Appendix 11 - Area Based Management (ABM)

11.1 - Attributes and required components of the Area Based Management

This Appendix outlines the main components of area-based management required by the ASC Farm Standard.

The purpose of the ABM is to improve health and biosecurity management on the farm, with the ultimate goal of minimising negative impacts on wild salmonids populations.

A. Definition of "area"

If ABM is a regulatory requirement in the farm's jurisdiction, then farms will use this definition of "area" for the purposes of these requirements. In jurisdictions where ABM is not a regulatory requirement, the area must reflect a logical geographic scope such as a fjord or a collection of fjords that are ecologically connected. The boundaries of an area should be defined, considering the zone in which key cumulative impacts on wild populations may occur, water movement and other relevant aspects of ecosystem structure and function.

B. Requirements related to participation in the ABM

Within the defined area, at least 80 per cent of farmed production (by weight) must participate in the ABM, even if not all farms are seeking certification under this requirement. Without majority of farms participating, the scheme will likely be ineffective. All farms owned by the company applying for certification in the area must participate in the ABM, regardless of certification status.

C. ABM components and guidance

The ABM must document:

1. The farms/companies included in the ABM, contact people (including contact information) and mechanisms for communication.
2. Shared disease management goals and objectives, related to understanding and minimising risk of on-farm disease transfer to wild fish, which are updated regularly based on new information or concerns raised to the ABM by communities or local wild fish interests as part of company engagement with stakeholders as outlined under 3.13.5.
3. Process for information and data-sharing to ensure coordination, including plans for stocking and fallowing, on-farm disease and parasite monitoring results (including sea lice numbers, suspicion of an unidentifiable transmissible agent, information on therapeutic treatments and data on resistance including information related to treatments not being as effective as expected.

The ABM must include procedures for coordination among farms as relates to:

1. <u>Treatments:</u>
    a. Farmers must be able to demonstrate a coordinated treatment plan and provide evidence that the schedule and rotation of treatments are being implemented.
    b. Consideration of the cumulative use and potential risks[210] of antibiotics

[210] Assessment of risk shall take into account the cumulative use of these antibiotics from salmon production within the area in order to assess the potential risk to human health from the development of resistance in the environment. Prescribing antibiotics highly important for human health shall be considered as a last resort.

classified as "highly important" by the WHO[211].

c. Where applicable, treatments and/or strategic harvesting of salmon is coordinated prior to outmigration of wild salmonids to ensure minimal on-farm lice levels at this sensitive time period for those species (as has been determined under Indicator 2.13.4).

d. Tracking of cumulative use of parasiticides (by chemical, annually and by production cycle) within the ABM.

2. Monitoring:

   a. On-farm disease and pathogen monitoring and information sharing among farms.

   b. On-farm resistance monitoring and information sharing among farms.

   c. For farms located in areas where there are wild salmonids, monitoring of wild salmonid populations that are relevant for the area must occur as specified under Indicator 2.13.5, either under the auspices of the ABM or under some other auspices.

3. Stocking: Records must demonstrate that all stocked fish within the ABM are of the same year class and that stocking dates were coordinated with other farms.

4. Fallowing: Coordination of fallowing between each production cycle to help break disease cycles, with a period when there are no farmed salmon in the area.

5. Setting and revising a maximum ABM lice load: The entire ABM will set a maximum lice load, expressed as total mature female lice on all farms in the area. In areas of wild salmonids, the ABM must demonstrate how the scheme incorporates the results of wild salmonids monitoring into revisions of this total lice load over time (see **11.2** below for additional details on this feedback loop).

11.2 - Setting and revising ABM lice loads and on-farm lice levels

Indicator 2.13.2 requires calculation of a "total load" sea lice value to better reflect the potential risks to wild populations.

An ABM shall initially set this total load value based on the regulatory requirements of the jurisdiction in which the farms operate and the results of any wild monitoring done to date. In practice, this would mean that farms in most ABM would take the on-farm lice levels they are required to achieve by regulators and multiply them times the number of farmed fish in the area.

For farms located in areas with wild salmonids, the ABM shall demonstrate how it is using the results of wild monitoring to review and potentially revise the maximum lice load for the area each year and/or production cycle. Adjustments to the area's lice load would lead to corresponding limits on lice levels on individual farms. This feedback loop must be transparent and document how the ABM scheme is being protective of wild fish through the interpretation of wild monitoring data. Specifically:

- The outcome of the review shall include a final recommendation and justification for maintaining or adjusting maximum sea lice loads in an ABM scheme.

[211] WHO 2018 list of "Critically important antimicrobials for human medicine" 2018 or most recent release: https://www.who.int/publications/i/item/9789241515528

- The review shall be documented and made available to auditors. Documentation shall include, as a minimum, the name of participating farms/companies (including responsible contact people), meeting minutes, recommendations, actions, and justification.

Given the time lag in collecting and analysing data from wild monitoring, it is expected that the ABM scheme will look at data from previous periods, particularly sensitive periods such as outmigration of wild salmon juveniles. The results of wild salmonids monitoring must over time inform the threshold level for on-farm sea lice levels during sensitive periods, with a similar type of feedback loop as described for the ABM total lice level. If wild salmonid monitoring data reveals that the established threshold (see Table 1, **Appendix 12 (3)**) is not protective of wild salmonids, the farm must set a lower threshold in subsequent sensitive periods. Conversely, data that consistently demonstrates healthy wild salmonid populations would allow for a level higher than the established threshold. This case would need to be made for the ABM as a whole to ASC.

Appendix 12 - Methodology Related to Monitoring Wild Salmonids, On-farm Sea Lice Sampling Requirements and On-farm Sea Lice Thresholds for Sensitive Periods

Appendix 12.1 - Methodologies for monitoring wild salmonids

All farms located in areas of wild salmonids must participate in monitoring of sea lice on wild salmonids. The purpose of this monitoring is to assist in clarifying the link between the health of wild and farmed fish through objective information. The monitoring must conform with the following requirements:

- The methodology, results and analysis demonstrate scientific rigour in the sampling size, location, species sampled and method.
- Monitoring is geographically relevant to the area where the farm/ABM is located.
- The process involves the participation of third parties, such as independent scientists. Government monitoring programs are acceptable, given the programme is geographically relevant.
- Numbers of sea lice per wild fish, and prevalence of sea lice shall be metrics considered in the research.

If national or local regulations prohibit the handling of wild salmonids, farms should provide evidence that populations are being monitored and protected, though direct involvement in the monitoring is not required.

Appendix 12.2 - On-Farm Sea Lice Sampling Requirements

1) Frequency: Weekly sampling during the sensitive period. Monthly sampling during the rest of the year.

2) Number of cages: At least 50% of cages are sampled over a 2-week period, with the entire farm sampled over at least a 6-week period.

3) Number of fish per cage: A minimum of 10 fish per cage.

4) Sea lice stage: At a minimum provide data on mobiles[212] and adult females.

Farms must ensure that sea lice which are detached from the fish while sampling are included in the final sampling count.

Fish welfare exemption: The veterinarian or fish health professional may exempt fish from being sampled during a certain period within the sensitive period. The reason for the exemption shall be documented[213].

[212] Pre-adult and adult sea lice males.
[213] Grounds for exemption may include: Immediately after smolting and stocking, undergoing a disease event and/or being treated (including treatment for sea lice. In case the reason for the exemption is related to fish treatment, the maximum duration for the exemption shall be 2 weeks), during specific environmental events (e.g. water temperature [i.e. below 4°C], low oxygen, algal bloom, jellyfish event). [214] ASC Salmon Standard (v1.4) released 05/9/2022.

Appendix 12.3 - Sea Lice Thresholds for Sensitive Periods

Regional sea lice thresholds and sensitive periods for the major salmon farming regions/jurisdictions are outlined in Table 1. The table corresponds to the lowest sea lice limits established in the different regions/jurisdictions at the date of release[214] of the ASC Salmon Standard (v1.4)[215]. ASC will conduct reviews every six months of evidence which support a change to these levels, following ASC's Programme Development and Revision Procedure.

If no limit has been established for the region/jurisdiction, the most rigorous threshold will apply (e.g., 0.2 adult females). If sensitive periods are not established for the region/jurisdiction, the timing of the sensitive period should be specified according to a defined Criterion (e.g. when juveniles are in proximity to cages) and using the latest knowledge.

Table 1: Sea lice Thresholds and Sensitive Period per Region/Jurisdiction.

Region/Jurisdiction	**Sea Lice Thresholds (*L. salmonis*)**	**Sensitive Period**
Canada (West Coast)	3 motile*	1st March to 30th June
Faroe Islands	0.5 adult female	1st May to 31st July
Iceland	0.5 mature female	Not established
Ireland	0.3 ovigerous female	1st March to 31st May
Norway	0.2 adult female	- Nord-Trøndelag and southwards: weeks 16 to 21 - Nordland, Troms and Finnmark: week 21 to 26
Scotland	0.5 adult female	1st February to 30th June

***** Motile includes adult *L. salmonis* females (with or without egg strings) and other motile *L. salmonis* (including adult males, and preadults). Mobile is considered a synonym of motile.

Fish welfare exemption: The veterinarian or fish health professional may exempt fish from being treated, and therefore affect the farm's ability to reduce the on-farm sea lice levels below the threshold within 21 days upon exceedance, during a certain period of time within the sensitive period. The reason for the exemption shall be documented[216]. In case of an exemption, the farm must reduce the on-farm sea lice levels below the threshold within 14 days from the first day of treatment.

[214] ASC Salmon Standard (v1.4) released 05/9/2022.
[215] Established either by the regulators or agreed by the industry (e.g., through an industry code of practice).
[216] Grounds for exemption may include: specific environmental events (extreme weather event, water temperature [i.e. below 4°C], low oxygen, algal bloom, jellyfish event), unforeseen increases in on-farm lice levels, documented logistical roadblocks or delays for implementing treatment.[217] Medicinal parasiticide includes hydrogen peroxide.

Appendix 13 – Methodology for Parasiticide Treatment

Continuous reduction of applying medicinal parasiticide treatments

The ASC Farm Standard requires farms to continuously reduce the number of medicinal treatments applied in treating sea lice. The ultimate vision is to no longer having to treat sea lice with medicinal treatments. However, at the same time, it is also recognised that this scenario is not yet achievable for the far majority of the industry at this moment in time.

In order to incentivise the development and implementation of non-medicinal measures (e.g. biological and mechanical control), the relevant Indicators under Criterion 2.13 require farms to meet an Entry Level (EL) that expresses the Weighted Number of Medicinal Treatments (WNMT), after which a fixed rate of reduction needs to be achieved until the WNMT meets the defined Global Level (GL).

This Appendix gives more detail on the various concepts referenced above, as well as providing metric levels that relate to the EL, GL and rate of reduction.

Weighted Number of Medicinal Treatments (WNMT)[217]

The Weighted Number of Medicinal Treatment frequency is the total number of medicinal parasiticide treatments applied over the production cycle within the UoC. Partial treatments should be counted as a proportion of the cages treated.

Some examples are given on how to count the WNMT, e.g.

- treating an entire farm (all cages) once, counts as WNMT = 1;
- treating 1 cage, out of 10, once, will count as WNMT = 0.1;
- treating 1 cage, out of 10, twice (i.e., two unique treatments), will count as WNMT = 0.2;
- treating 5 cages, out of 20, once, will count as WNMT = 0.25.

Additional considerations:

1. Hydrogen peroxide (H_2O_2) must be considered as medicinal parasiticide treatment and thus be included in the WNMT count;
2. If a *single* bath-treatment is prescribed to be applied as “coupled-treatment” (i.e. one treatment at t_1 and a follow-up treatment at t_2), then each treatment (t_1 and t_2) must be included in the WNMT count.

Some more examples are given on how to count the WNMT, e.g.:

- treating 1 cage, out of 10, once with hydrogen peroxide (H_2O_2), will count as WNMT = 0.1;
- treating 1 cage, out of 10, once with hydrogen peroxide (H_2O_2) as a coupled-treatment, will count as WNMT = 0.2;

[217] Medicinal parasiticide includes hydrogen peroxide.

Defining Entry Level (EL) and Global Level (GL)

Regional WNMT metric levels are set that form an Entry Level for farms in that region. Farms must be below, or at, EL for conformance. The results are presented in the table below:

Table: Regional Entry Level and Global Level (both in WNMT)

Region*	Entry Level (WNMT)	Global Level (WNMT)
Canada (West Coast)	1	3**
Canada (East Coast)	9	
Chile	9	
Faroe Islands	6	
Iceland	6	
Ireland	3	
Norway	5	
Scotland	9	

***Farms based outside the regions listed in this table shall apply an EL = 6 and GL = 3.
**** GL is set at 3 WNMT, unless twice a "coupled-treatment" is applied (counted as 2*2 = 4 WNMT), then GL = 4 WNMT applies. In case of this exception, additional medicinal treatments applied will result in an exceedance of GL=4.

In addition to the defined regional Entry Levels, a Global Level (GL) is determined as well. It is required that farms progress from EL to GL according to a fixed timeframe. However, some bath-treatments are given as "coupled-treatment" (as per above), which with a GL = 3, could result into having a part of the treatment falling beyond GL = 3. To reflect the realities of applying these coupled-treatments, an exception is defined in case two times a coupled-treatment is applied. For this specific situation, GL = 4 WNMT applies. Situations that do not meet this exception, shall apply GL = 3 WNMT.

Reducing from EL to GL

It is required for farms to reduce from £EL to GL by means of a fixed rate of reduction. This rate is determined at 25% WNMT per 2-year.

Appendix 14 – Pre-Grow Out

Table 2.14.1. Pre-Grow Out Requirements. This table lists all requirements for pre-grow out farms. Which farms the pre-grow out phase applies to, is specified in Table 2.14.2.

Disclaimer: conformance with the pre-grow out requirements below does not automatically means conformance at the grow-out site – cross-reference with other requirements in the grow-out Standard.

Indicators for Pre-Grow Out Farms	
2.14.1.1	The UoC shall demonstrate that the pre-grow out has all required legal licences and permits applicable to human rights, animal welfare and the environment, including benthic impacts, water quality and water abstraction.
2.14.1.2	The UoC shall demonstrate that the pre-grow out has a Wildlife Interaction Plan, including at least the following: a) identification of Threatened and Protected Species present in the region; b) mitigation measures to reduce negative impacts and allow the existence of such species, including measures aiming at not causing injuries or mortalities of any Threatened and Protected Species, except for situations where at least one of the following conditions apply: 1) Injured animals are unlikely to recover, or; 2) Immediate human safety is threatened, or; 3) Legal requirements mandate emergency euthanasia of injured animals.
2.14.1.3	The UoC shall demonstrate that the pre-grow out is not sited in Protected Areas (PA), Areas with Associated Designations or Other Effective Area-based Conservation Measures (OECMs), unless permissible under the conditions listed in **Appendix 5**.
2.14.1.4	The UoC shall demonstrate that the pre-grow out successfully rehabilitated a minimum of 50% of the surface area of natural wetland (including mangroves) converted before May 1999.
2.14.1.5	The UoC shall demonstrate that the pre-grow out does not convert natural wetlands (including mangroves) after May 1999, except for maintaining or establishing pumping stations or water pipes/canals and provided that a surface area equivalent to the total of the converted surface area is successfully rehabilitated.
2.14.1.6	The UoC shall demonstrate that the pre-grow out has an Escape Prevention Plan to minimise the risk of escapes. The plan shall include at least the following considerations:

	a) infrastructure maintenance to prevent escapes; b) infrastructure monitoring to detect risk of escapes; c) species characteristics (including possibility of uncontrolled spawning); d) escape response procedures; and e) assess the cause for any escapes or unaccounted animals and implement corrective measures.
2.14.1.7	The UoC shall demonstrate that the pre-grow out has a Biosolids Plan with the intent to prioritise re-use and minimise the impacts associated with biosolids disposal. The plan shall include at least the following: a) outline means of responsible re-use of uncontaminated biosolids (see Indicator 2.8.2 for allowed biosolids re-use purposes); b) outline means of responsible disposal including transport to the designated disposal area; c) outline record keeping requirements with regards to disposal times, amounts and location; and d) outline cleaning and maintenance procedures of water treatment system (if applicable) in relationship to biosolids disposal.
2.14.1.8	The UoC shall demonstrate that the pre-grow out has a Waste Plan to minimise wastage and pollution. The plan shall include at least the following considerations: a) waste reduction; b) re-use; c) recycling; d) pollution control and e) responsible disposal.
2.14.1.9	The UoC shall demonstrate that the pre-grow out has procedures for holding effluents for at least 48h, or as per product specifications (whichever is greater), after culture animals have been treated with hormones.
2.14.1.10	The UoC shall demonstrate that the pre-grow out has a Fish Health and Welfare Plan to prevent disease outbreaks and ensure good health and welfare of farmed animals. The plan shall include at least the following: a) a site-specific disease monitoring, response mechanisms and reporting requirements (including reporting WOAH-notifiable disease to authorities); b) a site-specific biosecurity procedure, including risk pathways into/out of and within the farm, to identify and minimise spreading of disease; c) a list of potential predators and any predator control measures needed, to avoid compromising the integrity of the containment system and the health and welfare of the fish;

	d) procedures to ensure the culling of moribunds is done using permitted methods only, as indicated in the species-specific transition periods (Table 1 of Criterion 4.14c); e) procedures to ensure acclimation period is applied before and during transfers to the UoC for a resting period after transportation, and avoid sudden changes in temperature, oxygen, salinity, pH, diet and feeding regimes; f) the plan is overseen and signed off by a veterinarian; and g) a review and where needed a revision of the plan when changes in farming activities or changes in external factors occur, following each production cycle, or upon the direction of the veterinarian or aquatic animal health professional.
2.14.1.11	*Indicator scope: shrimp* The UoC shall demonstrate that the pre-grow out post-larvae (PL) and broodstock have appropriate disease-free status and sources meet regional, national, and international importation guidelines (e.g. WOAH and ICES).
2.14.1.12	*Indicator scope: Penaeus vannamei and Penaeus monodon* The UoC shall demonstrate that the pre-grow out supplies nauplii, larvae or post-larvae (PL) originated from ablation-free (AF)[218] female broodstock.
2.14.1.13	*Indicator scope: cleaner fish from hatchery origin* The UoC shall demonstrate that the pre-grow out cleaner fish has appropriate disease-free status.
2.14.1.14	*Indicator scope: cleaner fish from wild caught origin* The UoC shall demonstrate that the pre-grow out has procedures that allow for the use of fishing gear that avoids injuries and unnecessary stress, and that is suitable for the size and species of cleaner fish being captured.
2.14.1.15	The UoC shall demonstrate that the pre-grow out only uses antibiotics with the purpose to treat and under prescription by a veterinarian.
2.14.1.16	The UoC shall demonstrate that the pre-grow out discloses to the UoC the antibiotic treatments on supplied animals, including the reason for their use and the quantity used.

[216] The following timelines shall apply to *Penaeus vannamei*: 1) Date the standard is effective (Q2 2025): 25% of the production to originate from AF broodstock. 2) 2 years from the date the standard is effective (Q2 2027): 50% of the production originates from AF broodstock. 3) 4 years from the date the standard is effective (Q2 2029): 100% of the production originates from AF broodstock. The following timelines shall apply to *Penaeus monodon*: 1) 2 years from the date the standard is effective (Q2 2027): 25% of the production to originate from AF broodstock. 2) 4 years from the date the standard is effective (Q2 2029): 50% of the production originates from AF broodstock. 3) 6 years from the date the standard is effective (Q2 2031): 100% of the production originates from AF broodstock. Other crustaceans are not included within the Indicator scope.

2.14.1.17	The UoC shall demonstrate that the pre-grow out does not use antimicrobials listed as Critically Important Antimicrobials for Human Medicine by the World Health Organisation (WHO) in animals intended to be sold as certified by the UoC.
2.14.1.18	*Indicator scope: salmon smolts and seabass, seabream and meagre* The UoC shall demonstrate that the pre-grow out conforms to species-specific limits on antibiotic treatments: a) salmon smolts: ≤ 3 at pre-grow out b) seabass, seabream and meagre: ≤ 3 at the pre-grow out and grow out combined.
2.14.1.19	The UoC shall demonstrate that the pre-grow out does not use wild harvested broodstock of Threatened and Protected Species.
2.14.1.20	*Indicator scope: bivalve* The UoC shall demonstrate that the pre-grow out does not source the UoC with wild seed from an open-access, unregulated source (excluding larval collection).
2.14.1.21	*Indicator scope: bivalve* The UoC shall demonstrate that the pre-grow out, in case of supplying hatchery produced seed to the UoC, has procedures to address genetic concerns specific to species and geographic region where the seed will be out-planted.
2.14.1.22	*Indicator scope: pangasius* The UoC shall demonstrate that the pre-grow out generates the seed supplied to the UoC from the pangasius population naturally reproducing in the river basin.
2.14.1.23	*Indicator scope: pangasius* The UoC shall demonstrate that the pre-grow out does not supply the UoC with wild-caught seed.
2.14.1.24	The UoC shall demonstrate that the pre-grow out has procedures for not engaging in or supporting forced, bonded, compulsory labour or human trafficking. This includes: - work that is exacted from any person under the threat of any penalty; - work for which the person has not offered himself or herself voluntarily;

	- the use of deception or other forms of coercion, for the purpose of exploitation; - the use of exploitative loans to prevent employees from leaving their jobs.
2.14.1.25	The UoC shall demonstrate that the pre-grow out has procedures for not engaging in child labour. Child labour is work that: - is mentally, physically, socially or morally dangerous and harmful to children; - interferes with their schooling.
2.14.1.26	The UoC shall demonstrate that the pre-grow out has procedures for the equal treatment of and opportunities for all employees and applicants for employment, including recruitment process and conditions, pay and benefits, working conditions, job assignment, training, promotion and other career opportunities, disciplinary practices, termination, and retirement.
2.14.1.27	The UoC shall demonstrate that the pre-grow out carries out: a) site-specific health and safety risk assessments that are approved by a member of senior management, and b) health and safety training as required to perform the duties and responsibilities of the job.
2.14.1.28	The UoC shall demonstrate that the pre-grow out has procedures to inform all employees that they are: a) free to join or form workers organisations (i.e., trade unions or other organisations that represent their labour concerns and interests), of their own choosing; and b) free to bargain collectively in accordance with applicable national legal requirements.
2.14.1.29	The UoC shall demonstrate that the pre-grow out has procedures for the presentation, treatment and resolution of grievances by employees, local communities and Indigenous and tribal peoples. The procedure shall include at least the following: a) a mechanism for the presentation of grievances; b) a mechanism for the processing of grievances, including timeframes; and c) a mechanism for the communication of the procedure to employees, communities, and Indigenous and tribal peoples.

Table 2.14.2 Pre-grow out stages and cut-off lines for the start of the grow-out phase

Pre-grow out requirements apply to farms which grow fish or larvae as follows:

Species group	Pre-Grow Out Phase	Start Grow-Out Phase
Seabass, Seabream, Meagre	Farms: broodstock / egg / larvae / seed / fingerling / smolt producers	When fish are stocked in *cages*[219]
Flatfish		When fish are stocked in *cages*[3]
Seriola and Cobia		When fish are stocked in *cages*[3]
Salmon		When fish are stocked in *cages*[220]
Tropical Marine Finfish		When fish are stocked in *cages*[3]
Freshwater Trout		When fish are ≥ 10 g or when fish are stocked in cages, whichever comes first
Pangasius		When fish are ≥ 10 g or when fish are stocked in ponds, whichever comes first
Tilapia		When fish are ≥ 10 g or when fish are stocked in cages, whichever comes first
Shrimp		When shrimp are PL25
Abalone		From transition to grow-out farming systems i.e., at 15-20mm average shell length or when switching to microalgae or formulated feeds, whichever comes first
Bivalve		Point of translocation

[219] For culture systems where fish are not moved to cages such as when producing fish in indoor facilities: the cutoff-line is 6 months post hatch.
[220] For culture systems where fish are not moved to cages such as when producing fish in indoor facilities: the cutoff-line is the point of smoltification, or 12 months post hatch if fish are cultured in freshwater.

Table 2.14.3 ASC Stock Status Record Template

The following table shall be completed by farms supplying batches of fish/larvae. This form serves to pass data down the supply chain. The table must include the aggregate of information relevant to that batch of fish, i.e., every supplier includes data compiled both from their direct suppliers and from their own production. In other words, a single ASC Stock Status Record accompanies batches of fish/larvae, rather than a separate record from each of the upstream suppliers. This declaration can also be completed for a number of batches, as long as the same information applies to all.

Species			
Batch identification number(s)			
Broodstock	The broodstock is hatchery raised	Yes ☐	No ☐
Antiparasiticide* treatments	Total cumulative number of antiparasiticide treatments used on this batch:	No treatment ☐	Number of treatments: …
Antibiotic treatments	Total cumulative number of antibiotic treatments for this batch:	No treatment ☐	Number of treatments: …
	Are any of the antibiotics used listed as Critically Important Antimicrobials for Human Medicine by the World Health Organisation (WHO)?	Yes ☐	No ☐
Feed	Product fed contained Genetically Modified Organisms (GMO) or ingredients produced from GMO.	Yes ☐	No ☐
ASC status	This batch is:	ASC certified ☐	ASC compliant ☐
Name of company supplying the batch(es) of egg/larvae/seed/fingerlings/smolt			
Date(s) of delivery			
Name and signature (responsible person of the supplying company)			

*Treatments with freshwater, hydrogen peroxide or formalin do not count towards the total cumulative number of treatments.

Appendix 15 – Remediation Process (applicable to 3.2 Forced Labour and 3.3 Child Labour)

Remediation process

The process and timeline for remediation is followed regardless of whether the issue is discovered through the grievance process, internally by the farm, or during the third-party audit. Although the remediation plan may be developed and implemented by the grievance committee or an external partner, the farm is always responsible for ensuring that the remediation process is carried out. The best interest of the person is prioritised throughout the remediation process, which includes the following steps:

1. Immediate response and safeguarding (where necessary)
2. Remediation plan development
3. Implementation and monitoring of remediation plan
4. Corrective action to prevent re-occurrence

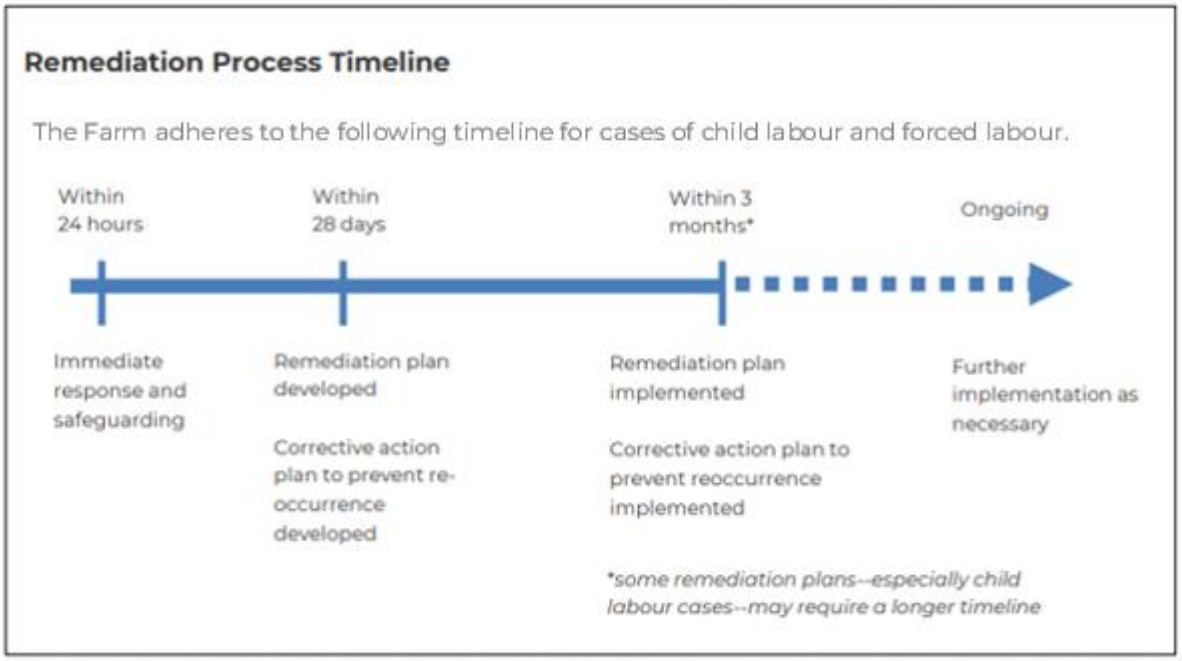

Figure 1: Remediation process timeline

1. Immediate Response and Safeguarding

Once a case has been found, the first step in remediation is for the farm to ensure the person's safety, and make sure that the person does not feel threatened. Not all situations require immediate safeguarding. However, child labour, forced labour, sexual harassment or other serious human rights abuses often require immediate actions to protect the person and remove them from an unsafe situation, until the remediation plan is developed and enacted.

Possible Immediate Steps for Cases of Child Labour and Forced Labour:

When a person working in forced labour is found to be working in a farm:

- remove the person from the forced labour situation if they are in danger
- provide them with a safe place to stay if necessary
- provide for necessary health checks and medical treatment
- when the person is removed from unsafe employment, support the person with an interim stipend at least equal to the higher of the following: the salary they had received or the local minimum wage until their remediation plan is agreed upon.

When a child of legal working age is found to be working in a hazardous situation:

- remove the child from the dangerous work situation
- provide for necessary health checks and medical treatment
- support the child with an interim stipend at least equal to the higher of the following: the salary they had received or the local minimum wage until their remediation plan is agreed upon.

When a child below the allowed working age is found to be working in a farm:

- remove the child from the work situation
- provide for necessary health checks and medical treatment
- make sure that the child is moved to a safe place away from work, and that their basic needs are met
- locate the parent or guardian if the child is not living with them
- contact local child protection authorities, community liaisons/leaders on child labour and/or child labour related NGOs if needed
- support the child with an interim stipend at least equal to the higher of the following: the salary they had received or the local minimum wage until their remediation plan is agreed upon

2. Remediation plan development

The next step is to develop and agree upon a remediation plan for the person, seeking input from the affected person, as well as external experts when appropriate. When it is a case of child labour, the child's family or guardian is also involved in the process. When the family is not available local child protection authorities are engaged.

Remediation will take different forms depending on the situation and the needs of the person in question, but always considers the best interest of the person. The development and implementation of most plans will involve working with an NGO or other partner organization, and/or government agencies who are experts in the issue. The criminal justice system is contacted when criminal actions have occurred. How quickly the plan is finalized will be dependent on the complexity of actions that need to occur and the urgency of the case, but in any case, within 28 calendar days of an abuse finding.

Elements to consider in the development of a remediation plan for child labour:

Where a child of legal working age is found working in a hazardous situation, the goal is to ensure the child's health and safety and preserve their income with safe work. Remediation actions may include for example:

- medical treatment, including long-term rehabilitation and recovery support when necessary
- transfer to safe work at least at the same level of pay
- other compensation

When a child below the allowed working age is found to be working, the goal is to protect the child and assure access to adequate resource and long-term support for the child and their education. Remediation actions may include for example:

- clarify the true age and identity of the child
- facilitation of access to schooling
- assistance with education-related costs including tuition and transportation fees, costs of uniforms or books or other related costs
- financial support to the family to compensate for the loss of the child's income
- employment offers for older, eligible members of the family
- repatriation when a child wishes to be reunited with family overseas
- medical costs
- ensure school attendance

Elements to consider in the development of a remediation plan for forced labour:

For forced and bonded labour, the goal is usually to provide safe and fairly compensated work where possible, and return any trafficked or persons employed against their will to their home when they wish. Remediation actions may include for example:

- providing medical treatment
- debt forgiveness to eliminate debt bondage situation
- revising and improving employee working conditions and payment
- financial compensation for wage theft or other damages
- returning personal/legal documents and property to ensure their freedom of movement
- repatriation to their home country

Better practices might include that whether the issue is discovered through a third-party audit, self-detected by the farm, or reported through the grievance mechanism, the grievance committee is involved in the development of any remediation plan. The committee is made aware of external resources available for remediation and the development of any remediation plan. This supports mutual learning and accountability.

3. Implementation and monitoring of remediation plan

Once the plan has been agreed on by all parties, it is implemented and monitored. Major remediation actions are completed within three months of finding the abuse. However, in some cases of child labour, implementation of the child's remediation plan can take up to several years--until a child is finished schooling and eligible for legal employment. In this case, the plan is underway (the child is enrolled in school and family is supported) at the end of the 90 days, with a clear plan of continued action.

Regular monitoring of the plan is important to confirm that the plan is implemented, that the implementation is effective, and that necessary adjustments are made when

circumstances change—for example when a child needs to change school enrolment due to a move.

4. Corrective action plan to prevent reoccurrence

An effective remediation process includes the development of a corrective action plan to ensure that roots causes are understood, and the abuse does not happen again to someone else. To develop this, the farm performs an analysis of what went wrong in their system to prevent human rights abuses, and then implements and monitors measures to prevent future recurrence.

Appendix 16 - Methodology for Wage Measurement

Background

ASC's wage measurement methodology follows the Anker Research Institute (ARI)'s methodology for measuring the prevailing wage (what is currently paid to the employees). The methodology can be read in full here. ASC recommends the use of either the online ASC template or the IDH Salary Matrix as tools to complete the wage calculation. The guiding principles for allowable remuneration are embedded in these tools.

Which employees to include in Living Wage calculation

The ASC definition of employee applies when determining the pool of categories, which means that subcontractors and temporary employees must be included. Apprentices, however, should not be included. Data may either: a) be collected from all employees, or b) be collected from a minimum of four categories of workers, with the additional following requirements.

- wage data is collected for the four largest job categories (the occupations or job grades with the largest number of employees)
- The lowest-paid employees must be included as a category.
- Subcontractors and temporary employees should be included as a category.
- The majority of employees must be included within the selected categories.
- Managers should not be included as a category (but they may be included when data is collected on all employees)

Data should be gender segregated, and the total percentage of employees included in the calculation must be reported.

Guiding principles for allowable remuneration in wage measurement calculation

This methodology outlines which types of remuneration (cash wages and benefits) can be included when calculating total remuneration to compare to a living wage benchmark. Most wages can be included, however there are some such as overtime pay, incentive pay, and deferred benefits, that cannot be included. There are also a limited number of in-kind benefits that can be counted towards overall remuneration. The ARI has outlined four conditions that must be met for remuneration to count towards wage measurement for comparison to a living wage:

From Living Wages Around the World by Martha and Richard Anker, Chapter 15 Measuring Prevailing Wages to Compare to a Living Wage, page 271.

- ***Receipt assured*** *Employees need to be able to count on receiving a wage, allowance, bonus, or benefit so that they are able to pay for ongoing expenses.*
- ***Received within one year*** *Employees have limited capacity to smooth out their spending over time without having to borrow and run the considerable risk of getting into perpetual debt. We assume that employees are able to smooth out expenditures for up to one year.*
- ***Earned during standard working hours working at a normal pace*** *The definition of a living wage indicates that it must be earned in standard working hours.*
- ***Received in cash (except for in kind benefits and medical insurance)*** *Remuneration needs to be available for ongoing expenses (i.e. paid in cash) or reduce such expenses (such as some in kind benefits).*

Allowable Wages and Benefits

The table below outlines which specific wage benefits, bonuses and allowances can be used when calculating total remuneration to compare to a living wage. All wage data and benefit data should be annualized and then calculated as a monthly amount to be comparable to wage benchmark data.

Wage/Benefit	Always include	Do not include	Rarely include	Rationale/Notes / Examples
Basic wage and any cost of living adjustment	✓			
Overtime pay and pay supplements for holidays, weekends, and night work		✓		Living wage should be achieved within normal working hours
Cash allowances and benefits	✓			• 13th month pay • Transportation cash allowance • Housing cash allowance • National holiday cash bonuses • Birthday cash bonus
Production incentive bonuses			✓	Production bonuses should only be included when received by the majority of employees, and not associated with an especially fast work pace or overtime.
Time off for holidays, annual leave, and sick leave		✓		Does not add to disposable income of employees. The exception to this Is employees with short term contracts who are paid an extra daily rate for

				holidays/vacation, when It Increases take-home pay
Maternity and paternity leave		✓		Does not add to disposable income of employees
Pension, provident fund, and severance payment		✓		Not received within one year
Employer contributions required by law, such as for social security programs, unemployment insurance, and workers' compensation/ injury insurance		✓		Does not add to disposable income of employees
Employer payment of private medical insurance	✓			

In-Kind Benefits

In-kind benefits are considered in the calculation of living wages as they reduce the amount of cash wage that employees require to cover living expenses. In order to determine a fair and reasonable value for in-kind benefits, the Ankers have developed a three-step approach:

From Living Wages Around the World by Martha and Richard Anker, Chapter 16 In kind benefits as partial payment of a living wage, page 294.

STEP 1: Determine allowable in-kind benefits

The Anker methodology includes the following lists of allowable benefits:

In-Kind Benefits	Can include	Do not include	Rationale/Notes / Examples
Meals at work	✓		Reduces food expense.
Food rations or food commodities given for free or sold at concession rates	✓		Reduces food expense.
Housing (including electricity, water, and fuel)	✓		Reduces housing expense.
Transport to and from work (and to town on weekends from agricultural estates)	✓		Reduces transport expense.

Child care	✓		Reduces childcare expense.
School for children of employees	✓		Reduces education expense.
Medical clinic and medical care not required by law and not for work-related matters	✓		Reduces medical expense.
Medical insurance not required by law	✓		Reduces insurance expense.
Employer payment of private medical insurance	✓		Reduces insurance expense.
Visas or work permits for migrant workers		✓	Employer obligation.
Clothing, equipment, and supplies for work		✓	Employer obligation.
Dormitories or shared housing for seasonal employees		✓	Does not reduce family housing cost.
Drinking water provided to employees at work		✓	Employer obligation.
Land for kitchen garden		✓	
Charitable contributions to the community that do not go exclusively to employees		✓	
Employers' contributions to Social Security or National Health Service required by law		✓	
Time off work for vacation, sick leave, maternity leave, or public holiday		✓	
Any other benefit that does not reduce the cash Income necessary for employees to meet their needs		✓	

STEP 2 Value in-kind benefits

The total cost to the employer of in-kind benefits should be divided by the number of employees to get the cost per employee.

Anker guidelines state that the value of an in-kind benefit should not:

- ***exceed its cost to employer.*** This guideline is in line with the national laws of many countries and also in-line with ASC requirements around in-kind benefits, including food and housing. Employers can value an In-kind benefit by the cost they pay to a contractor to provide the service. They can also estimate the cost of providing the benefit themselves.
- ***exceed its replacement cost to employees if they purchased it on the market.***
- ***exceed the cost of replacing equivalent meal prepared at home.*** The cost of preparing meals sold on the market is almost always higher than the cost of a meal prepared at home, as labour and overhead costs are not included in the cost of home meal preparation.

In-kind benefits cannot be lower than an alternative cash allowance option offered to employees. If a employee is offered the choice, for example, of on-site housing or a housing allowance, the in-kind value attributed to the onsite housing should not be less than the cash housing allowance.

When an in-kind benefit is not free, such as a subsidized lunch or medical-care or housing cost, for which employees have a co-pay, the cost to employees needs to be subtracted.

STEP 3: Confirm that the total estimated monetary value of all in-kind benefits are less than maximum limits allowed.

In order to ensure that employees have a sufficient amount of discretionary income (Income they can spend as they choose), and In line with legal requirements in many countries, the percentage of total income that Is provided to employees in-kind should be limited. According to the Anker methodology, limits on total monetary value of in-kind benefits are as follows:

From Living Wages Around the World by Martha and Richard Anker Anker, Chapter 15 Measuring Prevailing Wages to Compare to a Living Wage, page 299

- *Maximum value of 30% of wage for all acceptable in-kind benefits allowed.*
- *Maximum limit of 15% of wage allowed for housing and 10% for any other in kind benefits such as food or transport.*
- *Maximum value for all in kind benefits as partial payment of wage should not bring cash wage below minimum wage when this restriction is stipulated in law.*
- *In locations where laws do not allow in kind benefits to reduce cash wage below minimum wage, this restriction should be honored.*
- *Value of an in-kind benefit should not exceed amount allocated in living wage benchmark for the item.*