

APPENDIX F. ENVIRONMENTAL MANAGEMENT PROGRAMME



Prepared for: **Madlankala Primary Cooperative**

Project: **Lake Qhubu Intensive Land-Based Fish Farm**

Location: **Madlankala Reserve, Esikhaleni, Richards Bay, City of Mhlathuze, KwaZulu-Natal**

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Prepared By:



Project Information Sheet

PROJECT

Lake Qhubu Land-Based Aquaculture Development, located in Madlankala Reserve, Esikhaleni, Richards Bay, City of Mhlathuze, KwaZulu-Natal.

EDTEA REF NO: DC28/0006/2019

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Environmental Management Programme

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SECTION A: PRELIMINARIES

LIST OF ACRONYMS

BAR	Basic Assessment Report
DWS	Department of Water and Sanitation
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
DAFF	Department of Agriculture, Forestry and Fisheries
EMPr	Environmental Management Programme
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
GA	General Authorisation
I&AP	Interested and Affected Parties
IDP	Integrated Development Plan
ILBA	Intensive Land Based Aquaculture
MSDS	Material Safety Data Sheet
NEMA	National Environmental Management Act
PPP	Public Participation Process

GLOSSARY OF ITEMS

ARCHAEOLOGICAL RESOURCES: includes (a) material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures; (b) rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation; wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

AQUACULTURE: is defined as the propagation, improvement, trade or rearing of aquatic organisms (plant and animal) in controlled or selected aquatic environments (fresh, sea or brackish waters) for any commercial, subsistence, recreational or other public or private purpose.

BASIC ASSESSMENT: The process of collecting, organizing, analyzing, interpreting and communicating information that is relevant to the consideration of the application.

BIODIVERSITY: The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.

CONTRACTOR: companies and or individual persons appointed on behalf of the client to undertake activities, as well as their sub-contractors and suppliers.

DEVELOPMENT: the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.

DEVELOPMENT FOOTPRINT: any evidence of physical alteration as a result of the undertaking of any activity.

ENVIRONMENTAL CONTROL OFFICER: an individual nominated through the client to be present on site to act on behalf of the client in matters concerning the implementation and day to day monitoring of the EMP and conditions stipulated by the authorities as prescribed in NEMA.

ENVIRONMENT: in terms of the National Environmental Management Act (NEMA) (No 107 of 1998) (as amended), Environment means the surroundings within which humans exist and that are made up of:

- i. the land, water and atmosphere of the earth;
- ii. micro-organisms, plants and animal life;
- iii. any part or combination of (i) of (ii) and the interrelationships among and between them;
- iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence; and
- v. human health and wellbeing.

ENVIRONMENTAL IMPACT: the change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.

ENVIRONMENTAL MANAGEMENT PROGRAMME: a detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive environmental impacts and limiting or preventing negative environmental impacts are implemented during the life-cycle of the project. This EMP focuses on the construction phase, operation (maintenance) phase and decommissioning phase of the proposed project.

FRESHWATER AQUACULTURE: produces species that are native to rivers, lakes, and streams. U.S. freshwater aquaculture is dominated by catfish but also produces trout, tilapia, and bass. Freshwater aquaculture takes place primarily in ponds and in on-land, manmade systems such as recirculating aquaculture systems.

GENERAL WASTE: waste that does not pose an immediate hazard or threat to health or the environment, and includes -

- Domestic waste;
- Building and demolition waste;
- Business waste; and
- Inert waste.

GENERAL WASTE LANDFILL SITE: a waste disposal site that is designed, managed, permitted and registered to allow for the disposal of general waste.

HAZARDOUS WASTE: hazardous waste means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste have a detrimental impact on health and the environment.

INDIGENOUS VEGETATION: refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.

INTERESTED AND AFFECTED PARTY: for the purposes of Chapter 5 of the NEMA and in relation to the assessment of the environmental impact of a listed activity or related activity, an interested and affected party contemplated in Section 24(4) (a) (v), and which includes (a) any person, group of persons or organisation interested in or affected by such operation or activity; and (b) any organ of state that may have jurisdiction over any aspect of the operation or activity.

MARINE AQUACULTURE: refers to the culturing of species that live in the ocean. Marine aquaculture primarily produces oysters, clams, mussels, shrimp, and salmon as well as lesser amounts of cod, moi, yellowtail, barramundi, seabass, and seabream. Marine aquaculture can take place in the ocean (that is, in cages, on the seafloor, or suspended in the water column) or in on-land, manmade systems such as ponds or tanks. Recirculating aquaculture systems that reduce, reuse, and recycle water and waste can support some marine species.

MITIGATION: the measures designed to avoid reduce or remedy adverse impacts.

POLLUTION: the National Environmental Management Act, No. 107 of 1998 defined pollution to mean any change in the environment caused by the substances; radioactive or other waves; or noise, odours, dust or heat emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.

PRIMARY AGRICULTURE: The primary sector includes the production of raw material and basic foods. Activities associated with the primary sector include agriculture (both subsistence and commercial), mining, forestry, farming, grazing, hunting and gathering, fishing, and quarrying.

REHABILITATION: rehabilitation is defined as the return of a disturbed area to a state which approximates the state (wherever possible) which it was before disruption.

RECIRCULATING AQUACULTURE SYSTEM (RAS): is essentially a technology for farming fish or other aquatic organisms by reusing the water in the production. The technology is based on the use of mechanical and biological filters, and the method can in principle be used for any species grown in aquaculture such as fish, shrimps, clams, etc. Recirculation technology is however primarily used in fish farming, and this guide is aimed at people working in this field of aquaculture.

SECONDARY AGRICULTURE: The secondary agriculture provides value addition to agricultural products, creating facilities for primary processing and stress management in agriculture and adds value to the basic agro commodities to allow farmers to get better returns from their harvest.

WATER POLLUTION: The National Water Act, 36 of 1998 defined water pollution to be the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it less fit for any beneficial purpose for which it may reasonably be expected to be used; or harmful or potentially harmful (a) to the welfare, health or safety of human beings; (b) to any aquatic or non-aquatic organisms; (c) to the resource quality; or (d) to property.

WATERCOURSE: can be a) a river or spring; b) a natural channel or depression in which water flows regularly or intermittently; c) a wetland, lake or dam into which, or from which, water flows; and/or d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998) and a reference to a watercourse includes, where relevant, its bed and banks.

WETLAND: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

1. Introduction

This EMPr provides a framework for managing environmental risks specific to the Lake Qhubu ILBA. Each aquaculture farmer in the fish farm will be required to develop their own operational EMPr to give effect to the requirements of this framework as it pertains to their specific operations.

2. Responsibilities

- Madlankala Primary Cooperative is responsible for the development of a project-level Site Development Plan and EMPr, for consideration by the Competent Authority. These will be based on design criteria and mitigation measures contained in this framework EMPr.
- The Madlankala Primary Cooperative is the applicant for the Lake Qhubu ILBA and is responsible for overseeing the implementation of the EMPr by the various investors establishing in the Fish Farm.

3. Development of Project-Level EMPrs

The project-level EMPrs will be developed substantially in accordance with the requirements of the EIA Regulations (GNR 327) Appendix 4: Content of the Environmental Management Programmes (EMPr), and will therefore oversee the design, construction, operations, and rehabilitation aspects, if required, and provide:

- Management objectives.
- Details of impacts and risks to be avoided.
- Management actions and mitigation measures.
- Monitoring.
- Auditing compliance with the EMPr
- Reporting to the Competent Authority (EDTEA).
- Environmental awareness.
- Training of staff to manage job-specific environmental risks impacts.

4. Aspects Covered in the EMPr

The EMPr covers the aspects of the EMPr as illustrated in Diagram 1 below, within the boundary, including the wastes and emissions and other outputs that can interact with the environment. It therefore covers:

a. Aquaculture production

- Hatcheries
- Nurseries
- Grow-out Systems (with tanks, ponds, raceways, pumps, etc.).

b. Processing plants

a. Water management and treatment

- c. Effluent management and treatment.
- d. Solid waste management.
- e. Interaction with the land, soil, air, water and terrestrial habitats.

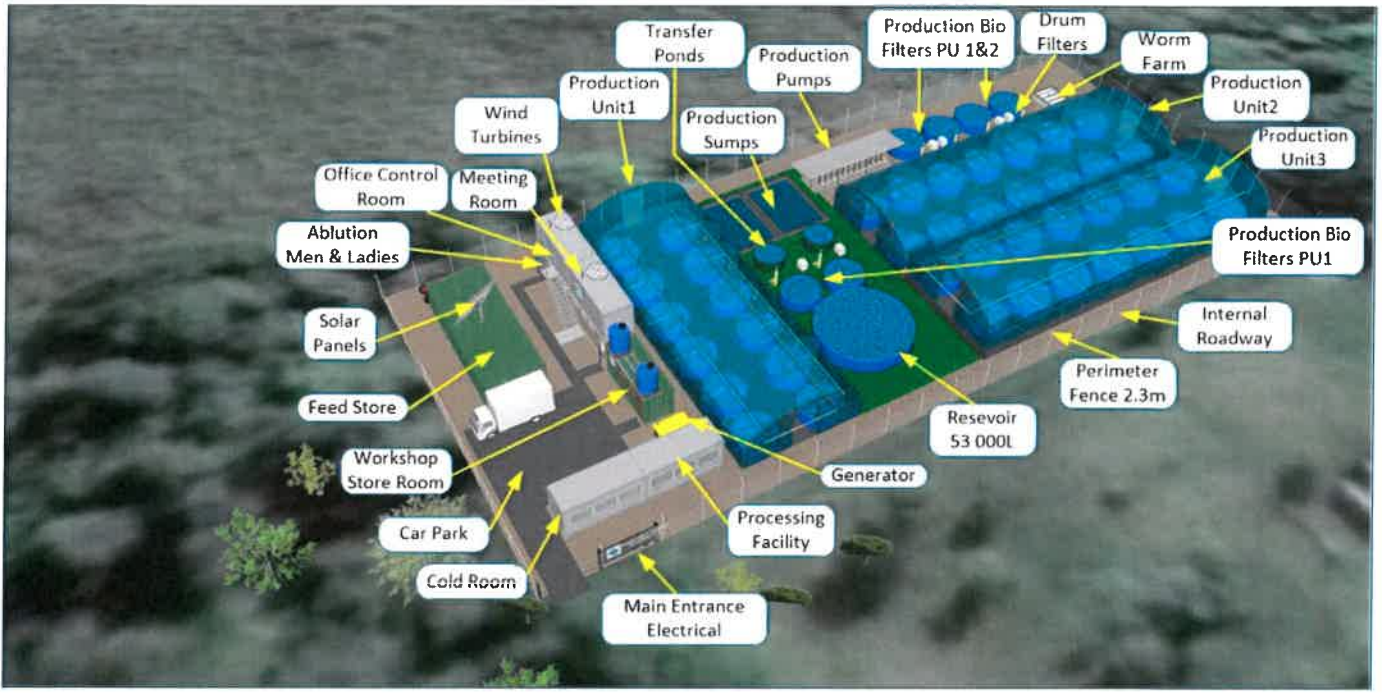
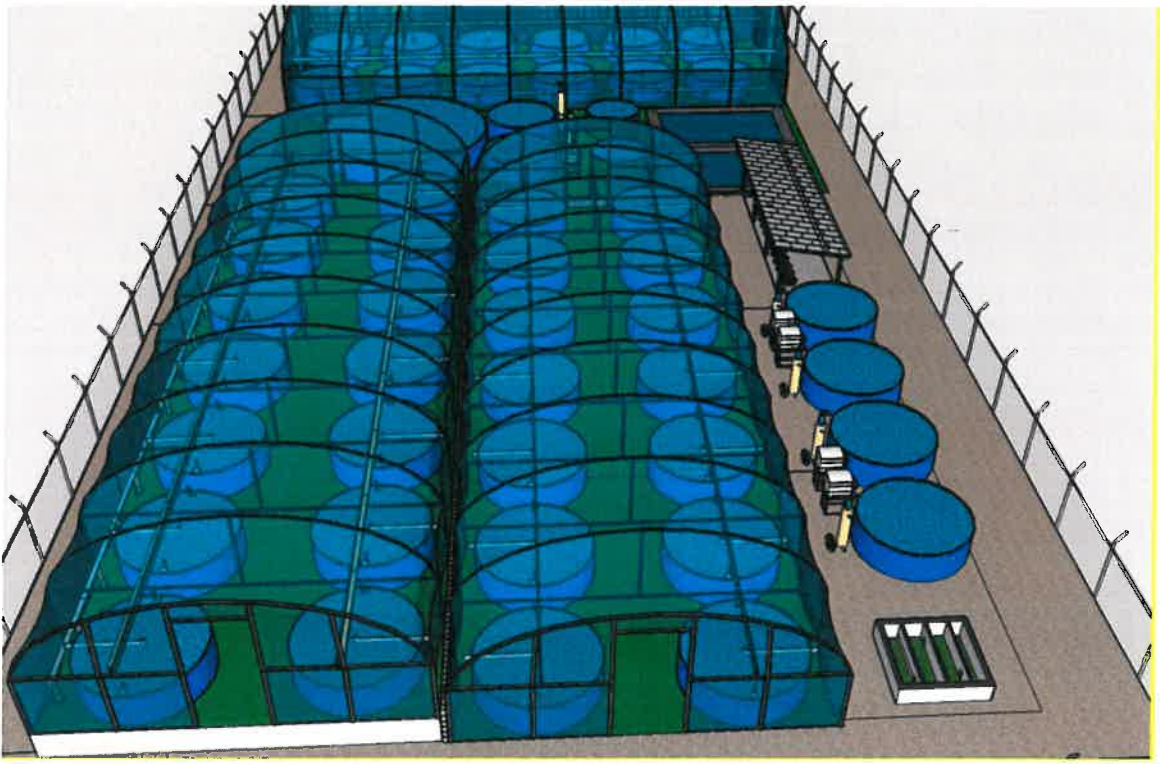


Diagram 1: Lake Qhubu Intensive Land Based Aquaculture (ILBA) Aspects Managed in this EMP



Map 1: Conceptual Layout of the Lake Qhubu ILBA

A recirculating system will be used involving the continuous treatment, reconditioning, aeration, and recirculation of water. Examples of a recirculating systems are illustrated in Diagram 2. A recirculating system use a variety of culture tanks, raceways and constructed ponds.

The fish harvested will be processed at a processing facility in the Lake Qhubu ILBA. Primary processing includes gutting, washing, grading, sorting and packing. Secondary processing includes de-heading, skinning, filleting, trimming and portion cutting. Primary and secondary processed products can be packed fresh, frozen, or can be vacuum-packed. Tertiary processing includes some form of heating, such as smoking, re-cooking, poaching in vacuum packed bags, or drying, canning, pickling, crumbing (i.e. fish fingers) and then packaging.

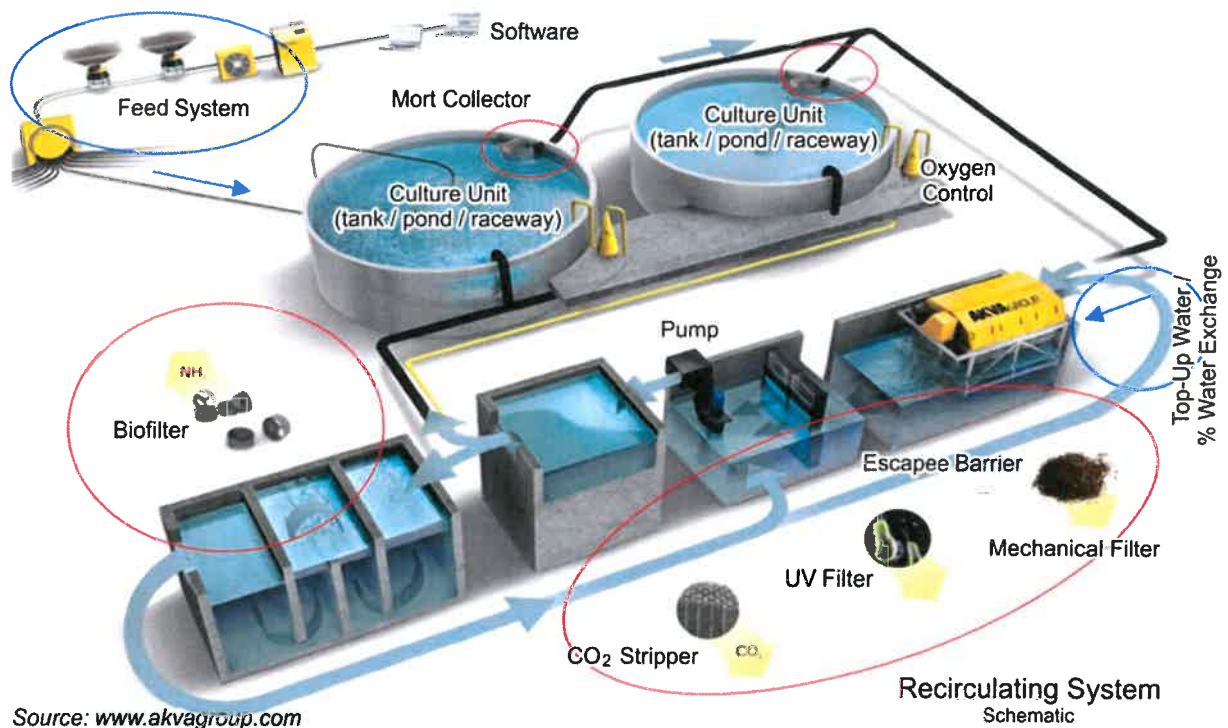


Diagram 2: Schematic Example of a Recirculating Aquaculture System

5. Management Objectives

- Applicant will compile project-level Site Development Plans and Designs in accordance with the design criteria contained in this EMPr.
- Applicant to compile project-level EMPr based on the mitigation measures contained in this EMPr, including monitoring.
- The Site Development Plans and project-level EMPr to be submitted to and agreed to by the Competent Authority (EDTEA).
- Applicant through the ECO to undertake monitoring and auditing as per their project-level EMPrs and corrective action to be taken as required.
- Applicant to regularly report to the Competent Authority on environmental matters, as per timeframes agreed to with the Competent Authority.
- The Competent Authority to oversee environmental compliance within the Lake Qhubu ILBA.
- Applicant is demonstrating adequate compliance with the EMPr.
- Environmental impacts within the Lake Qhubu ILBA are adequately managed and the Mitigated Project Impacts, as rated in the Section D of the Basic Assessment Report: Environmental Impact and Significance Rating, are not exceeded.
- Corrective action to be taken as required

Section B. Mitigation Measures and Design Criteria

Management Actions:	Development Phase:
1) Planning the Layout of the Site	
<ul style="list-style-type: none"> The Competent Authority to develop a master layout plan for the Lake Qhubu ILBA. 	Planning. Prior to construction.
<ul style="list-style-type: none"> Applicant to compile a project-level site development plan and EMPr, based on the EMPr developed for this EIA and conditions of Environmental Authorization, WUL and procedures for construction and operation, for consideration by the Competent Authority. 	Planning. Prior to construction.
2) Selecting the Species to be Cultivated in the Lake Qhubu ILBA	
<ul style="list-style-type: none"> Individual aquaculture farms to comply with the Alien and Invasive Species (AIS) Regulations (GNR 598, GG 37885), which may include an operation specific risk assessment and approval by the relevant authority prior to commencement of any operations. 	Prior to introduction of species.
<ul style="list-style-type: none"> Applicant to assess and demonstrate to the Competent Authority the feasibility of their chosen species and production technology. 	Prior to construction of individual farms.
<ul style="list-style-type: none"> The introduction of species to be considered on a case by case basis by the Competent Authority. 	Prior to introduction of species.

Management Actions:	Development Phase:
3) Managing Fresh Water Supply	
<ul style="list-style-type: none"> • Direct extraction • Running a surface/moveable pipe between the Farm and Lake 	Planning. Ongoing during life of ILBA
<ul style="list-style-type: none"> • Indirect extraction (extraction pit/well) • Digging a Pit/Well into the ground above the High-Water Level to below the water table allowing water to seep into it and extract water from there. • The Pit would be fenced off to prevent unauthorized entry to mitigate the risk of Human/Animal Safety 	Planning. Ongoing during life of ILBA
<ul style="list-style-type: none"> • Rainwater harvesting and re-use to be optimized. 	Planning. Ongoing during life of ILBA.
<ul style="list-style-type: none"> • Fresh water aquaculture developments in the Lake Qhubu ILBA to demonstrate concerted efforts to reduce their fresh water consumptive use. 	Planning. Ongoing during life of ILBA.
<ul style="list-style-type: none"> • Should the applicant be interested in establishing fresh water boreholes will be responsible to assess the feasibility of their proposal and to obtain the necessary water use authorization. 	Prior to construction of ILBA.
4) Aquaculture System Design	
<ul style="list-style-type: none"> • The Applicant to address biosecurity, animal health and hygiene, and product quality considerations associated with the use of waste water, farm produced feed inputs and integration of species. • Obtain the necessary aquaculture and veterinary approvals and permits. 	Planning, and ongoing during operational life of ILBA.
<ul style="list-style-type: none"> • Only appropriately lined aquaculture ponds, attenuation ponds, tanks and raceways to be used in the ILBA. 	Planning, construction and operation.
<ul style="list-style-type: none"> • With the exception of stormwater attenuation, no unlined ponds to be used. Unlined stormwater attenuation ponds only to be used in areas where geotechnical conditions have proven suitable and where infiltration will not cause instability or collapse of soils, and only where rainwater harvesting is not feasible. 	Planning, construction and operation.
<ul style="list-style-type: none"> • The ILBA to demonstrate efficient use of land and water resources. 	Planning, and ongoing during operational ILBA.
<ul style="list-style-type: none"> • Competent Authority to explore potential future options and linkages between aquaculture and other industries in the ILBA, i.e. utilising wastewater for biomass production, while improving the quality of wastewater releases at the same time. 	Planning, construction and operation.

Management Actions:	Development Phase:
5) Waste Water and Effluent Management	
<ul style="list-style-type: none"> • Effluent will not be released to the environment. It can be: <ul style="list-style-type: none"> - Treated on site and re-used. - Sent to another facility or industry in the region to be re-used. - Stored in appropriately designed storage tanks, from where it is to be removed to an authorised disposal facility / sewage treatment works. - Discharged to the municipal sewer network. These discharges to meet the quality requirements and conditions of the municipal system (permit requirements and by-laws). - Discharged to the marine pipeline, if a coastal water discharge permit is in place. These discharges to meet the quality requirements and conditions of the coastal water discharge permit. - Discharged to the dedicated marine discharge pipeline for which a coastal discharge authorisation (permit or general authorisation) has been obtained. These discharges to meet the quality requirements and conditions of the coastal waters authorisation. 	Construction and operation.
<ul style="list-style-type: none"> • Storage of waste to be in accordance with the environmental authorisation and procedures, this EMPr and the conditions of the waste license. 	Construction and operation.
<ul style="list-style-type: none"> • The ILBA to identify and quantify each of their waste streams and keep records for volumes produced, stored and discharged and/or disposed. 	Prior to construction of ILBA.
<ul style="list-style-type: none"> • The ILBA to develop a water and effluent monitoring programme based on industry best practices and standards and the various Waste license conditions. 	Prior to construction of ILBA.
<ul style="list-style-type: none"> • Processing plant waste, sludge, mortalities and other potentially hazardous or infectious waste to disposed at an authorized landfill site, unless it can be demonstrated that an alternative sustainable use are available and the necessary approvals have been obtained from NEMA:WA (license), as well as any environmental, water and waste approvals triggered by the use or application of the waste. 	Operation of ILBA.

Management Actions:	Development Phase:
<ul style="list-style-type: none"> Processing plant solid waste and mortalities to be stored in leak proof, vermin proof, sealed containers and disposed of at an authorised landfill site within 48 hours of being created and within 7 days if frozen. 	Operation.
<ul style="list-style-type: none"> Processing plants to be operated in accordance with best available industry practices and management principles. 	Operation.
8.1 6) Terrestrial Ecology	
<ul style="list-style-type: none"> Development of the ILBA to be limited to within the degraded areas comprising of gum plantations as indicated on the Environmental Authorisation, thus within the defined footprint of the Lake Qhubu ILBA. 	Planning, construction and operation.
<ul style="list-style-type: none"> Development, in the gum plantation, to take cognisance of the remaining indigenous vegetation. Site development plans to be developed with the following objectives: <ul style="list-style-type: none"> Alignment of access roads to follow existing tracks where practical. Buildings, structures and linear infrastructure to be focused, as far as reasonably possible, in areas where vegetation has already been disturbed by historical farming and the establishment of alien vegetation. Pockets and strips of indigenous vegetation to be maintained to serve as buffers between individual aquaculture operations. Maintain a 100 m buffer between the aquaculture operations and the lake habitat and breeding areas. 	Planning, construction and operation.
<ul style="list-style-type: none"> Construction to take place within the framework of an approved site development plan. 	Construction.
<ul style="list-style-type: none"> Re-vegetation as part of a rehabilitation plan is advocated. It is suggested that the topsoil layer be stockpiled separately from the subsoil layers. All stockpiles not to exceed a maximum of 2 m in height and to be properly maintained in accordance with the environmental authorisation conditions. When the construction has been completed, the topsoil layers, which contain seed and vegetative material, to be reinstated thus allowing plants to rapidly re-colonise the bare soil areas. 	Construction and operation.
<ul style="list-style-type: none"> Monitoring to be undertaken on bare soil areas for signs of erosion, such as drilling, and suitable mechanisms to abate erosion. 	Construction and operation.
<ul style="list-style-type: none"> During the operational phase, it is recommended that maintenance of rehabilitated areas be undertaken in accordance with the established rehabilitation plan and landscaping procedures, as well as a project specific environmental authorisation conditions to be prepared for the Lake Qhubu ILBA. 	Operation.
<ul style="list-style-type: none"> Clearing of vegetation during construction to be to a minimum, keeping to the width and length of the planned earthworks areas only. 	Construction.
<ul style="list-style-type: none"> Alien and invasive plant regrowth to be monitored, and any such species to be removed during the construction and operational phases in line with the relevant environmental authorisation conditions. 	Construction and operation.

Management Actions:	Development Phase:
<ul style="list-style-type: none"> The Applicant to continue with on-going alien and invasive clearing and maintenance practices as per established management practices and procedures. 	Construction and operation.
<ul style="list-style-type: none"> Soil in which alien vegetation is growing, is contaminated with the seed and is a potential source of seed for new invasions. Care must be taken when removing or disturbing this soil, as it would perpetuate the spread of alien vegetation. 	Construction and operation.
<ul style="list-style-type: none"> The Applicants permit to remove protected plant species from areas where infrastructure will be constructed in the Municipality, in terms of the Nature Conservation Ordinance (19 of 1974), must be current and all vegetation clearance to be in accordance with the following permit conditions: 	Construction.
<ul style="list-style-type: none"> - The location of individuals of the various species to be identified, located with a GPS and be physically marked. 	
<ul style="list-style-type: none"> - The person responsible for the relocation to work ahead and physically remove the plants before vegetation clearance starts. 	
<ul style="list-style-type: none"> - If a species is represented by too many individuals to make relocation of the entire population feasible, plants should be taken from different parts of the site, from different habitats, both young and old individuals should be selected as well as individuals reflecting variability in the population to ensure the plants relocated will express the broadest genetic variation and maximise the chance of survival. 	
<ul style="list-style-type: none"> - For plants that cannot be successfully uprooted and transplanted, seeds and/or small cuttings are to be collected and established in a nursery for cultivation and later introduction into selected localities. 	
<ul style="list-style-type: none"> - Plants are to be translocated in the most appropriate form, not only as whole plants but also as bulbs, seeds and cuttings. 	
<ul style="list-style-type: none"> - Private individuals and or nurseries to be given the opportunity to collect plants that are not relocated and that would otherwise be destroyed during vegetation clearance of the site. 	
<ul style="list-style-type: none"> The Applicants license, under the National Forests Act (84 of 1998) to cut and destroy protected trees for the purpose of developing infrastructure in the area must be current. All activities under this license to be strictly monitored by the ECO. 	Construction.
<ul style="list-style-type: none"> Mitigation with respect to minimising animal road mortalities is not always practical. Therefore, awareness to be created during the staff induction programme. Staff to be made aware of the general speed limits as well the potential animals that may cross and how to react in these situations. 	Construction and operation.
<ul style="list-style-type: none"> Mountable kerbing to be used to allow for the movement of animals across any roads, especially the smaller species of rodent, tortoises, snakes and lizards. 	Planning and construction.
<ul style="list-style-type: none"> The Lake Qhubu ILBA boundary fencing to allow for the passage of small and medium sized mammals. Mesh fencing not to be used around the boundary of the ILBA. The fence design to also allow for migration of tortoises, and thus tortoise holes must be provided. 	Planning and construction.

<ul style="list-style-type: none"> • Small mesh fencing may be used around areas where there is little or no natural habitat. This will assist with keeping rodents and other pest animals that may have been introduced (in feed, etc.) from escaping to the surrounding natural areas. 	Planning and construction.
<ul style="list-style-type: none"> • Suitable methods of solving the aggregation of birds to the ILBA to be investigated and may include means of complete exclusion (complete covering of ponds / raceways) or impeding access (spines or wires) where suitable. This is in interest of the facility since predation would have an economic effect on such operations and could compromise biosecurity controls. A monitoring programme is to be developed so that suitable adjustments can be made to prevent impacts from escalating. 	Operation.
<ul style="list-style-type: none"> • Off-road driving and access into surrounding open space areas, i.e. the lake's riparian areas and areas demarcated for Species of Special Concern to be strictly controlled. 	Construction and operation.
<ul style="list-style-type: none"> • Site specific rehabilitation measures to be developed for the various buffer zones and open areas within the ILBA. 	Construction and operation.
7) Managing Heritage Resources	
General	
<ul style="list-style-type: none"> • The Basic Assessment Report will be submitted to Amafa kwaZulu-Natal and uploaded onto SAHRA's (online system) website. 	EIA phase.
<ul style="list-style-type: none"> • For recorded heritage sites, adhere to specific recommendations for each of the sites. 	Planning, construction and operation.
<ul style="list-style-type: none"> • There is a likelihood that new heritage discoveries are made during construction (vegetation clearance and site grading). If any evidence of heritage sites or remains (e.g. shell middens, remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, shipwrecks, marine shell and charcoal/ash concentrations), unmarked or marked human burials, fossils or other categories of heritage resources are found during construction, Amafa kwaZulu-Natal to be alerted immediately, and an accredited professional archaeologist or paleontologist must be contacted as soon as possible to inspect the findings (SAHRA, 2010). 	Construction.
<ul style="list-style-type: none"> • If newly discovered heritage resources prove to be of significance, a rescue operation might be necessary. On receipt of a satisfactory mitigation permit report from the archaeologist and/or paleontologist, SAHRA to make further recommendations in terms of the possible destruction or preservation of the heritage resources (SAHRA, 2010). 	Construction.
Archaeology	
<ul style="list-style-type: none"> • No recorded sites located within the footprint of the ILBA. Should there be any, the following is required before disturbance to the sites may take place. 	Prior to construction.
<ul style="list-style-type: none"> - Sites to be recorded and a report to be submitted to Amafa kwaZulu-Natal. 	
<ul style="list-style-type: none"> - A destruction permit needed prior to disturbance. 	
<ul style="list-style-type: none"> - Based on outcome of the site recording, a Phase II permit and survey may be required. 	

<ul style="list-style-type: none"> Vegetation clearance in the ILBA to be done under the supervision of an archaeologist and in short strips, either by hand or with small machinery or with the least invasive method reasonably possible. This is to allow for documentation and/or rescue of any new discoveries (SAHRA, 2011). 	Construction.
<ul style="list-style-type: none"> An archaeologist to be present on site to monitor earth moving activities (SAHRA, 2011). 	Construction.
<ul style="list-style-type: none"> General recommendations for new heritage discoveries to be followed if evidence of heritage sites or remains is found (see above, as recommended by SAHRA, 2011). 	Construction.
Paleontology	
<ul style="list-style-type: none"> A paleontologist or an ECO trained by a paleontologist on how to search for possible fossil remains in freshly excavated material, to monitor earth moving activities (SAHRA, 2011). 	Construction.
<ul style="list-style-type: none"> An ECO trained by a paleontologist on how to search for possible fossil remains in freshly excavated material, to inspect excavations and notify a paleontologist if rich fossil remains are encountered. 	Construction.
Historical Sites	
<ul style="list-style-type: none"> The master layout plan for the Lake Qhubu ILBA to take cognisance of historical buildings and burial grounds and need to allow reasonable access by family members and historical interested groups. 	Planning.
<ul style="list-style-type: none"> Potential uses of the buildings as part of the ILBA and options to safeguard them from vandalism to be explored, with input by a heritage specialist. 	Planning, construction and operation.
<ul style="list-style-type: none"> Amafa akwaZulu-Natalito be informed of any alterations to buildings or other built structures older than 60 years. 	Planning, construction and operation.
<ul style="list-style-type: none"> All graves, including the unmarked ones, must be protected and conserved (SAHRA, 2011). 	Planning, construction and operation.
8) Managing Visual Impacts	
<ul style="list-style-type: none"> Design of buildings and structures, and the choice of paints, finishes and textures to be in accordance with the Municipality's Visual Guidelines for Development and the Architectural Guidelines. 	Planning and construction.
<ul style="list-style-type: none"> Lighting design to consider and minimise impacts: <ul style="list-style-type: none"> – Sky glow, light spill and glare towards the surroundings to be minimized. – Lighting to not exceed, in number of lights and brightness, the minimum required for safety and security. – Timer switches or motion detectors to be considered in areas that are not occupied continuously. – Outside lighting to be appropriately directed where required. Uplighting to be avoided. – Where possible, interior lighting to be switched off or dimmed at night and designed to minimize light escaping through windows and plastic sheeting. 	Planning, construction and operation.
<ul style="list-style-type: none"> Light spill and glare, from light fixtures and from vehicles on internal roads, to not reach into the 100 m buffer zone around the lake habitat as a precautionary measure to avoid disturbance to the birds at night. 	Planning and construction.

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• Noise	
<ul style="list-style-type: none"> Noisy activities to be avoided during construction and operational phases. Maintain the 100 m buffer zone around the Lake 	Construction and operation.
<ul style="list-style-type: none"> Construction work to be carried out from 07h00 am to 17h00 pm on weekdays and 08h00 to 13h00 on weekends and public holidays to avoid noise activities during the evenings. 	Construction and operation.
<ul style="list-style-type: none"> High pressure pumps, generators and noise generating components at the plant to be enclosed in structures where sound attenuation properties have been considered for the walls, roofs, access doors and ventilation outlets. 	Planning, construction and operation.
<ul style="list-style-type: none"> Comply with the South African Noise Standards (SANS 10103). 	Planning, construction and operation.
9) Marine Environment	
<ul style="list-style-type: none"> Develop and implement a biosecurity management plan and disease and animal health management plan which covers all aquaculture operations within the ILBA. 	Planning. Prior to construction of the ILBA.
<ul style="list-style-type: none"> Develop a comprehensive monitoring programme for the ILBA to include water quality in incoming water sources and effluent discharges, sediment physical and chemical characteristics, biological monitoring at the intake and discharge points (benthic invertebrates, phytoplankton etc.), assessment of exotic and invasive species in adjacent water, health monitoring and monitoring the compliance of individual farms with disease and fish health standards in accordance with the ILBA biosecurity management plan and disease and animal health management plan. The monitoring programme must incorporate both baseline assessments prior to impact, reference points outside of the local area of impact, action thresholds and performance assessment criteria. 	Planning. Prior to construction.
<ul style="list-style-type: none"> Individual aquaculture farms to comply with the Alien and Invasive Species (AIS) Regulations (GNR 598, GG 37885). No species on the invasive species list to be cultured on any farm in the ILBA without the operation conducting a risk assessment specific to the operation and species and receiving approval from the relevant authorities. Individual investors to develop and implement a biosecurity management plan and disease and animal health management plan for their operations in the ILBA. 	Planning. Prior to introduction of species.
<ul style="list-style-type: none"> All organisms obtained from other hatcheries or imported to be sourced only from certified disease, pathogen and parasite free sources. 	Operation.
<ul style="list-style-type: none"> Culture facilities must be designed to have multiple redundancy exclusion barriers or screens fine enough to contain the live stages of the organisms being cultured (eggs, larvae, juveniles etc.). 	Planning and operation of the ILBA.
<ul style="list-style-type: none"> Incoming water must be treated and sterilised to prevent the amplification of naturally occurring diseases and pathogens. 	Planning and operation of the ILBA.
<ul style="list-style-type: none"> Exclusion barriers to be maintained through a farm specific standard operating procedure and in accordance with the ILBA Biosecurity Management Plan. 	Planning and operation of the ILBA.
<ul style="list-style-type: none"> Consider sterilisation of fish through hybridisation or single sex production to provide genetic security from invasive species. 	Planning and operation of ILBA.

<ul style="list-style-type: none"> • Effluent water from hatcheries and grow-out facilities to be treated to prevent escapees and the transfer of pathogens and diseases into the nearby Lake Qhubu. The type of treatment is dependent on the culture organisms, culture methods, discharge volumes and biosecurity risk and need to be developed on an individual basis per aquaculture operation. Possible methods include filtration, ozonation or UV filtration but will be farm specific based on the culture species, design (re-circulating), water volumes and flow rates and must be determined in each Site Biosecurity Management Plan. Where there is a risk, and depending on the species, effluent water to be filtered and sterilised prior to discharge to prevent the escape of eggs, larvae and juveniles. 	<p>Planning and operation of the ILBA.</p>
<ul style="list-style-type: none"> • Effluent water from individual operations to comply with effluent discharge and water quality standards as per Municipality's waste discharge permit before release to the lake. 	<p>Planning and operation of the ILBA.</p>

Management Actions:	Development Phase:
<ul style="list-style-type: none"> Individual operations to develop farm specific monitoring programmes, including water quality, disease and fish health monitoring, pathogens in the facility, escapee trap performance, and incorporate action thresholds and performance assessment criteria. 	Planning and prior to construction of the ILBA.
<ul style="list-style-type: none"> Brood stock of indigenous species must be obtained from the same disease and genetic management zone in which the study area is situated. 	Planning and operation of the ILBA.
<ul style="list-style-type: none"> Ongoing monitoring of escapee management control measures on individual farms and at the ILBA level to monitor compliance and performance of the management measures is required. 	Planning and operation of the ILBA.
<ul style="list-style-type: none"> Open, non-enclosed farms must have effective physical barriers to exclude birds and other wildlife in order to prevent potential disease transfer vectors from accessing holding tanks and waste water sources. Non-lethal bird netting and screens may be used to ensure isolation of individual operations from each and prevent transmission vectors from accessing water sources. 	Planning and operation of the ILBA.
<ul style="list-style-type: none"> Quarantine and disease treatment tanks must be effectively isolated for other production sections of the facility and stringent sterilisation of the effluent water must be undertaken. Staff accessing these areas must comply with the biosecurity standards. 	Planning and operation of the ILBA.
<ul style="list-style-type: none"> All organisms introduced to the facility to be isolated in a quarantine system for a period of six weeks and subject to regular health inspections to monitor for disease. 	Planning and operation of the ILBA.
10) Biosecurity and Biodiversity Risk Control	
General Risk Management Measures	
<u>ILBA Level General Risk Management</u>	
<ul style="list-style-type: none"> Develop and implement an ILBA level <u>Biosecurity Management Plan</u> that must include: <ul style="list-style-type: none"> A biosecurity standard for the ILBA. An ILBA <u>Monitoring Programme</u> for influent and effluent water. This to include the monitoring of harmful algal blooms, pollution events, and banned bio-active compounds in effluent water. A Disease Management and Animal Health Management Plan for the ILBA, to be adapted as new operations come online to keep pace with new developments. An ILBA code of conduct for the responsible use of bio-active compounds and a list of banned substances. Lake water effluent quality standards based on the Municipality's water discharge permit. Effluent quality standards for releases to the municipal sewer system, based on permit conditions and by-law requirements. The plan to incorporate all the aquaculture operators and be adapted as required when new aquaculture operators establish in the ILBA. 	Planning, prior to construction.
<ul style="list-style-type: none"> Consider establishing a biosecurity committee with representatives from each sector to discuss biosecurity issues and coordinate activities. 	

Management Actions:	Development Phase:
<ul style="list-style-type: none"> High risk and invasive species require detailed risks assessments should they be considered. Madlankala Primary Cooperative to comply with the Alien and Invasive Species (AIS) Regulations (GNR 598, GG 37885). No species on the invasive species list to be cultured on-site in the ILBA without the operation conducting a risk assessment specific to the operation and species and receiving approval from the relevant authorities. 	Planning.
<ul style="list-style-type: none"> Enforce a ban on the sale of live fish to the general public (with the exception of ornamental fish) with particular reference to live tilapia sales. 	Operation.
Site Level Risk Management	
<ul style="list-style-type: none"> The site must comply with the Alien and Invasive Species (AIS) Regulations (GNR 598, GG 37885). No species on the invasive species list to be cultured on any farm in the ILBA without the operation conducting a <u>risk assessment</u> specific to the operation and species and receiving approval from the relevant authorities. 	Planning, prior to introduction of species.
<ul style="list-style-type: none"> Applicant to develop a farm <u>Biosecurity Management Plan</u> prior to the commencement of any farming activities, that must include: 	Planning and prior to construction of the ILBA.
<ul style="list-style-type: none"> - A farm disease management plan. 	
<ul style="list-style-type: none"> - A farm monitoring programme. 	
<ul style="list-style-type: none"> - A clear plan for prevention of escapees with redundancy in place in case of failure. 	
<ul style="list-style-type: none"> - Quarantine standard operating procedures. 	
<ul style="list-style-type: none"> - Feed testing and storage standard operating procedures. 	
<ul style="list-style-type: none"> - Measures for the exclusion of local wildlife, including monitoring of the effectiveness' of the measures. 	
<ul style="list-style-type: none"> Applicant to develop and implement an animal health management and monitoring programme and with input from an aquatic veterinary specialist. 	Planning and prior to construction of the ILBA.
<ul style="list-style-type: none"> Applicant to participate in the biosecurity committee and attend meetings to ensure that all role players are aware of issues as they crop up, including issues around animal health and diseases. 	Operation.
<ul style="list-style-type: none"> Adhere to existing industry specific biosecurity standards if applicable. 	Planning, construction and operation.
<ul style="list-style-type: none"> Consider sterilisation of fish through hybridisation or single sex production to provide genetic security from invasive species of fish such as tilapia. 	Planning and operation.
<ul style="list-style-type: none"> Comply with species specific DAFF permit conditions for broodstock collection and holding, hatchery production, grow-out, waste disposal and effluent quality etc. 	Operation.
<ul style="list-style-type: none"> Appropriate buffer zones to be maintained around individual aquaculture operations. The extent of the buffers will depend on the species cultured and its specific risks, the design of the operations and the culture systems used and the risk pathogen transfer between farms, including the risk of aerosol contamination. With the input of an aquaculture specialist, the design and layout of each development and its buffer zones to be considered on a case by case basis by the applicant and DAFF during the evaluation of permit applications. Larger buffer zones will be needed around high-flow outdoor systems such as abalone culture. 	Planning, construction and operation.

Management Actions:	Development Phase:
11) Disease Management	
14.2.1 Effluent Water Risk Management	
<u>All Culture Systems</u>	
<ul style="list-style-type: none"> Lake water intake points to be situated as far away from the effluent (wastewater) release points as practically possible 	Planning.
<ul style="list-style-type: none"> Abstracted lake water held in storage reservoirs to be filtered using drum filters to a minimum of 200 µm in order to facilitate additional filtration/sterilisation. 	Planning and operation.
<u>Recirculating Systems</u>	
<ul style="list-style-type: none"> At the site, filtration and sterilisation of influent lake water to be conducted. 	Planning and operation.
<ul style="list-style-type: none"> Filtration and sterilisation of all influent water is very good practice but it may not kill 100% of the pathogens which is why site-level biosecurity measures for disease control are so important. 	Planning and operation.
<ul style="list-style-type: none"> Appropriate treatment of freshwater influent water to be in place, dependent on the source of the water. 	Planning and operation.
14.2.2 Managing the Risk of Contaminated Feed as a Potential Disease Vector	
<u>All Culture Systems</u>	
<ul style="list-style-type: none"> Where possible, use only processed / prepared feeds and perform regular sampling of stored and delivered feed to ensure low bacterial counts, no contamination and optimal quality. 	Operation.
<ul style="list-style-type: none"> Feed to be stored under the correct conditions in order to prevent bacteria, fungi and parasites from contaminating stocks. 	Operation.
<ul style="list-style-type: none"> Feed only be procured from reputable feed companies with the required HAZOP certification. In cases where fresh (unprocessed) feed must be used, freezing the food item first will offer some protection. This feed to be treated as though it is an infectious agent. 	Operation.
14.2.3 Preventing Disease Transmission	
<u>All Culture Systems</u>	
<ul style="list-style-type: none"> All farms to adhere to the ILBA biosecurity management plan for the ILBA; this includes visitors to the sites and contractors working between sites. 	Operation.
<ul style="list-style-type: none"> Lake discharge points to be situated as far away from the abstraction pipeline as practically possible. 	Operation.
<ul style="list-style-type: none"> Appropriate buffer zones to be maintained. 	Operation.
14.2.4 Wastewater, Flooding, and Storm water as a Potential Disease Vector	
<u>All Culture Systems</u>	
<ul style="list-style-type: none"> The effluent streams from each aquaculture operation to be designed in a way that there is no opportunity for wastewater from one farm to come into contact with any part of another operation. 	Planning and operation.

<ul style="list-style-type: none"> Wastewater pipeline routes (subdivisions) to be designed and maintained to ensure there will be little or no backflow up the drainage line and overflow into the other operations in the case of overflows, leaks, breakages and blockages. 	Planning and operation.
<ul style="list-style-type: none"> Wastewater from the individual facilities to be effectively screened to isolate and cull any escaped fish and, where appropriate (i.e. recirculating aquaculture, depending on species), be sterilised using ozone or UV. 	Operation.
<ul style="list-style-type: none"> Effluent water from processing plants and laboratories is a particularly high risk and to be sterilised before release into the effluent line. 	Operation.
<ul style="list-style-type: none"> Storm water management to be planned to avoid overflows into biosecure areas. 	Planning and operation.
Pond Culture Systems	
<ul style="list-style-type: none"> Mitigation measures as those listed for Recirculating Systems (above), and 	
<ul style="list-style-type: none"> Wastewater pipelines from any PC facilities to be designed to accommodate large flood volumes in the case of a catastrophic collapse of a pond and to accommodate the volumes created during drainage for harvesting. 	Planning and operation.
<ul style="list-style-type: none"> Local climatic conditions to be taken into account during pond design phase to ensure that they are built with sufficient freeboard to allow for a 1:100 year storm event without over flowing. 	Planning and operation.
<ul style="list-style-type: none"> Proper drainage design to control potential water flow and controlled drainage for rainwater is required. Drains to be able to accommodate high volumes of water and to be screened to prevent escapees from leaving the individual farms via this route. 	Planning and operation.
14.2.5 Managing Undetected Spread of Disease Agents and Deterioration of Animal Health	
RAS Systems	
<ul style="list-style-type: none"> Develop and implement the disease management and animal health management plans as discussed in the general risk management measures. In terms of these plans, develop and implement an animal health monitoring programme specific to the farm design and husbandry techniques employed. The programme will include weekly sampling of animals from all the different areas on the farm and checks for the presence of disease agents and measure animal health. Farms to work closely with veterinary specialists to assist with the analysis of results and to develop sampling techniques 	Planning and operation.
14.2.6 Waterbirds and Other Animals as a Vector for Disease	
All Culture Systems	
<ul style="list-style-type: none"> Lake Qhubu ILBA to develop and implement a pest control standard operating procedure specific to their farm, with the Local Municipality's specification and procedures on pest control as framework. 	Planning and operation.
<ul style="list-style-type: none"> Non-lethal control of birds through exclusion physical barriers will reduce the chance of disease transfer via these methods. Non-lethal bird netting and barriers are commonly used. 	Planning and operation.
<ul style="list-style-type: none"> Effluent flows are a particularly easy risk to overlook and to be covered to exclude birds and feral cats etc. 	Planning and operation.

Management Actions:	Development Phase:
14.3 Biodiversity and Genetics	
14.3.1 Disease and parasite transfer to wild populations via effluent water	
<u>All Culture Systems</u>	
<ul style="list-style-type: none"> Once a tenant is identified, a species-specific risk assessment based on the proposed culture method to be undertaken to assess the potential for contamination of wild populations. 	Planning and operation.
<ul style="list-style-type: none"> Farms to adhere to industry standards applicable to their respective species and culture methods, such as abalone standards, or marine finfish standards and monitoring programmes. 	Planning and operation.
<ul style="list-style-type: none"> Processing plants and laboratories will require strict biosecurity standards and standard operating procedures in order to prevent discharge of potentially infectious water into the receiving environment. 	Planning and operation.
<ul style="list-style-type: none"> Disposal of sludge filtered from effluent water to also be treated as an infectious agent and a waste management plan to be developed to best deal with the risk. 	Planning and operation.
<ul style="list-style-type: none"> Provision of a healthy culture environment will reduce the risk that cultured animals succumb to disease and parasite infections which in turn reduces the risk of transfer to the receiving environment. 	Planning and operation.
<u>Recirculating Systems</u>	
<ul style="list-style-type: none"> Each farm to define appropriate and practical solutions for treatment of effluent water based on the species and proposed culture method. Generally, ozonation or UV filtration is acceptable methods commonly used but it is not always practical. Thus, a situation specific risk assessment and biosecurity and biodiversity management and monitoring plan must be prepared and approved by DAFF prior to the commencement of any activities. 	Planning and operation.
<ul style="list-style-type: none"> Effluent water from the culture of ornamental species in recirculating systems in particular, must be sterilized before release into the environment. 	Planning and operation.
14.3.2 Transfer of disease and parasites to native species through escaped fish	
<u>RAS Systems</u>	
<ul style="list-style-type: none"> Culture systems to be designed to have multiple redundancy barriers and screens fine enough to contain the life stage of the animals being cultured (eggs/larvae/juveniles etc.). Barriers must: <ul style="list-style-type: none"> Be designed to pass flow and exclude the animal being cultured. Maintained using standard operating procedures. Checked frequently to remove escaped fish that may have passed the first screens. 	Planning and operation.
<ul style="list-style-type: none"> Methods to prevent escapes from hatcheries include inclined belt filters that self-clean into a debris box (from where no fish can escape) as well as membrane filters. 	Planning and operation.

Management Actions:	Development Phase:
<ul style="list-style-type: none"> Enforce a ban on the sale (and giving away) of live fish to the general public (with the exception of ornamental fish), particularly tilapia and especially <i>O. niloticus</i> which has been identified as a significant biodiversity risk to native fish species. 	Planning and operation.
14.3.2.1 Genetic pollution of the local stocks through escapees	
Tilapia	
<ul style="list-style-type: none"> Strict adherence to the biosecurity management plan, preventing sales and giving away of live tilapia will eliminate this risk. 	Planning and operation.
<ul style="list-style-type: none"> Sterilisation of fish through hybridisation or single sex production offers genetic security from some species of fish such as tilapia. 	Planning and operation.
14.3.3 Introduction of invasive non-native species through escapees	
RAS Systems and PC	
<ul style="list-style-type: none"> Managed as per measures to prevent the transfer of disease and parasites to native species (above). 	Planning and operation.
<ul style="list-style-type: none"> Cultivation of invasive non-native species requires particular attention to the design of redundancy barriers to make sure that nothing gets past them, such as passing all effluent through sludge collecting / dewatering geo-textile bags, through which no escapees can pass. 	Planning and operation.
<ul style="list-style-type: none"> Strict adherence to the farm's Biosecurity Management Plan and preventing sales of live tilapia will eliminate this risk. 	Planning and operation.
<ul style="list-style-type: none"> Sterilisation of fish through hybridisation or single sex production offers genetic security from some species of fish such as tilapia. 	Planning and operation.
Fish Health Management	
14.4.1 Poor husbandry practices leading to disease outbreaks	
RAS Systems	
<ul style="list-style-type: none"> Apply measures for disease management (above). 	
<ul style="list-style-type: none"> Develop and implement site-specific disease and animal health management plans and standard operating procedures to give effect to the plans. These plans need to take into consideration the culture species and types of aquaculture operations to be developed and they need to be stringently enforced. 	Planning and operation.
<ul style="list-style-type: none"> Staff to be trained to strictly implement the standard operating procedures at all times. 	Planning and operation.
<ul style="list-style-type: none"> Develop and implement a plan for diagnosis and treatment and work with reputable veterinary professionals to develop a clear treatment plan. 	Planning and operation.
14.4.2 Bio-Active Compounds	
14.4.2.1 Drugs and therapeutant treatment risk to the environment	
RAS Systems	
<ul style="list-style-type: none"> Bio-active compounds to only be used when treatment cannot be avoided and where possible direct application is preferable to bath-type treatments. 	Planning and operation.
Management Actions:	Development Phase

<ul style="list-style-type: none"> • Health management to be the first line of defense and best management practice to help to reduce the incidence of disease on farms. 	Planning and operation.
<ul style="list-style-type: none"> • Chemicals banned for use elsewhere in the world such as malachite green, chloramphenicol and nitrofurans to never be used in the ILBA. 	Planning and operation.
2. Storm Water Management and Erosion Control	
The aim is for storm water to be controlled and attenuated to allow for particulates to settle in sediment traps or silt curtains to ensure that water released from the site has turbidity levels less than 10% above ambient levels (DWAF 1995) or less than 50 mg/l (IFC General Environmental, Health and Safety Guidelines 2007) (Chalmers, 2016).	
<ul style="list-style-type: none"> • The site layout plan and storm water management plan for the Lake Qhubu ILBA to take cognizance of the potential biosecurity and biodiversity risks and the recommendations made in that section of the report. 	Planning, prior to construction.
<ul style="list-style-type: none"> • The applicant is required to attenuate storm water on their premises and to comply with the Municipalities specifications for storm water management and erosion control during construction and operational phases. 	Planning, construction and operation.
<ul style="list-style-type: none"> • Adequate infrastructure to be provided for storm water management, attenuation, and accommodation of first flush volumes and contaminants. 	Planning, construction and operation.
<ul style="list-style-type: none"> • Clean and dirty storm water need to be kept separated. 	Planning, construction and operation.
<ul style="list-style-type: none"> • Where storm water is potentially contaminated, it is to be contained and treated before it is discharged in the lake. 	Planning, construction and operation.
<ul style="list-style-type: none"> • Clean storm water can be stored on site and used for other purposes. 	Planning, construction and operation.
<ul style="list-style-type: none"> • Applicants to be encouraged to optimise rainwater harvesting and re-use on their premises. 	Planning, construction and operation.
<ul style="list-style-type: none"> • All storm water management structures to be inspected, maintained and emptied of sediment, sand and debris on a regular basis. 	Planning, construction and operation.
<ul style="list-style-type: none"> • No driving allowed below the HWM during construction and operation, unless the reason for this has been motivated to the ECO and the necessary permit has been obtained. 	Planning, construction and operation.
<ul style="list-style-type: none"> • A site-specific storm water management and erosion control procedure is to be developed and implemented during the construction phase. 	Planning, construction and operation.
<ul style="list-style-type: none"> o Erosion control and protection measures to be adapted for the area and specific situation. Measures to slow down runoff and prevent erosion to be put in place. This may include silt traps / silt curtains / geotextile bags where required for construction activities taking place in close proximity to the lake. 	
<ul style="list-style-type: none"> o ECO to be on site during the construction phase and to strictly monitor storm water management activities, particularly during downpours. 	
<ul style="list-style-type: none"> o Avoid erosion by implementing the specifications for vegetation clearance and rehabilitation (minimize areas cleared and rehabilitate as soon as possible). 	

Management Actions:	Development Phase:
<ul style="list-style-type: none"> o Impacts on adjacent and downslope areas to be monitored. When erosion is observed, corrective measures to be implemented based on recommendations of the ECO. Where required, the ECO to obtain advice from a rehabilitation specialist. 	
<ul style="list-style-type: none"> • Routine monitoring of water leaving the storm water management system towards to lake, particularly following a downpour, was recommended by the Wetland Habitat Specialist. The ECO to determine the frequency and parameters to be monitored as this may differ for the construction and operational phases and depend on the type of activity taking place. Typically monitoring to include turbidity, total suspended solids and pH but must be expanded to dissolved oxygen, hydrocarbons and trace metals in areas of concern. 	Construction and operation.
<ul style="list-style-type: none"> • The water monitoring programme, which includes storm water monitoring, needs to be reviewed and updated to cover developments in the ILBA. 	Planning, prior to construction.
<h3>3. Surface and Groundwater Management</h3>	
<p>The focus is on preventing spills and on prompt containment and clean-up should it occur.</p>	
<ul style="list-style-type: none"> • Keep an inventory of all hazardous, bioactive and controlled substances used and stored on the site, with details about emergency response in case of spillage to the environment or personnel exposure (MSDS sheets). Maintain records of the quantity of the materials purchased, used and records of the wastes and empty containers sent for disposal. 	Planning, construction and operation
<ul style="list-style-type: none"> • A hazardous and chemical management plan to be prepared for each farm, addressing the storage, handling and application, potential risks and emergencies for all high-risk substances listed in the inventory. 	Planning, construction and operation
<ul style="list-style-type: none"> • Ensure appropriate location of the hazardous substance and hazardous waste storage areas, including chemical toilets and conservancy tanks. No such areas to be located in high risk exposure areas within 100 m of the lake or where a spill or the remnants of a spill could run into the storm water or rainwater collection system. 	Planning, construction and operation.
<ul style="list-style-type: none"> • Drainage around hazardous storage areas to be designed to ensure spills and the substances used for cleaning up spills and contaminated fire water can be contained and prevented from entering the storm water or rainwater collection system. 	Construction and operation.
<ul style="list-style-type: none"> • Appropriate spill kits to be available at all times in areas where hazardous substances are stored, as well as where these substances are used in high risk exposure areas, including areas where heavy vehicles and construction equipment containing fuels and lubricants are used and parked. 	Construction and operation.
<ul style="list-style-type: none"> • Heavy construction vehicles to be parked over appropriately sized trip trays. 	Construction.
<ul style="list-style-type: none"> • Construction equipment and plant containing fuels and lubricants to be used over appropriately sized trip trays. 	Construction.
<ul style="list-style-type: none"> • Servicing of vehicles, equipment and plant containing fuels and lubricants to only occur in an appropriately designed workshop with a bunded floor. 	Construction and operation.
<ul style="list-style-type: none"> • Access to and use of hazardous substances must be controlled by an appropriately trained individual. 	Construction and operation.
<p>Management Actions:</p>	<p>Development Phase:</p>

<ul style="list-style-type: none"> • Emergency preparedness procedures to be put in place for the containment of spills, prevention of contamination of the storm water management system and clean-up procedures. 	Planning, construction and operation.
<ul style="list-style-type: none"> • Emergency contact details to be readily available on each farm, and to include the municipal and regional hazardous waste response team / disaster management teams in event of large spills. 	Construction and operation.
<ul style="list-style-type: none"> • All personnel dealing with hazardous substances (including fuel) to be adequately trained to identify a potential risk and how to respond in case of a spill. 	Construction and operation.
<ul style="list-style-type: none"> • Conduct regular inspections of all areas where hazardous substances are stored or handled. 	Construction and operation.
<ul style="list-style-type: none"> • If fuel is stored on site, it is to be as far away as practically possible from the shoreline. The storage area must be designed and bunded in accordance with industry best practice and applicable regulations and standards. 	Construction and operation.
<ul style="list-style-type: none"> • The design of bunds for fuel and hazardous substance storage areas to be based on the volume and nature of substances stored, the risk of spillages and the following minimum design criteria: <ul style="list-style-type: none"> – The bunded area to effectively accommodate 110 percent of the stored liquids. – The bund floor and wall to be impervious and appropriate for the substance, even in the case of a fire. – Prevent the integrity and capacity of the bunded areas being compromised by rainwater, storm water, physical damage, vehicle collisions, and sand movement. – Bunded areas that are not covered, to be provided with sumps and lockable valves for controlled release of clean rainwater. – The integrity of the bunds to be tested before storage of the hazardous substance to ensure that it is impervious and that valves and sumps are fully functional. 	Construction and operation.
<ul style="list-style-type: none"> • On-site refueling of vehicles and equipment to be kept to a minimum, i.e. only for vehicles and equipment that stay on site for the duration of the construction period. 	Construction.
<ul style="list-style-type: none"> • Self bunded fuel tanks are recommended for the construction phase as this eliminates the need for construction of a temporary bund. 	Construction.
<ul style="list-style-type: none"> • Vehicle and equipment refueling areas on the outside of a bunded area, to be designed to contain leaks and spills that may occur during refuelling. 	Construction.
<ul style="list-style-type: none"> • All aquaculture tanks, dams, ponds, and culture units to be impervious (or lined) and sized with an appropriate freeboard and safety margins to avoid seepage, leaks and overflows of effluent, slurry and culture water containing high suspended solids, salts and nutrients. 	Planning and Operation.
<ul style="list-style-type: none"> • Effluent and sludge pumps, pipelines and buffer tanks to be designed with appropriate safety margins and backup systems to accommodate down-time, maintenance and repairs and power failures. 	Planning and Operation.
<ul style="list-style-type: none"> • Conduct regular inspections and maintenance of all pumps, pipelines, tanks and culture units to minimize the risk of leaks and breakages. 	Operation.
<ul style="list-style-type: none"> • The necessary water use authorisations to be in place for reservoir tanks. 	Prior to construction.
<ul style="list-style-type: none"> • The municipality's water monitoring programme, which includes groundwater monitoring, needs to be reviewed and updated to cover developments in the Lake Qhubu ILBA. 	Prior to construction.

4. Air Quality Management	
Dust Management	
Over the life of the ILBA, a combination of dust control measures will be needed. Each situation must be evaluated on a case by case base and the appropriate strategy to be defined based on the time of exposure (short-term during construction or longer term during operations), the extent of the affected area, the proximity to sensitive receptors and the potential to establish a stabilising vegetation cover. These include:	Construction and operation.
<ul style="list-style-type: none"> - Temporary - Wetting of soils to temporarily bind particles (only effective when sufficiently damp, needs to be re-applied daily or even multiple times a day depending on weather conditions). - Control or reduce the effect of the wind (net fences or other barriers placed in strategic positions and at right angles to the prevailing winds). - Confine or limit vehicle and equipment movement during high winds. - Limit the active handling of loose soils, such as grading, loading and dumping during high winds. - Good housekeeping (sweeping or other form of removal of loose material from areas where it can be entrained by vehicles or picked up by the wind). - Covering of bare soils and other fine loose particulates (mulching or gravel cladding). - More permanent binding of fine particles through the application of environmentally benign polymers and chemicals binders and tackifiers (typically only used in areas where there are extensive longer-term dust issues). - More - Establishing a stabilising vegetation cover as soon as possible once disturbance - Permanent of an area has ceased. 	
Management Actions:	Development Phase:
Odour Management	
• Fish to be processed on the same day as harvesting / slaughtering.	Operation.
• Fish by-products and waste earmarked for processing to be kept in cold conditions to avoid decomposition and odours until such time it is processed. Any fish waste processing facility to be designed to have zero redundancy, even if it means providing duplicates of key process steps.	Operation.
• Fish waste for disposal to be kept in cold conditions to avoid decomposition and odours until such time it is disposed.	Operation.
• Refer EMPr section on Waste Management to ensure correct storage, handling, processing, treatment or disposal of waste to be applied.	Operation.
• Facilities for the processing of more than 1 tn/day of raw animal matter not intended for human consumption to operate under a valid AEL and the minimum requirements outlined in GNR 893 in terms of the NEM:AQA.	Operation.

Management Actions:	Development Phase:
Resource Consumption and Greenhouse Gas Emissions	
<ul style="list-style-type: none"> • Applicant to explore potential options and linkages between different industries in the Local Municipality to improve resource use efficiencies (i.e. fresh water and energy) and reduce GHG emissions. 	Planning.
5. Socio-Economics	
<ul style="list-style-type: none"> • The Applicant's recruitment of labour from the nearby communities to empower the community. 	As required.
<ul style="list-style-type: none"> • The Applicant to communicate their labour and recruitment policies, procurement and processes to Contractors and Operators. 	As required.
<ul style="list-style-type: none"> • Recruitment to only take place through established Applicant's structures and procedures. Prospective job seekers that attempt to gain employment at the gate or on-site are to be advised to use the formal process through a Applicants Recruitment Centre. 	As required.
<ul style="list-style-type: none"> • Operators and Contractors to communicate the exact extent and nature of the required labour force to the Applicant to facilitate sourcing of labour through the established structures. 	As required.
<ul style="list-style-type: none"> • Preference to be given to local labour, suppliers, contractors and service providers as per Applicant's policies and procedures. 	As required.
<ul style="list-style-type: none"> • If inflated and/or unrealistic expectations regarding employment become apparent, this is to be communicated to the Applicant and available unions. 	As required.
<ul style="list-style-type: none"> • The Applicant to communicate the particulars of the proposed ILBA construction phase, such as its nature, extent, construction schedule, and anticipated size and composition of the labour force, to relevant stakeholders in order to plan for and address the potential for increased criminal activity. This includes the Safety and Security Directorate of the Municipality, South African Police Service, relevant Ward Councilors and Community Police Forums, and representatives of the local private security service industry if available. 	As required.
<ul style="list-style-type: none"> • Adhere to the Applicants Standard Health and Safety Specification for Construction (SES) and the requirements of applicable legislation, including the Occupational Health and Safety Act, Construction Regulations, and National Road Traffic Act. 	As required.
6. Monitoring	
<ul style="list-style-type: none"> • Requirements for monitoring are listed under the various sections under Management Actions. 	As stipulated in the various sections.
7. Construction Management	
<ul style="list-style-type: none"> • The EMPr highlighted various construction-related mitigation measures specific to the Lake Qhubu ILBA. Other general construction-related matters have been dealt with in the Basic Assessment Report for the Lake Qhubu ILBA and are therefore already written into the Competent Authority's Environmental Authorization conditions and procedures pertaining to construction. These matters are not repeated in this in the EMPr. 	Construction.

8. Managing Decommissioning	
<ul style="list-style-type: none"> • Over the life of the Lake Qhubu Fish Farm, some structures and infrastructure and investor facilities may have to be decommissioned in part or in full if it has reached the end of its useful life. The impacts of the decommissioning will be very similar to the construction impacts described in preceding sections of the report. 	Planning and Decommissioning
<ul style="list-style-type: none"> • Structures and infrastructure that have reached the end of its useful life and that cannot be repurposed or justifiably used for another purpose are to be demolished or dismantled and removed from the ILBA, and the land rehabilitated unless another use for the land has been identified. 	Planning and Decommissioning
<ul style="list-style-type: none"> • For all developments bellow the coastal management line, unless the development is designed to be flooded or flood protected (as per the marine effluent or intake pipelines mentioned above), all developments to be planned and designed with eventual closure, decommissioning and rehabilitation in mind. This implies that: 	Planning and Decommissioning
<ul style="list-style-type: none"> - A decommissioning plan and site rehabilitation plan is to be developed up front as part of the risk assessment and decision-making phase, including a cost estimate for the decommissioning, including removal of all structures, and rehabilitation of the site. The plan and cost estimate need to be reviewed and revised every three years or whenever changes are made that may affect the cost of decommissioning or rehabilitation. 	
<ul style="list-style-type: none"> - If successful decommissioning without unacceptable environmental impacts cannot be demonstrated, the development is not to be allowed to take place. 	
<ul style="list-style-type: none"> - The applicant needs to demonstrate that financial provision is being made in the business plan for eventual closure and decommissioning, including removal of all structures and rehabilitation of the site. 	
<ul style="list-style-type: none"> - The Municipality to ensure that the necessary assurances are in place to avoid applicants abandoning a site and leaving it in an un-rehabilitated state. 	

APPENDIX G. STORM WATER MANAGEMENT PLAN



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18 April 2018

**Cubhu Fish Farm / Madlankala Co-Operative
Storm water Management Plan**

The Farm Design reflects that all Water from the Production System will be contained in a Closed Recirculating System. A large Attenuation Pond is included to hold up to 30% of the Total water Volume in circulation at any time and through which Production Water will pass on regular intervals.

In terms of Storm water Management, the Project is going to be situated on the Shore of Lake Cubhu and so all runoff (rain) will eventually end up back in the Lake. On the Farm Footprint Gutters will be installed as well as Surface Drains to direct Water into the Attenuation Pond with an Overflow into the Lake in a controlled manner.

These provisions will be incorporated into the Final Engineering Drawings should the Project go ahead.

Yours sincerely

Kumaran Moodaly

Marketing Director