



漁農自然護理署
Agriculture, Fisheries and
Conservation Department

Consultancy Ref.: AFCD/FIS/02/19 Consultancy Service for Environmental Impact Assessment Study for Designation of New Fish Culture Zones

Executive Summary for Establishment of
Fish Culture Zone at Mirs Bay

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Dr Jasmine Ng
Office Managing Partner

ERM-Hong Kong, Limited
2509, 25/F One Harbourfront
18 Tak Fung Street
Hung Hom, Kowloon
Hong Kong

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1. INTRODUCTION

1.1 Background

Marine fish culture has been an important activity for fisheries production in Hong Kong over decades. Mariculture activities are required to operate under licence in designated Fish Culture Zones (FCZs) under the *Marine Fish Culture Ordinance (MFCO) (Cap. 353)*. In view of the environmental impact resulting from mariculture, there has been a moratorium on the issue of new marine fish culture licences (MFCLs) and licensed raft area extensions in the existing FCZs since 1990, as well as on the designation of new FCZs, except for a limited number of forced re-siting necessitated by public works. Given the technical advancement in mariculture techniques and strengthening of regulatory measures, together with the changes in the operation of the sector over the years, the environment of FCZs and marine environment in the vicinity have improved significantly in the past two decades.

In 2010, the Committee on Sustainable Fisheries (CSF), which was established by the Government to study the long-term goals, direction and feasible options for the sustainable development of local fisheries industry, recommended a review of the moratorium to facilitate fishermen to switch from capture fisheries to mariculture. Mariculture is considered a practical alternative for capture fishermen to make a living as their knowledge on marine environment and fish would be useful in farming marine fish.

To pave the way for facilitating the sustainable development of the local mariculture sector, the Agriculture, Fisheries and Conservation Department (AFCD) proposed to lift the moratorium by designating new FCZs and issuing new MFCLs. In 2014, the AFCD commissioned a consultancy study to explore suitable sites as new FCZs on the basis of a list of social and environmental criteria with reference to the latest international fish culture practices ⁽¹⁾. Relevant stakeholders, including Government bureaux / departments and mariculture representatives, have been consulted to gauge their views on site selection. The mariculture sector in general supported the designation of new FCZs and agreed that the sector should be modernised. Four locations have been shortlisted as potential sites for the designation of new FCZs, including Wong Chuk Kok Hoi FCZ, Outer Tap Mun FCZ, Mirs Bay FCZ and Po Toi (Southeast) FCZ. The Chief Executive announced in the 2018 Policy Address that the Government would recommend designating new FCZs at suitable locations, which would create room for the mariculture sector to grow further, including allowing capture fishermen to switch to this sustainable mode of operation, making it possible for the development of newer type of deep-water mariculture in the open sea, and attracting new entrants.

This Environmental Impact Assessment (EIA) studies one of the proposed FCZ sites, i.e. Mirs Bay FCZ (hereafter referred to as “the Project”). The location plan of the Project is shown in **Figure 1.1**.

1.2 Nature of the Project

The Project aims to establish a new FCZ at Mirs Bay to facilitate the sustainable development of the local mariculture sector. The scope of the Project includes:

- Assembly and anchorage of fish farm structures which are manufactured off-site, including fish rafts / cages, auxiliary facilities and mooring system, within the Project site; and
- Marine fish culture activities within the Project site regulated under the *Marine Fish Culture Ordinance (Cap. 353)*.

No land-based works, structures and activities will be involved in the Project.

The Project is a designated project by virtue of Item M.1(a) of Part I of Schedule 2 of the *EIAO*, which specifies “A fish culture zone more than 5 ha in size” and requires an Environmental Permit (EP) under the *EIAO* for its construction and operation.

(1) Consultancy Ref. AFCD/FIS/01/14 Consultancy Services for Identification of New Fish Culture Zones in Hong Kong – Feasibility Study

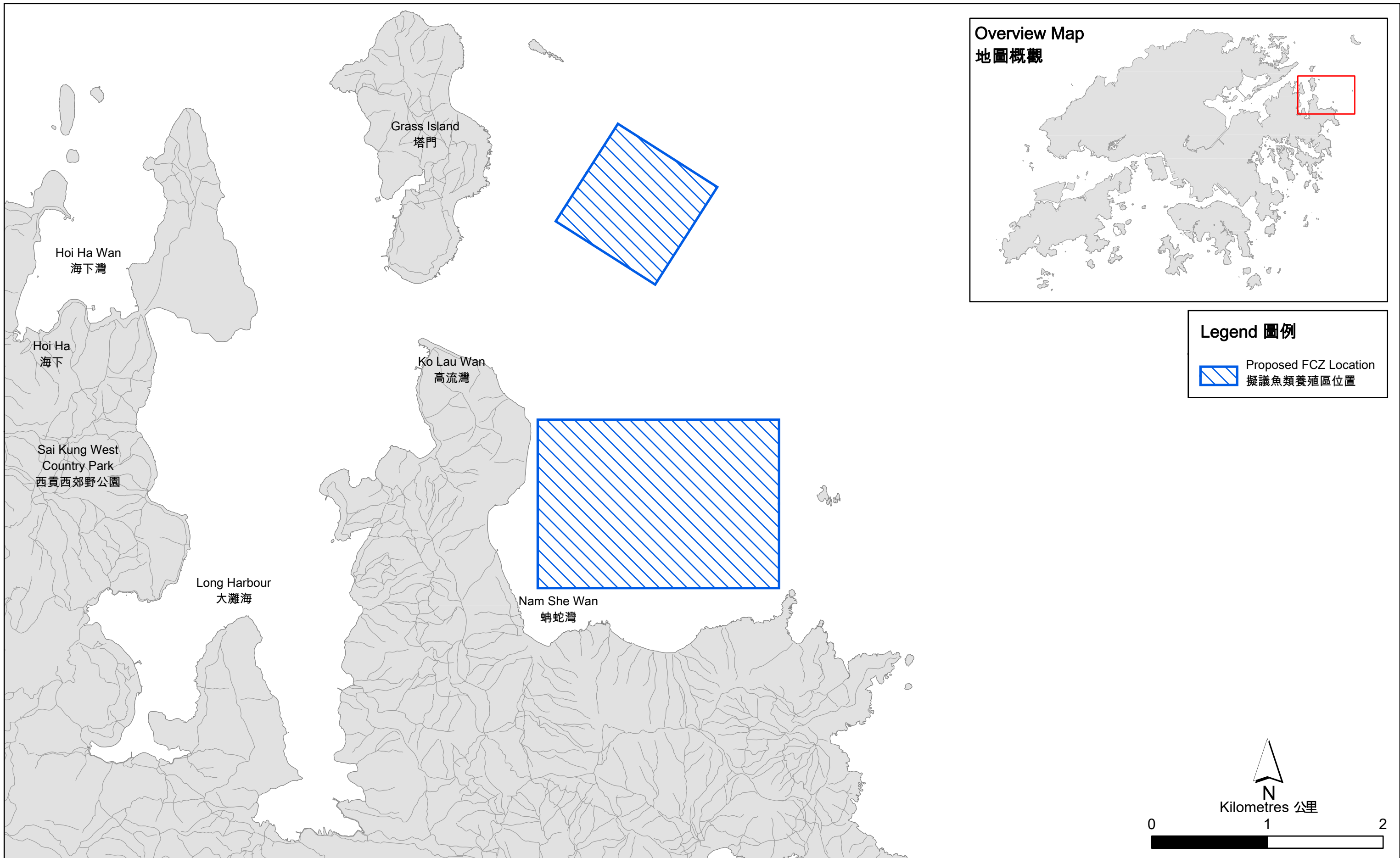


Figure 1.1
圖 1.1

Location Plan for the Establishment of Fish Culture Zone (FCZ) at Mirs Bay
在大鵬灣設立魚類養殖區的位置圖

In accordance with the requirements of Section 5(1)(a) of the *EIAO*, an application for an EIA Study Brief for the Project was submitted on 15 October 2019 under *EIAO* with a Project Profile (PP) (No. PP-592/2019). An EIA Study Brief (No.ESB-326/2019) for the Project (hereafter referred to as “the Study Brief”) was issued on 27 November 2019 in accordance with Section 5(7)(a) of the *EIAO*.

1.3 Purpose and Objectives of this EIA Study

The purpose of this EIA study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and associated works that will take place concurrently. This information will contribute to decisions by the Director of Environmental Protection on:

- the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project;
- the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and
- the acceptability of residual impacts after the proposed mitigation measures are implemented.

The detailed requirements of the EIA Study are set out in Clause 3 of the Study Brief. As specified in the Study Brief, this EIA Study has addressed the key environmental issues associated with the construction and operation of the Project.

This EIA Report has been produced in accordance with the requirements in the EIA Study Brief (No. ESB-326/2019) and the *Technical Memorandum on Environmental Impact Assessment Process* issued under the *EIAO* (*EIAO-TM*) for the Project, the aim being to obtain an EP under the *EIAO*. The description of the Project presented in the EIA Report has been based on the best available information from AFCD that describes the relevant construction activities, operational details, and baseline information describing the conditions relating to the Project and its surrounding environment.

2. OBJECTIVES AND BENEFITS OF THE PROJECT AND CONSIDERATION OF ALTERNATIVES

2.1 Purpose and Objectives of the Project

The Project involves the establishment of a new FCZ at Mirs Bay for mariculturists to operate their fish rafts. The main purpose and objective of the Project is to provide opportunities to develop a newer type of deep-water mariculture, create room for the mariculture sector to grow further and attract new entrants, potentially allowing capture fishermen to switch to a sustainable mode of operation.

2.2 Benefits of the Project

The benefits of the Project have been discussed in detail in **Section 2.3** of the EIA Report and are summarised in **Table 2.1**.

Table 2.1 Summary of Benefits of the Project

Aspect	Benefits
Sustainable mariculture development in Hong Kong	<ul style="list-style-type: none"> ■ Increase local mariculture production to support local demand for live marine fish, with a quality, healthy, safe, diversified and stable supply with low carbon footprint; ■ Provide an avenue for capture fishermen, who face various operational challenges, to switch to a sustainable operation mode, which in turn alleviates local fishing pressure and promotes the conservation and recovery of fisheries resources and preservation of the marine environment; ■ Allow mariculturists of the existing FCZs to consider pursuing modernised and sustainable modes of operation in the new FCZs, such that the marine environment of the existing FCZs can improve when the level of mariculture activities there decreases; ■ Larger production scale enabled with technology can allow operating costs to be optimised, and hence improving cost-efficiency and competitiveness; ■ Provide high value-added fisheries products and assists the fisheries sector to seize the opportunities in the Greater Bay Area (GBA) and other places; ■ Attract new entrants and business opportunities to further grow the sector and related trades organically, also providing employment opportunities.
Advanced Mariculture Operation in Deeper Waters	<ul style="list-style-type: none"> ■ More fish stock can be kept within a larger area of the water column to achieve optimal stock density and a good mariculture environment; ■ Sufficient buffer distance amongst fish cages and between the fish cage and seabed will be maintained and thus allowing adequate water circulation and prevents the build-up of organic content and degradation of the nearby marine environment. Organic content is also not built up on the seabed and maintenance dredging and sediment removal are therefore not required for FCZ in deep waters, and the associated water quality impacts and related ecological and fisheries impacts can be avoided; ■ Use of weather-resistant materials of fish cages could reduce general / floating refuse on the sea; ■ The fish cage design could withstand strong waves and surges such that the fish cages can remain onsite during typhoons with minimal fish loss/ escape and can effectively reduce impact of fish escape on local ecology and fisheries and offsite impact as a result of fish cage relocation due to adverse weather;

Aspect	Benefits
	<ul style="list-style-type: none"> ■ Only commercial pellet feed or alternative feed with better feed conversion ratio will be allowed at the proposed FCZ. This could effectively reduce organic loading due to feed wastage, and reduce potential transmission of parasitic and infectious disease which in return may cause organic loading due to fish carcasses and dead fish arising from the fish culture operation; ■ Use of green technology and automation could reduce feed wastage and physical labour, as well as reduce emissions (e.g. from diesel generators for electricity generation), wastes and water quality impacts; ■ Fish farm structures have the potential to provide artificial substrates beneficial to the marine habitat.

2.3 Scenarios With and Without the Project

2.3.1 Without Project Scenario

In the absence of new FCZs, the fisheries sector would need to rely on existing FCZs to provide grounds for mariculture development. Consequently the industry would have limited capacity to make use of advanced, and most importantly more environmentally friendly, mariculture technologies which work best in deeper waters and have limited potential and cost-efficiency to be adopted in the existing FCZs mostly in shallow waters. Even though some elements of the mariculture operations could be modernised and improved, e.g. use of more weather resistant and durable materials, renewables energy and technology, better quality of fish feed etc., there is little room to enhance the mariculture environment and production in the existing FCZs given the lack of incentives from the existing family-based, small-scale operations, and the reluctance of new entrants to invest in mariculture in these existing FCZs which is once perceived as environmentally constrained and financially risky. These existing FCZs operating as status quo are not suitable for the sustainable development of mariculture in Hong Kong. Without new mariculture sites and methods, it will be challenging for mariculturists to invest and diversify, mariculture production will continue to decline in quality and quantity with reference to the production trend of previous years, fishermen's livelihood will be adversely affected, and the development of the fisheries sector will be halted.

2.3.2 With Project Scenario

The proposed FCZ at Mirs Bay is one of the measures that support the sustainable development of mariculture in Hong Kong through the designation of new FCZs. With the Project in place, the environmental benefits associated with the sustainable development of mariculture and the use of advanced mariculture operation (**Table 2.1**) can be realised. Ultimately, in line with the long-term goals developed by the Committee on Sustainable Fisheries that AFCD set up in late December 2006, the establishment of new FCZs can contribute to the sustainable management of marine resources and preservation of the marine environment for our society to enjoy, while providing a supply of fresh and quality fisheries products to local consumers, and creating job opportunities to the fisheries sector and related trades such that fishermen and fish farmers can achieve self-reliance and maintain their livelihoods in the changing business operating environment.

2.4 Consideration of Different Development Options

2.4.1 Development Option by Expanding the Existing FCZs

The development option by expanding the existing FCZs was explored. Given most of the existing FCZs are located in inshore areas with shallow water depths, these locations are not feasible to support the more advanced type of deep-water mariculture in line with the global practice. In addition, there exists other development constraints around the existing FCZs, such as existing marine usage, ecological sensitive receivers, etc. Sediment removal may also be required periodically to maintain a

suitable environment for mariculture. As such, the environmental impacts are likely to be more detrimental for FCZs in inshore areas with shallow water depths. This will limit the potential for developing sustainable mariculture and promoting the modernisation and competitiveness of the fisheries industry. Therefore, expansion of existing FCZs is not a feasible development option for the Project.

2.4.2 Development Option by Identifying Suitable Sites for New FCZs

The criteria for the site selection of sustainable mariculture were reviewed with reference to international guidelines (e.g. the Food and Agriculture Organization (FAO)), which include minimum water depth, wave exposure, water quality, the compatibility with the existing usage and environment, accessibility and infrastructure and site security.

A site search was conducted to identify suitable locations in Hong Kong waters for the development of new FCZs considering the site selection criteria and this is discussed in **Section 2.5.1.2** of the EIA Report. Incompatible areas with absolute constraints were excluded, while the compatible areas for a suitable location were considered taking into account environmental, physical and operational constraints. As western Hong Kong waters are under the influence of freshwater discharges from the Pearl River Estuary, eastern Hong Kong waters are preferred when identifying suitable sites for new FCZs. The most suitable areas for FCZ development were then identified based on avoidance of encroachment onto environmentally sensitive areas, selection of site with better water flushing rate, and operational consideration such as accessibility and availability of pre-existing infrastructure. Four sites, namely Wong Chuk Kok Hoi, Outer Tap Mun, Mirs Bay, Po Toi (Southeast) (**Figure 2.1**), are selected for the establishment of new FCZs based on the site selection criteria and views from stakeholders. These sites avoid the encroachment to areas with ecologically important habitats, such as marine parks / reserve, coral habitats with high ecological value, key marine mammal habitats, wintering and nesting grounds for birds, mangroves and horseshoe crab habitats. The identified sites are also relatively remote, which minimise impacts on air quality, noise and visual sensitive receivers.

2.4.3 Consideration of the Size and Boundary of the Project Site

The Project site boundary has been designed taking into account the environmental, physical and operational constraints. The Project has been sized to provide sufficient capacity for sustainable mariculture activities, without compromising the existing surrounding environment. For instance, the options between the establishment of a single larger FCZ and smaller FCZ at different locations have been considered. While the establishment of a single larger FCZ will concentrate the pollution loading in a particular area, the establishment of small FCZ at different locations will reduce the organic loading and therefore minimise the impact to coral communities and habitat for marine ecological and fisheries resources in the surrounding waters.

While a large portion of Mirs Bay is suitable for FCZ operation after reviewing the constraints and the site selection criteria, the Project size has been reduced and optimized to occupy the waters closer to shore of Tap Mun and Nam She Wan for shelter and minimize the interaction with ocean-going marine traffic travelling to Yantian Port.

Considering the potential water quality impact due to mariculture activities of the Project, the Project is divided into two sub-areas to reduce impacts to the adjacent environment, including marine ecology and fisheries.

Besides, the extent and boundary of the Project site has also been optimized with sufficient clearance to minimise the impacts to coral communities along the coastline, as well as habitats for marine ecological resources and fisheries resources. Meanwhile, sufficient clearance to navigation routes has been provided to minimise the potential risk of fish escape and introduction of invasive species to the marine environment due to accidents/ collisions of marine vessels with fish farm facilities. The Project site has also been positioned with a 50 m clearance between the low water mark and the inshore boundary.

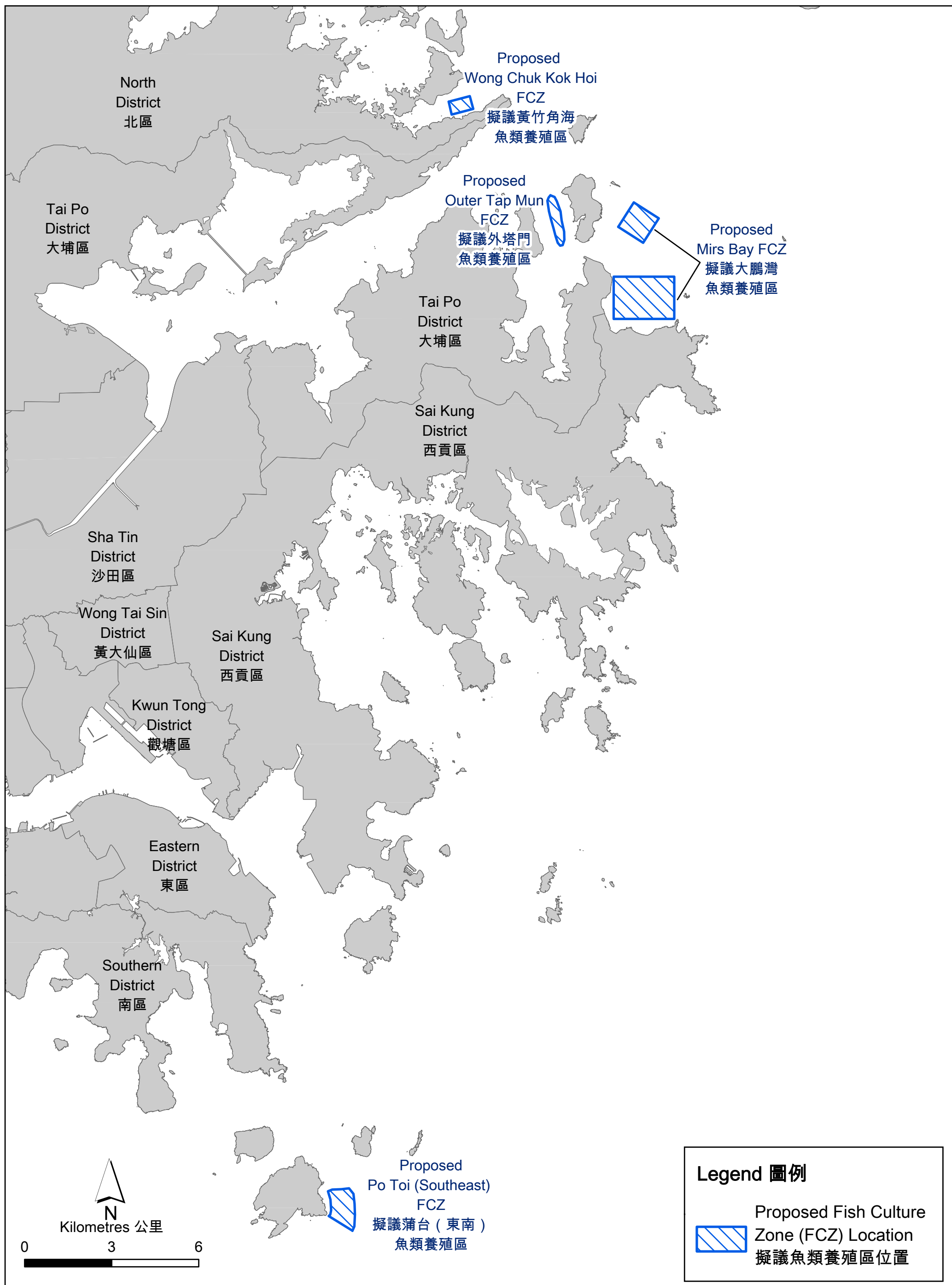


Figure 2.1
圖 2.1

Proposed Locations for the Establishment of Fish Culture Zones
 擬議設立魚類養殖區的位置

Although no gazetted principal fairways are located within the site, the Project boundary has also been designed to provide a passage for vessels travelling to and from Long Harbour through the south channel at Tap Mun Hau to minimize impact to marine traffic.

2.5 Fish Farm Designs to be Adopted at the Proposed FCZ

Different fish farm designs have been considered with regard to the Project site (see Section 2.6 of the EIA Report) and the environmental considerations in selecting the preferred fish raft for the proposed FCZ are summarised in **Table 2.2**. Overall, traditional fish cages on rafts with fewer environmental benefits are considered not suitable for the Project site. Four modern fish rafts with advanced features with various environmental benefits including floating gravity cage/ submersible gravity cage, integrated multi-trophic aquaculture (IMTA) and semi-submersible steel truss cage, are reviewed and considered suitable and preferable for the new FCZ. While the environmental performance of the modern fish rafts is generally similar, the type of fish farm/ raft to be deployed at the proposed FCZ will be subject to the fish farm operational plan submitted by the future licensees for agreement with AFCD.

Table 2.2 Environmental Consideration of Fish Farm Designs

Fish Farm Design	Environmental Consideration
<p data-bbox="203 331 495 360">Traditional Cages on Rafts</p>  <p data-bbox="203 900 450 928">(Photo Source: AFCD)</p>	<ul data-bbox="1167 336 2011 651" style="list-style-type: none">■ Most of the traditional rafts are built on-site using timber and supported by floating units made of empty plastic drums or polystyrene foam floats, which may lead to waste being released to the sea during the construction;■ Not weather resistant and require frequent maintenance and major repairing, which result in more waste generation during mariculture operation;■ Susceptible to weather damage, therefore traditional cages have to be installed at inshore and sheltered waters where maintenance dredging and sediment removal may be required.

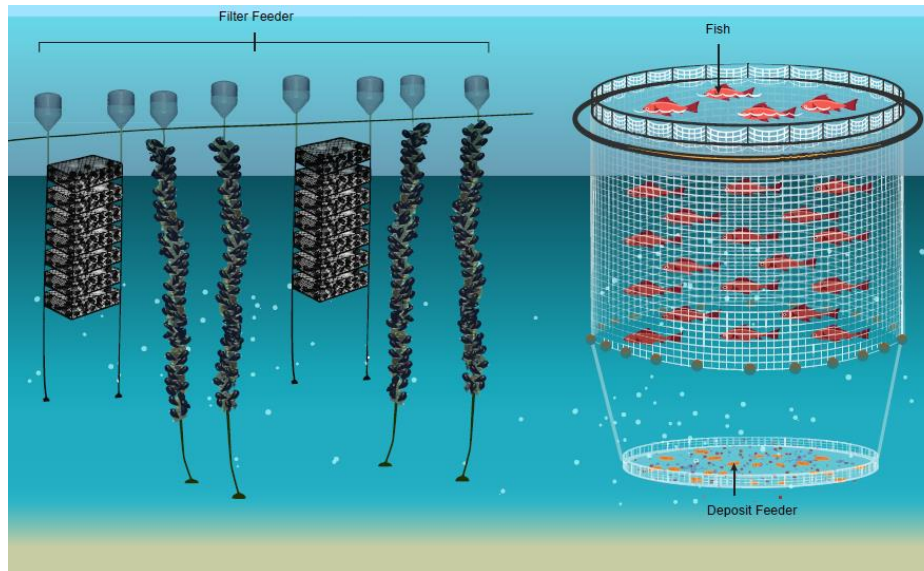
Fish Farm Design

Advanced Technologies – Floating Gravity Cage / Submersible Gravity Cage



(Photo Source: Polarcirkel Plastic Cage, Qingdao Qihang Fishing Cage Co., LTD)

Advanced Technology – Integrated Multi-trophic Aquaculture (IMTA)



Environmental Consideration

- Fish farm components are prefabricated offsite which reduces on-site construction activities and waste generation and hence minimising potential impact to the surrounding environment;
- Use of technology (e.g. real-time surveillance and water quality monitoring, renewable energy sources such as solar and wind) and automation (e.g. fish feeder) can reduce labour intensive activities, hence reduce potential disturbance to ecology and environment from feed wastage, workforce wastes, vessel trips, etc.;
- Cages made of weather-resistant materials such as high-density polyethylene (HDPE) and steel truss cages are more durable and of good quality, with less waste generation from damage or repair;
- Submersible/ semi-submersible fish cages are designed to endure adverse weather conditions. Fish loss/ escape due to cage/raft damage can therefore be minimised and potential impact of introduction of invasive species on local ecology and fisheries could be reduced. Besides, the need for temporary relocation of fish raft due to adverse weather is also reduced and therefore reducing the associated potential impact;
- Separation distance between fish rafts / cages and between the cage bottom and seabed would be maintained to allow adequate water flow in between and reduce impacts on water quality such as changes in flow regime and build-up of organic content, reducing the subsequent ecological and fisheries impacts in the vicinity and degradation of the nearby marine environment;
- Since organic content is not built up on the seabed, maintenance dredging and sediment removal are therefore not required for FCZ in deep waters, and the associated water quality impacts and related ecological and fisheries impacts can be avoided; and
- Fish farm structures have the potential to provide artificial substrates for marine organisms to colonise and build diverse and functional habitats.

Fish Farm Design

Environmental Consideration

Advanced Technology – Semi-submersible Steel Truss Cage



(Photo Source: AFCD)

2.5.1 Consideration of Construction Methods and Sequence

With the use of advanced mariculture technologies, a majority of the framework of the fish cages will be prefabricated off-site, and then tow the fish farm framework to the Project site for assembly and anchorage. It is in fact unlikely that this more advanced type of deep-water mariculture can be completely assembled from raw materials on-site and there is no alternative construction method. Prefabrication work off-site can minimize the construction duration on-site and hence reducing the duration when potential impacts to the environment can occur. It is expected to avoid generation of construction and demolition (C&D) materials and potential water quality impact from construction site run-off during the construction of the Project. Generation of underwater sound is minimised in this method, with less disturbance to marine and fisheries habitats. Also, less labour input required on site would result in reduction of waste generated from human activities.

2.6 Summary of Key Environmental Problems Avoided and Sensitive Areas Protected

A summary of the key environmental problems avoided with the environmentally friendly options and recommended environmental designs of the Project have been discussed in Section 12.3 and Section 12.4 of the EIA Report and the summary is provided in **Table 2.3**.

Table 2.3 Key Environmental Problems Avoided, Sensitive Areas Protected and Environmental Outcomes Achieved

Design Approach	Key Environmental Problems Avoided, Sensitive Areas Protected and Environmental Outcomes Achieved
Migration to environmentally friendly modernised mariculture	<ul style="list-style-type: none"> Adverse impacts from mariculture activities to water quality, marine ecology, fisheries and waste management would be avoided.
Site selection to avoid encroachment onto environmental sensitive areas	<ul style="list-style-type: none"> Direct impact from anchorage, assembly and operation of FCZ to marine ecological resources such as artificial reefs, coastal protection area are avoided. Adverse impacts to marine ecology and fisheries due to encroachment onto environmental sensitive areas would be avoided.
Site sitting at deeper waters to avoid organic accumulation and the need of sediment removal	<ul style="list-style-type: none"> Adverse impacts from maintenance dredging and sediment removal works to water quality, marine ecology and fisheries would be avoided.
Control maximum standing stock level	<ul style="list-style-type: none"> Adverse impacts from mariculture activities to water quality, marine ecology and fisheries would be avoided.
Adopt modern prefabricated fish culture raft	<ul style="list-style-type: none"> Adverse impacts from on-site construction to water quality, marine ecology, fisheries and waste management would be avoided.
Adopt modern fish farm designs and advanced mariculture technologies	<ul style="list-style-type: none"> Adverse impacts from mariculture activities to water quality, marine ecology, fisheries and waste management would be avoided.
Adopt fish farm designs and layout to maintain adequate water flushing	<ul style="list-style-type: none"> Adverse impacts from mariculture activities to water quality, marine ecology, fisheries and waste management would be avoided.

2.7 Summary of Alternative Mitigation Measures

Viable sites of the Project have been considered during the Project's Feasibility Study, based on the environmental benefits and dis-benefits for the construction and operation of the new FCZs. Various development options are reviewed and considered in the EIA study. The environmental benefits and dis-benefits of the development options are summarised in **Table 2.4**. Mirs Bay is one of the proposed sites which met the selection criteria for new FCZs and is sited to avoid encroaching sensitive receivers (e.g. ecologically important habitats, areas of high fisheries importance). To further minimise potential impacts, the Project site will adopt modernized and advanced type of aquaculture technologies and operate within the maximum standing stock as identified in this EIA study.

Table 2.4 Summary of Environmental Benefits and Dis-benefits of the Development Options and Alternative Mitigation Measures Considered for the Project

Development Options	Benefits	Dis-benefits
<p>Project Siting</p> <p><u>Preferred Option</u> Site selection of sustainable mariculture with reference to international guidelines, which include minimum water depth, wave exposure, water quality and the compatibility with the existing usage and environment</p>	<ul style="list-style-type: none"> ■ Avoid encroaching into ecological sensitive receivers e.g. marine reserves, coral habitats of high ecological value and areas of high fisheries importance, thus avoid impacts to marine ecology and fisheries ■ Better water flushing rate for mariculture to allow adequate water dispersion and prevent the build-up of organic content and degradation of the nearby marine environment. Consequently, organic content is also not built up on the seabed and maintenance dredging and sediment removal are therefore not required for FCZ in deep waters, and the associated water quality impacts and related ecological and fisheries impacts can be avoided ■ Remote area at Mirs Bay minimises impacts on air quality, noise, and visual sensitive receivers 	<ul style="list-style-type: none"> ■ May pose potential environmental impacts to newly affected areas. However, careful site selection and fish farm design have been done to avoid / minimise potential impacts.
<p><u>Alternative Option</u> Expanding existing FCZs</p>	<ul style="list-style-type: none"> ■ Limit environmental impacts to areas that are already affected by existing FCZs. 	<ul style="list-style-type: none"> ■ Development constrained by existing marine usage and nearby ecological sensitive receivers. Water flushing rate is generally lower due to inshore and shallow waters of the existing FCZs. Impacts to water quality, including restricted dispersion and accumulation of organic loading due to FCZ operation, are likely to occur when more mariculture production is necessary to support the development of mariculture in Hong Kong. ■ Sediment removal may be required periodically to maintain a suitable environment for mariculture. The environmental impacts are likely to be more detrimental

Development Options	Benefits	Dis-benefits
Project Size / Scale		
<p><u>Preferred Option</u> Establishment of smaller FCZ at different locations</p>	<ul style="list-style-type: none"> ■ Establishment of smaller FCZs to reduce the organic loading at individual site, to minimise impact to coral communities and habitat for marine ecological and fisheries resources. ■ With sufficient clearance to navigation routes, accidents / collision of marine vessels with fish farm facilities, and potential risk of fish escape and introduction of invasive species to the marine environment can be minimised. 	<ul style="list-style-type: none"> ■ Affect more areas with potential environmental impacts but better control of impact intensity to within relevant criteria.
<p><u>Alternative Option</u> Establishment of a single larger FCZ</p>	<ul style="list-style-type: none"> ■ Limit environmental impacts to single location but with higher intensity. 	<ul style="list-style-type: none"> ■ The pollution loading from mariculture operation will concentrate in a particular area. The potential impacts to water quality, marine ecology and fisheries of the surrounding waters are expected to increase.
Fish Farm Layout and Design		
<p><u>Preferred Option</u> Use of advanced mariculture fish farm designs (e.g. HDPE cages, steel stuss cages)</p>	<ul style="list-style-type: none"> ■ Durable and weather-resistant material would less likely to get damaged or repaired and result in less waste generated. ■ Less susceptible to damage during adverse weather condition, such as typhoons, and minimise potential risk of fish loss / escape, and subsequent impact on local ecology and fisheries; and also minimise impact due to fish cage relocation. 	<ul style="list-style-type: none"> ■ Higher setup cost.

Development Options	Benefits	Dis-benefits
	<ul style="list-style-type: none"> ■ Adequate water flow and dispersion of organic content between cages / rafts, and along the water column is allowed. Adequate clearance from seabed will also be maintained. Water quality impacts such as changes in flow regime and build-up of organic content are minimised. Subsequent ecological and fisheries impacts in the vicinity and degradation of the nearby marine environment could be reduced. The need for maintenance dredging and sediment removal during construction and operation of the Project is also avoided. ■ Use of green technology and automation could reduce feed wastage and physical labour, hence reduce potential disturbance to water quality, ecology and environment from feed wastage, workforce wastes, vessel trips, etc. 	
<p><u>Alternative option</u></p> <p>Use of traditional fish farm designs (e.g. made of timber supported by floating units made of empty plastic drums or polystyrafoam floats)</p>	<ul style="list-style-type: none"> ■ Lower setup cost. 	<ul style="list-style-type: none"> ■ Non-weather resistant materials and easy to get damaged or repaired. More wastes are expected to be generated. ■ Susceptible to damage from adverse weather conditions such as typhoons. Potential risk of fish loss / escape is higher, and subsequent impact on local ecology and fisheries; and also impact due to fish cage relocation would increase. ■ Potential impact on water flow and dispersion of organic content between cages / rafts, and along the water column might be present, and result in the build-up of organic content on seabed. Maintenance dredging and sediment removal may be required periodically and water quality impacts would arise. Subsequent ecological and fisheries impacts in the vicinity and

Development Options	Benefits	Dis-benefits
		<p>degradation of the nearby marine environment would also increase. Other mitigation measures will be required to control and minimise impacts to water quality, such as the use of silt curtains, closed grab dredger, etc.</p> <ul style="list-style-type: none"> ■ Require more labour input and hence increase potential disturbance to ecology and environment from feed wastage, workforce wastes, vessel trips, etc.
<p>Construction Methods and Sequence of Works for the Project</p>		
<p><u>Preferred option</u></p> <p>Fish farm framework are pre-fabricated off-site, then assemble and anchored on-site</p>	<ul style="list-style-type: none"> ■ Minimisation of construction duration on-site and hence reducing the duration when potential impacts to the environment can occur. ■ No generation of C&D materials on-site and potential water quality impact from construction site run-off during the construction of the Project is avoided. The use of silt curtain and construction boats for silt curtain deployment are therefore not required, the subsequent impacts to marine and fisheries habitats such as underwater sound from marine vessels are minimised ■ Less labour input required on site would result in reduction of waste generated from human activities 	<ul style="list-style-type: none"> ■ N/A
<p><u>Alternative option</u></p> <p>No alternative option applicable as the fish farm framework used for advanced type of mariculture is large in scale, and could not be constructed from raw materials on site.</p>	<ul style="list-style-type: none"> ■ N/A 	<ul style="list-style-type: none"> ■ N/A

2.8 Consideration of Public Concerns

The Project Profile of this Project was exhibited to the public for comments on 16 October 2019, and stakeholder engagement activities which commenced in June 2021 were conducted during the course of this EIA Study. These activities included briefings and meetings with special interest groups, members of the Legislative Council, fishermen groups, mariculturists, environmental bodies etc. The comments received from the public and key stakeholders mainly focused on the potential impacts of the Project on water quality, marine ecology, fisheries, waste management, visual and noise aspects and are discussed in Section 1.5 of the EIA Report. These impacts are assessed in this EIA Study.

3. PROJECT OVERVIEW

3.1 Site Location and History

The Project site at Mirs Bay is located east of Tap Mun (**Figure 1.1**). It consists of two areas, one around 105 hectares (~1,000 m long and ~1,000 m wide) east of Tap Mun and the other around 305 hectares (~2,000 m long ~1,500 m wide) east of Kau Lau Wan. The total area of the Project site is approximately 410 hectares. The Project site is exposed to wind from all directions, and is located at water depths of -15 m to -20 m.

There is no historic use of the Project site based on the existing information. The land surrounding the Project site is generally rural area with no planned developments, historical, or existing infrastructure facilities in the vicinity. No historical contamination concern is identified within the Project site. Sai Kung East Country Park is located in the vicinity of Project site while there are no SSSI and Marine Parks located in the vicinity. The village / residential area closest to the Project site is over 1 km at Kau Lau Wan.

3.2 Project Description

The Project is comprised of the following key components which are discussed in detail in Section 2.9 of the EIA Report:

- Fish rafts / cages manufactured off-site which will be towed to the Project site;
- Mooring system to be anchored to the fish rafts / cages and assembled on site; and
- Auxiliary facilities, such as storage space and shelters would be positioned by anchor lines attaching to the anchorage points on the seabed.

The detailed number, size and separation distance of the fish rafts / cages would be determined at a later stage. No land-based works will be involved in the Project.

The Project may have the potential to interact with the proposed FCZs at Wong Chuk Kok Hoi and Outer Tap Mun, subject to the timing of completion of legislative exercise to amend the *Schedule to the Fish Culture Zone (Designation) Order (Cap. 353B)*, and existing FCZs in the vicinity. This EIA Study did not identify any other existing or committed projects in the vicinity of the Project site which may potentially interface with the construction and operation of this Project. The cumulative impact assessment is based on the worst-case scenarios of concurrent operation of all existing and planned FCZs as sources of pollution and the impacts are addressed in this EIA Study.

3.2.1 Construction Phase

For all types of advanced aquaculture technologies, the construction of the proposed Project will mainly involve the setup of fish farm structures, including fish rafts / cages, auxiliary facilities (such as storage areas on communal rafts) and mooring system at sea. No land-based works, structures and activities are involved in the Project and no landscape areas will be affected. The scale of construction work on-site is relatively small, and the installation of fish farm structures are expected to be completed within a few weeks for each fish raft. Main components of the rafts / cages are manufactured off-site and will be towed to the Project site using tug boat. On-site assembly and anchoring of the fish rafts / cages will be assisted by a small number of marine vessels such as sampans and small speed boats for up to a few trips per day. These vessels will be the major means of transport to the Project site during the construction phase and anchoring of these vessels might be required. No dredging works are required during the construction phase and no heavy construction plant would be used. Fish rafts / cages and auxiliary facilities, such as storage space and shelters, will be positioned by anchor lines attaching to the anchorage points on the seabed. Use of winch might also be required during the assembly and anchorage of fish rafts / cages. Depending on the design and specifications, required works to assemble fish rafts onsite could vary and may include

tighten up connections by nuts and bolts, ropes or equivalent, assembling parts with pre-casted grooves, etc. All construction activities shall be conducted during daylight hours.

3.2.2 Operation Phase

Mariculture activities, such as management of fish raft / cages and fish stocks within the Project site at sea will be undertaken during operation phase. No land-based works, structures and activities are involved in the Project and no landscape areas will be affected. Limited numbers of small power generators will be used on fish rafts to support daily mariculture activities. The transportation of fish stocks, fish feed, fish raft equipment and workforce as well as occasional visitors will mainly make use of small marine vessels such as sampans and speed boats for a few trips a day. These vessels will be the major means of transport to the Project site during operation phase. As the fish farm facilities will be used mainly for fish farming purposes, auxiliary facilities such as storage space and shelters will be present, while as automated / remote fish feeder machines will be adopted in the Project to reduce physical labour input. Mariculturists are not anticipated to live on the rafts as in some traditional fish farms. No maintenance dredging or sediment removal will be required during FCZ operation.

AFCD will limit the number of marine fish culture licences issued to control the standing stock of the Project site to within its maximum carrying capacity of 5683.5 ton at any given time as identified in this EIA study. Licensees would be required to submit a fish farm operational plan to AFCD under the *Marine Fish Culture Ordinance (Cap. 353)* that describes site practices and control of mariculture activities to minimise impacts on the environment. The general management of the new FCZs shall follow the *Marine Fish Culture Ordinance (Cap. 353)* and *Marine Fish Culture Regulations (Cap. 353A)*.

3.2.3 Tentative Implementation Programme

Subject to the completion of this EIA study and issuance of EP, legislative exercise will be carried out to amend the *Schedule* to the *Fish Culture Zone (Designation) Order (Cap. 353B)* by negative vetting for designating new FCZ. Consequential amendments to other related ordinances will also be made as necessary. After the designation of the new FCZ tentatively in Year 2023, AFCD will grant new marine fish culture licences to the mariculturists who successfully apply to operate in this FCZ.

Construction activities by licensees are expected to commence in Year 2024, subject to the timing of application and approval of the new marine fish culture licence. Mariculture activities are expected to commence after the completion of construction by licensees, and would typically last for more than 10 years without major repair.

4. LEGISLATIVE REQUIREMENTS, EVALUATION CRITERIA AND SENSITIVE RECEIVERS

4.1 Water Quality

This EIA Study has described the potential impacts associated with the construction and operation of the Project on water quality that have been identified and analysed for compliance with the prevailing WQOs stipulated under the *Water Pollution Control Ordinance (WPCO)* and the *Technical Memorandum Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-ICW)*, *Hong Kong Planning Standards and Guidelines (HKPSG)*, and the criteria and guidelines stated in the *EIAO-TM Annexes 6 and 14* respectively.

The Assessment Area for water quality assessment covers the Mirs Bay and the Tolo Harbour and Channel Water Control Zones (WCZs). The water quality in the Assessment Area was very good with high levels of dissolved oxygen (DO), and low nutrient and *E. coli* levels. Compliance with the Water Quality Objectives (WQOs) is generally observed in most parameters at the selected monitoring stations at the two WCZs. Water Sensitive Receivers (WSRs) were identified in the Assessment Area, including:

- Recreational areas, such as secondary contact recreation subzones of WCZs;
- Marine Park;
- Existing and proposed FCZs;
- Habitats for marine organisms including coral and benthic communities, and Finless Porpoise;
- Spawning ground and nursery area of fisheries resources;
- Artificial reefs (ARs);
- Intertidal area;
- Sites of Special Scientific Interest (SSSIs); and
- Non-gazetted beaches.

The potential impacts arising from the construction and operation phases of this Project to these WSRs have been evaluated and the findings are summarised in **Section 5.1**.

4.2 Marine Ecology

The potential impacts of the construction and operation activities of this Project on marine ecology have been assessed in this EIA Report. The impacts have been identified and analysed for compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 8 and 16* respectively.

The Assessment Area for marine ecological impact assessment is the same as the assessment area for water quality impact assessment. Known marine ecological important habitats and species in the vicinity of the Project site within the Assessment Area including existing Country Parks, SSSI, existing marine parks, mangroves, coral communities, marine benthos of conservation interest, and ecologically important species including Amphioxus and White-bellied Sea Eagle.

Field surveys, which include subtidal (benthic and coral) surveys were conducted during September 2020 to February 2021 to update the baseline conditions of the marine habitats and assemblages within and around the Project's footprint. Results of the field surveys confirmed the findings of the literature review, and are presented below:

- Recognised Sites of Conservation Importance: These include a number of existing country parks (Sai Kung East Country Park, Sai Kung West Country Park and Sai Kung West Country Park (Wan Tsai Extension)), existing marine park (Hoi Ha Wan Marine Park (HHWMP)), as well as SSSI (Hoi Ha Wan SSSI).

- **Marine Mammals:** According to the latest AFCD Marine Mammal Monitoring Report 2021/22 ⁽²⁾, no records of Hong Kong's resident marine mammal species, the Finless Porpoise (FP) *Neophocaena phocaenoides* and the Chinese White Dolphin (CWD) *Sousa chinensis*, are present in the Assessment Area. FPs are mainly distributed in the southern and eastern waters of Hong Kong and CWDs are mainly distributed at western and southwestern Lantau waters, and so their habitats do not overlap with the Project site.
- **Horseshoe Crab, and its Breeding and Nursery Grounds:** Two species of horseshoe crab, *Tachypleus tridentatus* and *Carcinoscorpius rotundicauda* have previously been recorded around Hong Kong waters. Adult horseshoe crabs are not recorded in the northeastern waters of Hong Kong. The nearest confirmed nursery site and key nursery ground are located at Lai Chi Wo in YCTMP which is out of the Assessment Area and are considered to be too remote to be affected by the Project.
- **Mangroves:** Patches of mangroves are found along the coastline from Tai Tan to Ham Tin Wan and at Hoi Ha Wan. The nearest mangrove is located at Chek Keng and Ham Tin which are ~3.1 km away from the Project site and most of them are located more than 3.5 km away. These sites are considered to be far away to be affected by the Project.
- **Coral Communities:** The field survey results indicated that the majority of corals recorded within the Assessment Area were common and widespread species in Hong Kong, including hard corals *Montipora peltiformis*, *Plesiastrea versipora* and *Porites* sp.. Isolated colonies of soft coral *Dendronephthya* sp., black corals *Antipathes curvata* and *Cirripathes* sp. were recorded at the surveyed area. The coral coverage were generally low (<5%-10%) at areas in the vicinity of the Project site. Higher coral coverage was recorded near Nam She Wan.
- **Amphioxus:** The baseline subtidal benthos field survey results indicated that three species of amphioxus, including *Branchiostoma belcheri* was found in both wet and dry seasons, and two other species *B. japonicum* and *B. malayanum* were found in dry season only within the Project site. Sampling Station MB9 was found to have high density of amphioxus during both seasons.
- **Other Intertidal and Subtidal Assemblages:** Other intertidal and subtidal benthos species reported from the field surveys and literature review in the Assessment Area are common and widespread in Hong Kong with no species of conservation importance. Previous studies have indicated that the benthic communities of the Assessment Area were impoverished. Seagrass (*Halophila minor*) was reported to be present at To Kwa Peng; however, as it is located far from the Project site (~3.9 km) to be affected by the Project.
- **White-Bellied Sea Eagle (WBSE):** The species was spotted on Port Island and Tsim Chau at 2.7 km and >4 km away from the Project site respectively. The species is uncommon but widespread in Hong Kong. The nesting grounds of WBSE is also considered far away to be affected by the Project.

Based on the literature and survey data, the ecological importance of waters at the Project site is considered low. Other marine habitats (e.g. intertidal, subtidal hard bottom, subtidal soft bottom) at the Project Site and its vicinity are generally considered as of low ecological importance, while moderate ecological importance was recorded at subtidal habitats near Nam She Wan and at specific amphioxus habitat within and in the vicinity of the Project site.

The potential impacts arising from the construction and operation phases of this Project to these marine ecological resources have been evaluated and the findings are summarised in **Section 5.2**.

(2) AFCD (2022) Monitoring of Marine Mammals in Hong Kong Waters (2021 -2022).

4.3 Fisheries

The potential impacts to fisheries caused by the construction and operational activities of this Project have been assessed in this EIA Report. The impacts have been identified and analysed for compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 9 and 17* respectively.

The Assessment Area is the same as that identified in the water quality impact assessment and sensitive receivers for fisheries are identified as follows:

- Recognised spawning ground and nursery area of commercial fisheries resources in northeastern waters which are located at ~5.9 km and ~0.7 km from the Project site respectively;
- FCZs at Tap Mun (located at ~2.1 km northwest of Project site), Kau Lau Wan (located at ~1.4 km west of Project site) and Sham Wan (located at ~4.0 km southwest of Project site); and
- ARs in Long Harbour (33,420 m³) and HHWMP (9,530 m³), located at >2.3 km and ~4.5 km west of the Project site respectively.

A review of baseline information on commercial fisheries resources, habitats and fishing operations surrounding the waters of the Project site from available literature has been undertaken. Results from the review indicated that low to high levels of fishing operation with low to moderate levels of fisheries production were reported at the Project site. The Assessment Area including the Project site mainly supported fish families of low commercial value. Areas which supported fish families of higher commercial values, such as HHWMP, is located at some distances from the Project site. The Project site is located out of the recognised spawning ground and nursery area. The potential for the Project site and its immediate vicinity to function as a unique and important spawning ground and nursery area is relatively low.

The potential impacts arising from the construction and operation of this Project on these sensitive receivers have been evaluated and the findings are summarised in **Section 5.3**.

4.4 Waste Management

The potential waste management implications caused by construction and operation activities of this Project have been assessed in this EIA Report. The assessment followed the technical requirements given in *Appendix E* of the Study Brief. The impacts have been identified and analysed for compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 7 and 15*, respectively.

An analysis of waste generation activities was conducted to identify the quantity, quality and timing of the waste arising from the construction and operation activities of the Project. Appropriate waste management measures including waste generation reduction, recycling and disposal options, as well as alternative project design, are also proposed for each type of wastes taking account of potential hazard, air and odour emission, noise, wastewater discharge and public transport in order to minimise waste generation and maximise waste reduction within the Project site.

The potential impacts arising from the construction and operation of this Project on waste management have been evaluated and the findings are summarised in **Section 5.4**.

4.5 Visual

This EIA Study has described the visual impacts associated with the construction and operation of this Project. The purpose of the assessment was to evaluate the predicted impacts to Visual Sensitive Receivers (VSRs) as per *EIAO GN 8/2010* and the criteria and guidelines stated in the *EIAO-TM Annexes 10 and 18* respectively.

This EIA Study has identified six VSRs, including visitors at Tap Mun campsite, Kau Lau Wan and Nam She Wan beach, residents at Kau Lau Wan, hikers / recreational viewers from elevated areas of Nam She Wan and Sai Kung East Country Park and hikers at Tai Tan Country Trail. The quality of

most existing views towards the Project is generally good, with a high degree of visibility to natural views.

The potential visual impacts and glare effect from the construction and operation of this Project to these sensitive receivers have been evaluated and the findings are summarised in **Section 5.5**.

4.6 Air Quality

The potential air quality impacts caused by construction and operation activities of this Project have been assessed in this EIA Report. The impacts have been identified and analysed for compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 4 and 12* respectively and the applicable criteria stipulated under the *Air Pollution Control Ordinance (APCO)*.

The Assessment Area is defined as an area within 500 m from the Project site boundary, with representative air sensitive receivers (ASRs) identified beyond the 500 m Assessment Area, including village houses of Tap Mun New Fisherman's Village and Kau Lau Wan. The potential impacts arising from construction and operation of the Project on the identified representative ASRs have been evaluated and the findings are summarised in **Section 5.6**.

4.7 Noise

The potential impacts of noise caused by the construction and operation activities of this Project have been assessed in this EIA Report. The impacts have been identified and analysed for compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 5 and 13* respectively and the applicable criteria stipulated under the *Noise Control Ordinance (NCO)*.

The Project site is located about 100m north of Sai Kung East Country Park and is located in an open sea. Background noise at the Project site and the surrounding environment is dominated by the prevailing sea waves. Three Noise Sensitive Receivers (NSRs) have been identified, including Sai Kung East Country Park and village houses at Tap Mun and Ko Lau Wan and the potential impacts arising from the construction and operation phases of the Project on these representative NSRs have been evaluated where appropriate. Sai Kung East Country Park has been identified within 300 m Assessment Area. Other NSRs are located 1.1 km away from the Project site boundary. The potential impacts arising from construction and operation of the Project on the identified representative NSRs have been evaluated and the findings are summarised in **Section 5.7**.

4.8 Cultural Heritage

The potential impacts to cultural heritage, in particular marine archaeology, associated with the construction and operational of this Project have been assessed in this EIA Report. The assessment followed the Requirements for Marine Archaeological Investigation (MAI) (*Appendix I* of EIA Study Brief). The impacts have been identified and analysed to be in compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 10 and 19* respectively.

No sites of archaeological interest, declared monuments, proposed monuments, graded historic sites / buildings / structures, or Government historic sites identified by Antiquities and Monuments Office are present within the Assessment Area. The MAI identified one sonar contact within the Assessment Area, which is most likely to be modern, recently deposited debris that would not be of high archaeological potential.

The potential impacts arising from the construction and operation of this Project on cultural heritage have been evaluated and the findings are summarised in **Section 5.8**.

5. SUMMARY OF ENVIRONMENTAL IMPACTS

5.1 Water Quality

5.1.1 Construction Phase

The construction for this Project will not involve civil or marine works. The construction works include the assembly of parts to form fish rafts for mariculture, as well as the towing and anchoring of fish rafts from other location(s) to the new FCZ using tug boat. The towing and anchoring of fish rafts is expected to have very limited impact on water quality. The level of sediment suspended in the water column from anchoring will be very limited and localised. Besides, the Project site is overall deep enough such that propeller would not have interaction with the seabed sediment and so SS elevation due to propeller wash is not anticipated. The use of chemicals on-site is expected to be minimal and no unacceptable water quality impact from the onsite installation of fish raft would be expected. Details of tools and materials adopted on-site would be determined by the future licensees.

Because of the lack of major works to be conducted, it is unlikely there will be a significant workforce present during construction phase, and any sewage / wastewater generated shall be collected at the transportation / work vessel(s) for disposal at appropriate facilities on land. No unacceptable water quality impact from sewage / wastewater from workforce is anticipated.

5.1.2 Operation Phase

The maximum standing stock of the Project site was estimated using an established computer modelling system. AFCD will ensure the production scale of the Project site will not exceed the maximum standing stock level by controlling the mariculture production scale permitted under individual license. The potential change in water quality due to mariculture activities at the Project site have been assessed using computer simulations, which considered the influence of other nearby FCZ operations as well as pollutants from the rest of HK and the Guangdong area. Compliance with WQO is achieved at all of the WSRs (except for the DO criterion which showed baseline exceedance at WSR of planned Wong Chuk Kok Hoi FCZ), and no project contribution to Wong Chuk Kok Hoi FCZ is expected from the mariculture operation of the Project. Therefore, no unacceptable water quality impact has been predicted.

Temporary relocation of fish rafts may be conducted at the discretion of licensees with AFCD's agreement in case of potential circumstances that affect mariculture activities. The fish rafts will be relocated away from ecological and fisheries sensitive areas, as well as marine fairways and utilities. Such relocation will be temporary and the fish rafts will return to the Project site upon the cease of the circumstances. Given the operation phase modelling results indicated no unacceptable change in water quality from mariculture activities at the Project site, if some of the mariculture operation is temporarily relocated, the associated pollution load would likely to be more spread out to a wider area and the potential change in water quality would be even less significant. Therefore, it is expected the potential temporary relocation of fish rafts would not result in adverse change in water quality exceeding the case under normal operation.

Sufficient separation distance will be maintained between fish rafts / cages to allow water flow. Therefore, the presence of floating structures of fish rafts will not exert significant drag on the tidal stream and no notable change in flow regime would be expected.

Mariculturists at the Project site would be required to strictly observe the requirement under *Cap. 529 Veterinary Surgeons Registration Ordinance* and have strict control on prescription drugs. In AFCD's regular inspection of existing FCZs in recent years, there was no identified case of excessive storage of drugs or pharmaceuticals. Therefore, there would be very limited pharmaceuticals for fish kept onsite and those would be stored at secured locations, and discharge of water containing pharmaceuticals is not expected from daily operation. In view of the above, the risk of spillage of fish drugs or pharmaceuticals is low.

Only pellet feed or alternative feed with better feed conversion ratio will be permitted within the proposed FCZ. Spilled / excess fish feed generally does not persist for considerable amount of time because of attempt for recovery by crew or consumption by existing fish population. Bags of feed dropping into the sea during storage or transportation will be recovered by the crew. Even if not recovered, the bag would limit the exchange materials such that the nutrient content would unlikely be released all at once and result in significant water quality impact. In view of this, the risk and consequence of such scenario are deemed minimal and no unacceptable impact on water quality is expected.

Operational activities would involve the removal of fouling organisms of the rafts. Fouling organisms are usually removed mechanically so chemical is generally not required. Dislodged fouling biomass falling into the sea would not constitute additional pollution load because such biomass has fed on the original pollution source from the fish farm operation.

Disinfection of culture gears is required for disease control. Amongst different methods of disinfection, submersion to water dosed with formaldehyde or bleach within enclosed container could be used. Chemical used will be required to be stored properly onsite and disposed of by licensed contractor. No onsite disposal would be allowed.

Given small marine vessels such as sampans and speed boats will be used during mariculture operation for a few trips a day, increased marine traffic would not result in notable change in water quality. Generation of sewage by staff and visitors onsite would be limited. Sewage shall be stored on vessels or at the mariculture facilities and be regularly disposed by licensed contractor, and no sewage from staff will be discharged into the sea.

5.2 Marine Ecology

5.2.1 Construction Phase

The disturbance of marine habitats (up to ~410 ha, including marine waters and benthic habitats) due to the assembly and installation activities of fish rafts are considered as environmentally acceptable to marine ecology due to the temporary nature of the construction activities (a few weeks for each fish raft / cage), limited disturbance to small extent of surface layer of seabed, the availability of similar habitat in the vicinity and overall low ecological importance of the affected area. Although a small extent of amphioxus habitat was identified within the Project site, the majority of the Project site is of muddy and silty nature and therefore is not considered an important recruitment area and spawning ground for amphioxus. Nevertheless, specific mitigation measures, including avoidance of construction works within the amphioxus habitat within the Project site, will be implemented to further avoid / minimise the potential impact from disturbance to marine habitats.

Other disturbances including the generation of noise, glare and dust from construction activities such as assembly of fish raft are considered environmentally acceptable to marine ecology as marine species, mostly fishes, would temporarily avoid areas in the vicinity of the works area or close to the source of disturbance, while major lighting sources will be pointed inward and downwards to avoid disturbance to wildlife.

Underwater sound and increase marine traffic generated from marine construction activities are also not expected to result in unacceptable impacts to marine ecological resources, considering the relatively small number of marine vessels present temporarily during fish farm construction and the habituation of similar sounds by marine organisms in the current underwater soundscape.

5.2.2 Operation Phase

As the fish farm structures will not occupy all of the Project site, the disturbance of about <410 ha of marine habitats within the Project footprint is considered to be acceptable to marine ecology with the area affected which is of overall low ecological importance. Although a small extent of amphioxus habitat was identified within the Project site, the majority of the Project site is of muddy and silty

nature and therefore is not considered an important recruitment area and spawning ground for amphioxus. Nevertheless, specific mitigation measures, including avoidance of operation works within the amphioxus habitat within the Project site, will be implemented to further avoid / minimise the potential impact from disturbance to marine habitats. Recolonisation by marine organisms in the new artificial habitats provided by the fish farm structures is expected to occur.

Fish rafts / cages are built with permeable nets to allow water exchange with the marine environment and no unacceptable change in hydrodynamics is expected to occur.

Other disturbances including the generation of noise, glare and dust from operation activities such as cleaning of fish cages and the use of lighting are considered environmentally acceptable to marine ecology as marine species, mostly fishes, would temporarily avoid areas in the vicinity of operational area or close to the source of disturbance, while major lighting sources will be pointed inward and downwards to avoid disturbance to wildlife.

Unacceptable adverse impacts to marine ecological resources and marine parks, associated with increased marine traffic and underwater sound from project vessels, are not expected to occur during Project operation. Isolated incidents (e.g. typhoon and algal bloom) may require temporary relocation of fish raft and additional vessel movements during such emergency conditions, however, considering the small number of marine vessels required and the temporary nature of the operation, unacceptable impacts of increased marine traffic due to temporary relocation of fish rafts on marine ecological resources are not expected.

Increase of underwater sound due to fish farm operation would be temporary which the underwater sound characteristics of these vessels are similar to the operations at Tap Mun FCZ, Kau Lau Wan FCZ and marine traffic at ferry routes nearby. Marine organisms in these waters are habituated to the background level of underwater sound and unacceptable impacts on marine ecological resources are not anticipated.

Impacts of changes in water quality arising from mariculture activities are predicted to be largely confined in the vicinity of the Project site. No unacceptable change in water quality is predicted at all marine ecological sensitive receivers when comparing the baseline and project scenarios.

Potential Impact on the introduction of invasive species is considered minor with regular monitoring of mariculture facilities to prevent fish escape. No unacceptable impacts to marine ecological resources and species of conservation importance are expected to occur.

5.3 Fisheries

5.3.1 Construction Phase

Considering the temporary nature of the disturbance (a few weeks for each fish raft/cage), unacceptable impacts on fisheries are not expected. Direct impacts arising from the proposed fish farm construction works include temporary disturbance (a few weeks for each fish raft / cage) to fisheries habitats within the area and water column partially occupied by the fish farm structures, and loss of access to potential fishing ground with an area of approximately 410 ha. Fish farm structures, such as fish cages will occupy a section of the water column and the disturbance of seabed due to the anchorage of fish farm structures will be confined to a thin surface layer (<0.5 m) within a small area. Considering the temporary nature of disturbance during construction phase, the impacts on fishing activity are considered to be of minor significance. Potential impacts of elevated levels of underwater sound as a result of construction activities are considered acceptable with the presence of existing underwater sound from Tap Mun FCZ, Kau Lau Wan FCZ and marine traffic at ferry routes nearby. No unacceptable construction phase impacts to fisheries are expected to occur and no fisheries-specific mitigation measures are required during construction.

5.3.2 Operation Phase

Direct impacts arising from mariculture activities will include changes in fisheries habitat within the area and water column occupied by the fish farm structures, and loss of access to fishing grounds within the FCZ (410 ha). The fish farm structures will not fully occupy all of the Project site area but mainly a section of the water column and a small area of seabed confined to a thin surface layer (<0.5 m). The presence of fish farm structures will also provide hard substrates that could be colonised by a variety of marine organisms and bringing potential positive effect on fisheries resources. Although the Project site covers some areas of Mirs Bay, majority of fisheries resources found in and around the vicinity of the Project site are of low commercial value, unacceptable impacts on fisheries are not expected. Impacts on fishing activity are localized with moderate impact on fishing operation as fishing activities are not allowed inside fish farm structures. Considering that suitable fishing grounds outside of these structures can allow similar fishing activities to take place, unacceptable impacts on fishing activity are not expected. Potential impacts of elevated levels of underwater sound generated from the marine vessels in the vicinity of the Project site are considered acceptable with the presence of existing underwater sound from Tap Mun FCZ, Kau Lau Wan FCZ and marine traffic at ferry routes nearby. Temporary relocation of fish rafts may occur over a short time, therefore, unacceptable impacts are not anticipated. Impacts of changes in water quality arising from mariculture activities are predicted to be largely confined in the vicinity of the Project site. The management of fish health will be conducted regularly to prevent fish disease outbreaks, including the Fish Health Inspection Programme to be conducted regularly by AFCD and the implementation of good mariculture practices by licensees. No unacceptable operational phase impacts to fisheries are expected to occur and no fisheries-specific mitigation measures are required during operation.

5.4 Waste Management

5.4.1 Construction Phase

The assessment concludes that no C&D materials and chemical waste will arise from the construction of the Project. The amount of general refuse generated from site workers and the floating refuse entrapped by the fish cages/ fish rafts are anticipated to be insignificant. The construction of the Project site will take only a few weeks for each fish raft.

Adequate waste containers will be provided at appropriate locations to facilitate recovery of recyclables within the Project site. Regular clearance and disposal of waste are also required to avoid odour and litter impact. With the implementation of the mitigation measures recommended, no unacceptable environmental impacts arising from storage, handling, collection, transport and disposal of wastes during the construction phase are anticipated.

5.4.2 Operation Phase

It is expected that less than 315 kg organic waste, including uneaten fish feed, fish excretion and fish carcasses, will be generated per day during the operation phase. Regular removal of these organic wastage will be required within the licensed area with proper storage using enclosed containers and disposed of at the nearest accessible FEHD refuse collection points with public pier following the existing practice under Cap. 353. In the unlikely case that significant amount of dead fish occur, the licensed fish farmers would inform AFCD immediately. AFCD will then liaise with relevant Government departments (e.g. Food and Environmental Hygiene Department, Marine Department) to collect the dead fish from the Project site directly as necessary. All staff and visitors shall refrain from littering to the sea.

Waste impact related to generation of general refuse, as well as the entrapment of marine floating refuse, within the Project site are expected to be insignificant. Adequate waste containers will be provided at appropriate locations to facilitate recovery of recyclables within the Project site. Regular clearance and disposal of waste are also required to avoid odour and litter impact. Small amount of chemical wastes will be generated, which will be carefully handled under the *Code of Practice on the*

Packaging, Labelling and Storage of Chemical Wastes and collected by licensed chemical waste collector to licensed chemical waste treatment facilities for disposal at the Chemical Waste Treatment Centre (CWTC) at Tsing Yi. With the implementation of the mitigation measures recommended, no unacceptable environmental impacts arising from storage, handling, collection, transport and disposal of wastes during the operation phase are anticipated.

5.5 Visual

5.5.1 Construction Phase

Construction works will take a few weeks for each fish raft. The duration of impact is temporary; and the impact is reversible. Mitigation measures, including reduction of construction period on site and sensitive design of the fish rafts / cages, would further reduce the impacts to all VSRs.

With the implementation of mitigation measures, unacceptable visual impacts due to the construction of the Project are not anticipated.

5.5.2 Operation Phase

The FCZ facilities are not expected to be higher than 3 m in height above water (except during maintenance), and only the upper part of the fish rafts / cages would be above waters, they would only block part of the view in the vast sea. The impact is reversible. The new structures will be designed in accordance with relevant marine safety standards and regulations. Sensitive architecture design will be considered where practicable. Residual visual impacts will be between insignificant and slight to moderate. No unacceptable residual visual impact is expected.

Night-lighting will be used for safety purpose in this Project and the light sources will generally be of low intensity, the orientation of light will point towards to the fish rafts / cages, and will not be pointing horizontally and to the VSRs. In addition, no mirrors or polished materials will be installed on the fish rafts / cages, reflectance of light will be low. Therefore, the night lighting and glare impact is considered acceptable.

With the implementation of mitigation measures, unacceptable visual impacts due to the operation of the Project are not anticipated.

5.6 Air Quality

5.6.1 Construction Phase

Potential sources of impacts will mainly arise from emissions from small marine vessels such as tug boats, sampans and speed boats for towing the fish rafts / cages to the Project site for setup, assembly and anchoring on site. Given the small scale construction works, only a few trips per day for the transport of the fish rafts / cages would be required and thus the potential emissions from the operation of these small marine vessels are expected to be minor. In addition, construction equipment may also be used to assist with the assembly and anchoring of the fish rafts / cages, as well as installation of the auxiliary facilities on site. The associated emissions are also expected to be minor given the limited number of construction equipment to be used on site. Potential emissions from these small marine vessels and construction equipment would be short-term as the construction period would take a few weeks for each fish raft.

Considering the large separation distance between the Project site and the nearest ASR (more than 1 km away), as well as the limited and short-term air emissions associated with the construction works, adverse air quality impact arising from the construction of the Project is not anticipated. The *Air Pollution Control (Marine Light Diesel) Regulation* and *Air Pollution Control (Fuel for Vessels) Regulation* will be followed to control emissions from the operation of the marine vessels. *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation* and *Air Pollution Control (Fuel*

Restriction) Regulation will also be followed to control emissions from the operation of the construction equipment.

5.6.2 Operation Phase

A few small power generators will be used within the Project site to support daily mariculture activities during operation phase. It is also expected there would be a few trips per day of small marine vessels such as sampans and speed boats for the transportation of fish stock, fish raft equipment, daily necessities and occasional visitors to and from the Project site. As these operational activities only involve limited number of small power generators and just a few vessel trips per day, potential emissions from the operation of these small power generators and vessels are expected to be very minor.

Considering the large separation distance between the Project site and the nearest ASR (more than 1 km away) and that the potential air emissions associated with the operational activities of the Project would be limited, adverse air quality impact arising from the operation of the Project is not anticipated. The *Air Pollution Control (Marine Light Diesel) Regulation* and the *Air Pollution Control (Fuel for Vessels) Regulation* will be followed to control emissions from the operation of the marine vessels. *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation* and *Air Pollution Control (Fuel Restriction) Regulation* will also be followed to control emissions from the operation of the small power generators within the Project site.

5.7 Noise

5.7.1 Construction Phase

Potential sources of impacts will mainly arise from towing of fish rafts to FCZ by tug boat, and assembly and anchoring of fish rafts by winch. The construction of the Project would take a few weeks for each fish raft. No heavy powered mechanical equipment (PME) is required and no noisy activities will take place during the construction phase. All construction works will be carried out during non-restricted hours only. The main components of the fish rafts and cages will be manufactured off-site.

Sai Kung East Country Park is identified within the 300 m Assessment Area, and no specific noise limit for Country Parks is available from the relevant legislation and guidelines, including *EIAO-TM* and *GW-TM*. The area of Sai Kung East Country Park within 300m of the Project is not accessible by any hiking trail and the nearest accessible hiking trail is more than 300m away from the Project. Other NSRs are located away from the Project Site (at least 1.1 km). In view of small scale of the Project with limited numbers of marine vessel trips / day and noisy activities are not required, adverse noise impact during construction phase is not anticipated. No mitigation measures during construction of the Project are required. Good site practices are recommended despite no adverse construction noise impact is anticipated.

5.7.2 Operation Phase

Limited numbers of small power generators will be used on fish raft to support the daily mariculture activities. The transportation of fish stock, fish feed, fish raft equipment, other daily necessities as required by the workforce at fish farm, as well as occasional visitors will occur with the use of small marine vessels such as sampans and speed boats for a few trips a day. No PA system or loudspeaker will be used on-site during operation of the Project. No maintenance dredging or sediment removal is anticipated during FCZ operation.

Sai Kung East Country Park is identified within the 300 m Assessment Area, however, the area of Sai Kung East Country Park within 300 m of the Project are not accessible by any hiking trail due to steep slope. The nearest accessible hiking trail is more than 300 m from the Project. There is no specific operation phase noise criteria for Country Parks in the relevant guidelines and TMs. Other NSRs are

located far away from the Project Site (at least 1.1 km). With the small number of marine vessel trips / day for transportation, limited numbers of small power generators and no noisy operational activities within the Project site, adverse noise impact due to operation of the Project is not anticipated. No mitigation measures during operation of the Project are required.

5.8 Cultural Heritage

5.8.1 Construction Phase

Potential impact on a sonar contact C1-SC006 that may have marine archaeological potential is identified for construction phase of the Project. A buffer area of 20m radius from C1-SC006 is recommended to avoid any tug boat anchoring, and anchoring of the fish rafts / cages in the area so as to avoid any impact to C1-SC006. The locations and relocations of fish rafts / cages are regulated by the *Marine Fish Culture Ordinance (Cap. 353)*, and AFCD will ensure the locations of anchoring of vessels and fish rafts / cages will not be located within the buffer area. Site inspections on a regular basis by the Environmental Team (ET) are recommended to check if any seabed disturbance work is conducted in the buffer area. With the implementation of mitigation measures, unacceptable impacts on cultural heritage due to the construction of the Project are not anticipated.

5.8.2 Operation Phase

Potential impact on sonar contact C1-SC006 during operation phase can be avoided by setting a buffer area of 20m radius from C1-SC006 to avoid any tug boat anchoring, and anchoring of the fish rafts / cages in the area so as to avoid any impact to C1-SC006. The locations and relocations of fish rafts / cages are regulated by the *Marine Fish Culture Ordinance (Cap. 353)*, and AFCD will ensure the locations of anchoring of vessels and fish rafts / cages will not be located within the buffer area. AFCD will conduct regular site inspections to check if any seabed disturbance work is conducted in the buffer area. With the implementation of mitigation measures, unacceptable impacts on cultural heritage due to the operation of the Project are not anticipated.

5.9 Environmental Monitoring and Audit

A summary of the environmental impacts is presented in **Table 5.1**. This EIA Study of the Project has been demonstrated to comply with the *EIAO-TM* requirements. Actual impacts during the construction and operation works will be monitored through a detailed EM&A programme. Full details of the programme are presented in the **EM&A Manual** associated with this EIA Report. This programme will provide management actions and supplemental mitigation measures to be employed should any impacts arise, thereby ensuring the environmental acceptability of the construction and operation of this Project.

Baseline marine water quality monitoring at all designated monitoring stations including control stations shall be conducted prior to the commencement of the Project construction of any licenced fish raft.

In addition, bi-weekly site inspections are recommended to be conducted regularly by the ET during construction phase of the Project to verify that appropriate environmental protection and pollution control mitigation measures are properly implemented in accordance with this EIA.

Water quality monitoring at selected WSRs will be conducted during the operation phase of the Project according to the EM&A programme to confirm no unacceptable change in water quality at the nearby water sensitive receivers. Details of the programme are presented in the **EM&A Manual** associated with this EIA Report.

Mariculture water quality monitoring will also be conducted by AFCD, in addition to the operational phase water quality monitoring at sensitive receivers, to regular monitor the operation and water quality within the proposed FCZ.

Table 5.1 Summary of Environmental Impacts

Sensitive Receivers / Assessment Points	Relevant Standards and Criteria	Results of Impact Predictions		Extents of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts (After Mitigation)
		Potential Impacts	Significance of Impacts (Without Mitigation)				
Water Quality							
<p>Water Sensitive Receivers (WSRs) within Mirs Bay WCZ and Tolo Harbour and Channel WCZ:</p> <ul style="list-style-type: none"> Recreational areas, such as secondary contact recreation subzones of WCZs; Marine Parks; Existing and proposed FCZs; Habitats for marine organisms including coral and benthic communities, and Finless Porpoise; Spawning ground and nursery area of fisheries resources; Artificial reefs (ARs); Intertidal area; Sites of Special Scientific Interest (SSSIs); Non-gazetted beaches. 	<ul style="list-style-type: none"> Annexes 6 and 14 of EIAO-TM Water Pollution Control Ordinance Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters WQOs for: <ul style="list-style-type: none"> Mirs Bay WCZ Tolo Harbour and Channel WCZ Hong Kong Planning Standards and Guidelines (HKPSG) 	<p>Construction Phase</p> <ul style="list-style-type: none"> Towing and onsite installation of fish rafts Sewage / wastewater from workforce <p>Operation Phase</p> <ul style="list-style-type: none"> Changes in water quality from pollution loadings arise from mariculture operation Changes in hydrology and flow regime due to presence of mariculture facilities Spillage of fish drugs, pharmaceutical chemicals and feed additives Wastewater from daily operation of fish farms, disinfection of gears, and sewage from workforce Increased marine traffic, boating and visitor activities 	<ul style="list-style-type: none"> No unacceptable impacts No unacceptable impacts No unacceptable impacts No unacceptable impacts No unacceptable impacts No unacceptable impacts 	<p>No</p> <p>Compliance with WQO criterion is achieved at most of the water sensitive receivers, and no contribution to WQO exceedance is expected from the operation of the Project</p>	<ul style="list-style-type: none"> Sufficient separation distance will be maintained between fish rafts / cages to allow adequate water flow and reduce impacts on water quality such as changes in flow regime. Licensing would be based on the estimated carrying capacity of the Project site to limit potential change in water quality. No sediment removal/ dredging works will be conducted. No on-site construction except for assembly and towing works will be conducted. 	<p>Construction Phase</p> <ul style="list-style-type: none"> Any sewage / wastewater generated should be collected at the transportation / work vessel(s) for disposal at appropriate facilities on land. <p>Operation Phase</p> <ul style="list-style-type: none"> Standing stock should not exceed 5683.5 tonnes. AFCD will ensure the production scale of the Project site will not exceed the maximum standing stock level by controlling the mariculture production scale permitted under individual license. In case of potential circumstances (e.g. red tide event, outbreak of fish disease), the licensees will review the need of fish raft relocation and propose the fish raft relocation plan as necessary for agreement with AFCD. Only pellet feed or alternative feed with better feed conversion ratio will be permitted within the proposed FCZ. No chemically-laden solution from culture gears disinfection should be discharged into the sea. Onsite storage of chemicals should be controlled and minimised as practicable. Excess chemicals as well as chemical waste generated should be removed from the site at appropriate facilities or by licensed contractor as soon as possible. Fuel storage onsite should be minimised, and if needed, be located at sheltered and secure location. Littering of the sea should be prohibited. 	<ul style="list-style-type: none"> No unacceptable residual impacts are anticipated.
Marine Ecology							
<p>Marine Ecological Sensitive Receivers within Mirs Bay WCZ and Tolo Harbour and Channel WCZ:</p>	<ul style="list-style-type: none"> Annexes 8 and 16 of the EIAO-TM EIAO Guidance Notes No. 6/2010, 7/2010 and 11/2010 	<p>Construction Phase</p> <ul style="list-style-type: none"> Habitat disturbance 	<ul style="list-style-type: none"> Minor significance Minor significance 	<p>No</p>	<ul style="list-style-type: none"> Avoidance measures as detailed above. Avoid areas of high marine ecological importance, such 	<p>Construction Phase</p> <ul style="list-style-type: none"> Avoid construction works at areas identified with high density of amphioxus (i.e. Station MB9). 	<ul style="list-style-type: none"> No unacceptable residual marine ecological impacts during the construction and operation of the Project are anticipated.

Sensitive Receivers / Assessment Points	Relevant Standards and Criteria	Results of Impact Predictions		Extents of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts (After Mitigation)
		Potential Impacts	Significance of Impacts (Without Mitigation)				
<ul style="list-style-type: none"> Country Parks SSSI Existing marine parks Mangroves Coral communities Amphioxus White-bellied Sea Eagle 	<ul style="list-style-type: none"> Marine Parks Ordinance Wild Animals Protection Ordinance Protection of Endangered Species of Animals and Plants Ordinance Country Parks Ordinance Town Planning Ordinance Hong Kong Planning Standards and Guidelines Chapter 10 (HKPSG) United Nations Convention on Biodiversity (1992) Peoples' Republic of China (PRC) Regulations and Guidelines 	<ul style="list-style-type: none"> Underwater sound generated from marine construction activities and marine vessels 			as existing marine parks and amphioxus habitat.	<ul style="list-style-type: none"> Operation Phase <ul style="list-style-type: none"> Avoid operation works at areas identified with high density of amphioxus (i.e. Station MB9). Mitigation measures proposed for water quality. 	<ul style="list-style-type: none"> The fish farm structures, which would provide artificial substrates for forming habitat and shelter for juveniles or adult fisheries, would provide positive effects on marine ecological resources within and adjacent to the Project Site.
		<ul style="list-style-type: none"> Operation Phase <ul style="list-style-type: none"> Changes in marine habitats (marine waters and benthic habitat) Change in water quality due to temporary relocation of fish rafts Underwater sound from daily operations and marine vessels Change in water quality during fish farm operation Introduction of invasive species 	<ul style="list-style-type: none"> Minor significance Minor significance Minor significance Minor significance Minor significance 	No			
Fisheries							
<ul style="list-style-type: none"> Fisheries Sensitive Receivers within Mirs Bay WCZ and Tolo Harbour and Channel WCZ: Recognised spawning ground and nursery area of commercial fisheries resources Tap Mun FCZ, Kau Lau Wan FCZ, Sham Wan FCZ ARs in Long Harbour and HHWMP 	<ul style="list-style-type: none"> Annexes 9 and 17 of the EIAO-TM Fisheries Protection Ordinance Marine Fish Culture Ordinance Water Pollution Control Ordinance 	<ul style="list-style-type: none"> Construction Phase <ul style="list-style-type: none"> Direct disturbances to fisheries habitat and loss of access to fishing grounds Underwater sound generated from marine construction activities and marine vessels 	<ul style="list-style-type: none"> Minor significance Minor significance 	No	<ul style="list-style-type: none"> Avoidance measures as detailed above Avoid areas of high fisheries importance. 	<ul style="list-style-type: none"> Construction Phase <ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> No unacceptable residual fisheries impacts during the construction and operation of the Project are anticipated. While the proposed FCZ would provide more fisheries resources to the local and global fisheries market, the fish farm structures would also provide artificial substrates, which could form habitat and shelter for juveniles or adult fisheries resources. Besides, the reduced fishing pressure may also have potential positive effect on fisheries resources within and adjacent to the Project site.
		<ul style="list-style-type: none"> Operation Phase <ul style="list-style-type: none"> Changes in fisheries habitats and loss of access to fishing grounds at the location of fish farm structures Change in water quality due to temporary relocation of fish rafts Underwater sound from daily operations and marine vessels Change in water quality during fish farm operation Potential outbreak of fish diseases 	<ul style="list-style-type: none"> Minor significance Minor significance Minor significance Minor significance Minor significance 	No			
Waste Management							
Project Area	<ul style="list-style-type: none"> Annexes 7 and 15 of the EIAO-TM Technical requirements as stated in Appendix E of the Study Brief 	<ul style="list-style-type: none"> Construction Phase <ul style="list-style-type: none"> General refuse and floating refuse generated 	<ul style="list-style-type: none"> No unacceptable impact 	No	<ul style="list-style-type: none"> Migration to environmentally friendly modernised mariculture Adopt modern prefabricated fish culture raft 	<ul style="list-style-type: none"> Construction Phase <ul style="list-style-type: none"> Nomination of approved personnel (e.g. environmental officer of the contractor(s), representative of the project proponent) to be responsible for good site practices, arrangements for collection and effective 	<ul style="list-style-type: none"> No unacceptable residual impacts are anticipated.

Sensitive Receivers / Assessment Points	Relevant Standards and Criteria	Results of Impact Predictions		Extents of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts (After Mitigation)
		Potential Impacts	Significance of Impacts (Without Mitigation)				
	<ul style="list-style-type: none"> ▪ <i>Waste Disposal Ordinance (WDO) (Cap 354)</i> ▪ <i>Waste Disposal (Chemical Waste) (General) Regulation (Cap 354C);</i> ▪ <i>Marine Fish Culture Ordinance (Cap 353)</i> ▪ <i>Land (Miscellaneous Provisions) Ordinance (Cap 28)</i> ▪ <i>Public Health and Municipal Services Ordinance (Cap 132) - Public Cleansing and Prevention of Nuisances Regulation</i> ▪ <i>Merchant Shipping (Prevention and Control of Pollution) Ordinance (Cap 413)</i> ▪ <i>Waste Disposal (Charging for Municipal Solid Waste) (Amendment) Ordinance 2021</i> 				<ul style="list-style-type: none"> ▪ Adopt modern fish farm designs and advanced mariculture technologies ▪ Adopt fish farm designs and layout to maintain adequate water flushing 	<ul style="list-style-type: none"> disposal to an appropriate facility of all wastes generated at the site. ▪ Training of site personnel in proper waste management and handling procedures by AFCD. ▪ Provision of sufficient waste disposal points and regular collection for disposal. ▪ Appropriate measures to reduce windblown / floating litter and dust during transportation of waste by transporting wastes in enclosed containers. ▪ A recording system (e.g. log book for mariculture operation) for the amount of wastes generated, recycled and disposed of and the disposal sites for checking by AFCD. ▪ Provision of adequate waste containers at strategic locations to facilitate recovery of recyclables. ▪ Regular clearance and disposal of waste to avoid odour and litter impact. 	
		Operation Phase <ul style="list-style-type: none"> ▪ Organic waste, chemical waste, general refuse and floating refuse generated 	<ul style="list-style-type: none"> ▪ No unacceptable impact 	No		Operation Phase <ul style="list-style-type: none"> ▪ Nomination of approved personnel (e.g. environmental officer of the contractor(s), representative of the project proponent) to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility of all wastes generated at the site. ▪ Training of site personnel in proper waste management and handling procedures by AFCD. ▪ Provision of sufficient waste disposal points and regular collection for disposal. ▪ Appropriate measures to reduce windblown / floating litter and dust during transportation of waste by transporting wastes in enclosed containers. ▪ A recording system (e.g. log book for mariculture operation) for the amount of wastes generated, recycled and disposed of and the disposal sites for checking by AFCD. ▪ Regular removal of organic wastes within the licensed area with proper storage using enclosed containers and dispose at the nearest accessible FEHD refuse collection points with public pier. 	

Sensitive Receivers / Assessment Points	Relevant Standards and Criteria	Results of Impact Predictions		Extents of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts (After Mitigation)
		Potential Impacts	Significance of Impacts (Without Mitigation)				
						<ul style="list-style-type: none"> Provision of adequate waste containers at strategic locations to facilitate recovery of recyclables. Regular clearance and disposal of waste to avoid odour and litter impact. Careful handling of chemical waste under the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Use of properly designed fish cages/ rafts with no sharp turns or abrupt indentation to minimise trapped or accumulated floating refuse. Use of good-quality feed, i.e. pellet feed, to reduce uneaten feed wastage. The fish farmers will keep detailed operational records to allow more accurate estimation of fish feed input and to minimise unnecessary wastage of feeds. The uneaten feeds should be cleaned up immediately to minimise leaching to the adjacent water. 	
Visual							
Visual Sensitive Receivers (VSRs) that may be affected by the Project: <ul style="list-style-type: none"> Recreational user Residential users 	<ul style="list-style-type: none"> Annexes 10 and 18 of the EIAO-TM and EIAO Guidance Note 8/2010 (Preparation of Landscape and Visual Impact Assessment under the Environmental Impact Assessment Ordinance) Hong Kong Planning Standards and Guidelines (HKPSG) issued by the Planning Department (November 2015), in particular Chapter 11 Urban Design Guidelines Study on Landscape Value Mapping of Hong Kong 	Construction Phase <ul style="list-style-type: none"> Setup of fish rafts / cages Provision of auxiliary facilities 	<ul style="list-style-type: none"> No unacceptable impact 	No	<ul style="list-style-type: none"> Site selection at some distance away from visual sensitive receivers. 	Construction Phase <ul style="list-style-type: none"> Pre-construction and construction period for the Project site should be reduced as far as practical to lower visual impact. The new structures will be designed in accordance with relevant marine safety standards and regulations. Sensitive architectural design will be considered where practicable. This should take into account material texture, colour, finishes to structures to ensure the fish rafts / cages blend into the existing context, cause least disturbance to the existing seascape, and are the most visually appealing. 	<ul style="list-style-type: none"> No unacceptable residual impacts are anticipated.
		Operation Phase <ul style="list-style-type: none"> The presence and operation of the FCZ, including night time lighting for the sake of safety purpose 	<ul style="list-style-type: none"> No unacceptable impact 	No		Operation Phase <ul style="list-style-type: none"> After operation, the open water occupied by the Project site will be reinstated to their former state. Light intensity and beam directional angle should be controlled at the Project site at the design stage to reduce light pollution and glare (e.g. hooded lights, specific directional focus, etc.). 	

Sensitive Receivers / Assessment Points	Relevant Standards and Criteria	Results of Impact Predictions		Extents of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts (After Mitigation)
		Potential Impacts	Significance of Impacts (Without Mitigation)				
Air Quality							
Air Sensitive Receivers (ASRs) identified beyond 500m from the Assessment Area: <ul style="list-style-type: none"> Village House of Tap Mun New Fisherman's Village Village Houses of Kau Lau Wan 	<ul style="list-style-type: none"> Annex 4 of EIAO-TM Air Pollution Control Ordinance AQO 	Construction Phase <ul style="list-style-type: none"> Emissions from small marine vessels and construction equipment 	<ul style="list-style-type: none"> No adverse impact is anticipated 	No	<ul style="list-style-type: none"> Optimise the number of small marine vessels and construction equipment in operation as far as practicable during construction phase. Optimise the number of small marine vessels for goods transportation and visitors, as well as the number of small power generators in operation as far as practicable during operation phase. 	Construction Phase <ul style="list-style-type: none"> Relevant control measures as stipulated in the <i>Air Pollution Control (Marine Light Diesel) Regulation</i>, <i>Air Pollution Control (Fuel for Vessels) Regulation</i>, <i>Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation</i> and <i>Air Pollution Control (Fuel Restriction) Regulation</i>. 	<ul style="list-style-type: none"> No adverse residual impacts are anticipated.
		Operation Phase <ul style="list-style-type: none"> Emissions from small marine vessels and small power generators on site 	<ul style="list-style-type: none"> No adverse impact is anticipated 	No		Operation Phase <ul style="list-style-type: none"> Relevant control measures as stipulated in the <i>Air Pollution Control (Marine Light Diesel) Regulation</i>, <i>Air Pollution Control (Fuel for Vessels) Regulation</i>, <i>Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation</i> and <i>Air Pollution Control (Fuel Restriction) Regulation</i>. 	
Noise							
Noise Sensitive Receivers (NSRs) within 300m from the Assessment Area <ul style="list-style-type: none"> Sai Kung East Country Park Noise Sensitive Receivers (NSRs) beyond 300m from the Assessment Area <ul style="list-style-type: none"> Village House at Tap Mun Village House at Ko Lau Wan 	<ul style="list-style-type: none"> Annexes 5 and 13 of EIAO-TM Noise Control Ordinance 	Construction Phase: <ul style="list-style-type: none"> Noise from towing of fish using tug boat Noise from assembly and anchoring of fish rafts by winch. 	<ul style="list-style-type: none"> No adverse impact anticipated 	No	<ul style="list-style-type: none"> Project site located in remoted location avoiding impacts. 	Good site practice	<ul style="list-style-type: none"> No adverse residual impacts are anticipated.
		Operation Phase: <ul style="list-style-type: none"> Noise from mariculture activities Transportation of fish stock, fish feed, fish raft equipment and workforce as well as occasional visitors using small marine vessels 	<ul style="list-style-type: none"> No adverse impact anticipated 	No			
Cultural Heritage							
Sensitive Receivers: <ul style="list-style-type: none"> One sonar contact C1-SC006 that may be of marine archaeological potential identified in the Assessment Area 	<ul style="list-style-type: none"> The study methodology follows the criteria and guidelines as stated in <i>Annexes 10 and 19</i> of the <i>EIAO-TM</i> and the Requirements for MAI as stated in <i>Appendix I</i> of the Study Brief 	Construction Phase <ul style="list-style-type: none"> Potential impact on a sonar contact C1-SC006 that may have marine archaeological potential is possible during tug boat anchoring and anchoring of fish rafts / cages as the seabed will be disturbed by the anchoring but confined to a thin vertical surface layer (<0.5 m), and <2 m horizontally. 	<ul style="list-style-type: none"> Potential impact anticipated 	No	<ul style="list-style-type: none"> A buffer area of 20m radius from C1-SC006 to avoid any tug boat anchoring and anchoring of the fish rafts / cages in the area. 	Construction Phase <ul style="list-style-type: none"> A buffer area of 20m radius from C1-SC006 to avoid any tug boat anchoring and anchoring of the fish rafts / cages in the area. The locations and relocations of fish rafts / cages are regulated by the Marine Fish Culture Ordinance (Cap. 353), and AFCD will ensure the locations of anchoring of vessels and fish rafts / cages will not be located within the buffer area. 	<ul style="list-style-type: none"> No impacts to terrestrial and marine cultural heritage resources are expected, no adverse residual impacts are expected.

Sensitive Receivers / Assessment Points	Relevant Standards and Criteria	Results of Impact Predictions		Extents of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts (After Mitigation)
		Potential Impacts	Significance of Impacts (Without Mitigation)				
		Operation Phase <ul style="list-style-type: none"> Potential impact on a sonar contact C1-SC006 that may have marine archaeological potential is possible. 	<ul style="list-style-type: none"> Potential impact anticipated 	No		Operation Phase <ul style="list-style-type: none"> A buffer area of 20m radius from C1-SC006 to avoid any tug boat anchoring and anchoring of the fish rafts / cages in the area. AFCD will maintain the record of the buffer area and the locations of the fish rafts / cages. The locations and relocations of fish rafts / cages are regulated by the Marine Fish Culture Ordinance (Cap. 353), and AFCD will ensure the locations of anchoring of vessels and fish rafts / cages will not be located within the buffer area. AFCD will conduct regular inspections to check if any seabed disturbance work is conducted in the buffer area. 	

6. CONCLUSION

This EIA Study has critically assessed the overall acceptability of the environmental impacts likely to arise as a result of the construction and operation of the Project. It has demonstrated the acceptability of any residual impacts from this Project and the protection of the population and the environmentally sensitive resources. This EIA Study concluded that, with the implementation of the recommended mitigation measures, the Project would be environmentally acceptable and in compliance with the relevant assessment standards / criteria of the *EIAO-TM*. Where appropriate, EM&A mechanisms have been recommended to verify the accuracy of the EIA predictions to ensure the effectiveness of the recommended mitigation measures.

The implementation of this Project is in line with the HKSAR Government's objective of creating room for the mariculture sector to grow further with the establishment of the new FCZs, to allow capture fishermen to switch to a sustainable mode of operation and making it possible for the development of newer type of deep-water mariculture in the open sea and attracting new entrants into the fisheries industry.

ERM has over 160 offices across the following countries and territories worldwide

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Australia	New Zealand
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France	Romania
Germany	Russia
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Hong Kong	South Africa
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ERM's Hong Kong Office

2509, 25/F One Harbourfront
18 Tak Fung Street
Hunghom, Kowloon
Hong Kong

T: (852) 2271 3000

F: (852) 3015 8052

www.erm.com

