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10 Fisheries

10.1 Introduction

10.1.1 Assessment Area

10.1.1.1 As set out in Section 3.4.12.2 of the EIA Study Brief (EIA Study Brief No.: ESB-294/216), the Assessment Area for the Fisheries Impact Assessment (FIA) shall include the North Western Water Control Zone as designated under the Water Pollution Control Ordinance (Cap. 358) and include any other areas likely to be impacted by the Project (**Figure 10.1**). Special attention should be given to loss or disturbance of fishing ground, fisheries habitat, spawning and nursery grounds, water quality deterioration at sensitive receivers such as fish culture zones (FCZ) or artificial reefs (ARs).

10.1.2 Assessment Approach

10.1.2.1 It is stated in the Appendix J of the EIA Study Brief that the existing information on commercial fisheries resources and fishing operations in the waters of the Assessment Area shall be reviewed. Based on the review results, the assessment shall identify data gap and determine if there is any need for field surveys to collect adequate fisheries baseline information. If field surveys are considered necessary, the assessment shall recommend appropriate methodology, duration and timing for such surveys.

10.1.2.2 The scopes of the FIA as required in the Appendix J of the EIA Study Brief are as follows:

- (i) description of the physical environmental background;
- (ii) description and quantification of the existing fisheries activities;
- (iii) description and quantification of the existing fisheries resources;
- (iv) identification of parameters (e.g. water quality parameters) and areas of fisheries importance;
- (v) prediction and evaluation of any direct/indirect, onsite/offsite impacts on fisheries (such as potential loss or disturbance of fishing grounds, fisheries habitats, spawning or nursery grounds, aquaculture sites and artificial reefs and hydrological disruptions) caused by the project;
- (vi) evaluation of cumulative impacts on fisheries;
- (vii) proposals of feasible, practical and effective alternatives and / or mitigation measures with details on justification, description of and programme feasibility as well as staff and financial

implications including those related to subsequent management and maintenance requirements of the measures; and

- (viii) review for the need of monitoring during the construction and operational phases of the Project and, if necessary, proposal for a monitoring and audit programme.

10.1.3 Key Fisheries Issues

10.1.3.1 A number of sites of fisheries importance and key potential impacts were highlighted and listed out in the EIA Study Brief for the FIA. These include:

Sites of Fisheries Importance

- Fishing grounds;
- Fisheries habitats;
- Spawning or nursery grounds;
- Aquaculture sites; and
- Artificial reefs (ARs).

Key Potential Impacts

- Potential loss or disturbance of fishing grounds; and
- Potential loss or disturbance of fisheries resources.

10.2 Legislation, Standards and Guidelines

10.2.1.1 The local relevant regulations, legislation and guidelines for the assessment of fisheries impacts including the following:

- The Environmental Impact Assessment Ordinance (Cap. 499) and the associated TM;
- Fisheries Protection Ordinance (Cap. 171) and its subsidiary legislation, the Fisheries Protection Regulations;
- Marine Fish Culture Ordinance (Cap. 353) and its subsidiary legislation;
- Marine Parks Ordinance (Cap. 476); and
- Water Pollution Control Ordinance (Cap. 358) and its subsidiary regulations and statements.

10.2.1.2 Annex 17 of the TM-EIAO sets out the general approach and methodology for assessments of fisheries impacts arising from a project or proposal, to allow a complete and objective identification, prediction and evaluation of the potential fisheries impacts. Annex 9 recommends the criteria that can be used for evaluating fisheries impacts.

- 10.2.1.3** Destructive fishing practices such as the use of explosives, toxic substances, electricity, dredging, suction and trawling devices for the purpose of fishing are detrimental to fisheries and the marine ecosystem are prohibited under the Fisheries Protection Ordinance (Cap. 171).
- 10.2.1.4** Marine fish culture is protected and regulated by the Marine Fish Culture Ordinance (Cap. 353) which requires all marine fish culture activities to operate under licence in designated fish culture zones.
- 10.2.1.5** Under the Marine Parks Ordinance (Cap. 476), fishing activities, including commercial fishing, inside Marine Parks are restricted, and could only be conducted with a permit issued by the Authority.
- 10.2.1.6** Water Pollution Control Ordinance (WPCO) (Cap. 358) aims to control water pollution in the waters of Hong Kong. According to the Ordinance and its subsidiary legislation, Hong Kong waters are divided into ten water control zones (WCZs). WCZs are designated with individual water quality objectives to promote the conservation and best use of those waters in the public interest. Corresponding statements of Water Quality Objectives (WQO) are stipulated for different water regimes (marine waters, inland waters, bathing beaches subzones, secondary contact recreation subzones and fish culture subzones) in each of the WCZ.

10.3 Methodology for Baseline Establishment

10.3.1 Literature Review

10.3.1.1 Existing information about the fisheries baseline condition within the Assessment Area was reviewed. Relevant literature included previous EIA studies, research studies, consultancy studies, and AFCD data were reviewed. The review, with focus primarily on the Subject Site and secondarily on the Assessment Area, aimed to collect fisheries data, to establish the fisheries baseline conditions, and to identify practices, sites and species of potential fisheries importance which may be affected by the Project for incorporation into the assessment.

10.3.1.2 This review includes but not limited to the following:

- Agriculture, Fisheries and Conservation Department (AFCD) latest annual report and website;
- Tung Chung New Town Extension (AEIAR-196/2016) EIA Report;
- Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014) EIA Report;
- Port Survey 2006 (AFCD); and
- Other relevant reports from government and private sectors.

10.3.1.3 AFCD's latest annual report 2015/2016 and website provide the most updated information on the development and trend in Hong Kong fisheries. The latest annual fisheries production is also provided.

10.3.1.4 The approved Tung Chung New Town Extension involves reclamation to the east of Tung Chung New Town. A fisheries survey for the EIA was conducted including gill net and caging. Two sampling locations were in the vicinity of the Subject Site.

10.3.1.5 The proposed third runway involves reclamation to the north of the existing airport island. A comprehensive fisheries and aquaculture interview surveys including fish trawl, purse-seine, gill net, hand lining, underwater visual counts around the ARs, and ichthyoplankton and fish post-larvae surveys were conducted covering North Lantau waters during 2013 under the approved EIA report for 3RS.

10.3.1.6 Port Survey is a comprehensive survey routinely conducted by AFCD to collect data on fisheries production and fishing operations in Hong Kong waters. Different from the approach adopted in previous Port Surveys in which Hong Kong waters were divided into fishing areas of various sizes, a uniform grid of 720 ha cell size was overlaid on Hong Kong's waters for Port Survey 2006 and the fisheries related information (e.g. production, vessel number, catch value) was presented in several categories. The fisheries resources within the Assessment Area were evaluated based upon the information from Port Survey 2006. The results of Port Survey 2006 are available on AFCD website.

10.3.1.7 Other relevant studies include:

- Fisheries Resources and Fishing Operations in Hong Kong Waters (AFCD 1998);
- Consultancy Study on Fisheries and Marine Ecological Criteria for Impact Assessment (CCPC 2001); and
- Agreement No. CE 23/2012 (EP) Environmental Monitoring and Audit for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau (2012 – 2017) – Investigation.

10.3.1.8 The validity of the information compiled during the literature review has been assessed and confirmed before it is adopted into the present FIA study.

10.3.2 Need for Field Survey

10.3.2.1 According to the reviewed literatures, existing information has well covered the Assessment Area, which provides comprehensive and quantitative data in North Lantau waters, including the waters near Subject Site. As the proposed development is land-based in nature, it is considered that the literatures can provide sufficient information for fisheries impact assessment and there is no information gap on fisheries baseline conditions within the Assessment Area, and thus no fisheries surveys were proposed for the study.

10.4 Fisheries Baseline Condition

10.4.1 Sites of Fisheries Importance

10.4.1.1 Fishing grounds cover most of the open waters in North Lantau waters, except for shipping fairways and marine exclusion areas.

10.4.1.2 Besides the fishing grounds in North Lantau waters, the following sites of fisheries importance are located within the Assessment Area and shown in **Figure 10.1**:

- Ma Wan Fish Culture Zone (FCZ);
- ARs in Sha Chau and Lung Kwu Chau Marine Park (SCLKC Marine Park);
- Embayment of north Lantau;
- Important spawning grounds of fish and shrimp (in particular the North Lantau waters between the Brothers and Lung Kwu Chau) (AFCD 1998); and
- New ARs to be deployed in The Brothers Marine Park.

10.4.2 Capture Fisheries

10.4.2.1 The fishing industry of capture fisheries makes an important contribution to Hong Kong in maintaining a steady supply of fresh marine fish to local consumers. In 2015, it produced an estimated 145,193 tonnes of capture fisheries valued at about \$ 2,338 million (Information from AFCD website, 2017).

10.4.2.2 AFCD Port Survey provides the most comprehensive information on capture fisheries in Hong Kong waters, including fishing operations and fisheries production (adult fish and fish fry).

10.4.2.3 The Port Survey consisted of an interview programme. In Port Survey 2006, about 36% of the local fishing fleet which accounted for all homeports (places at which local fishing vessels are based) and vessel types was interviewed (AFCD website, 2017). Particulars such as vessel length, type and homeport of the fishing vessels were recorded and information about their fishing operations and fisheries production in Hong Kong waters was collected during the interviews.

10.4.2.4 In Port Survey 2006, grid cells were categorised into one of the 6 classes, in accordance with their overall adult fish production. i.e. > 0 & ≤ 50 kg/ha; 50-100 kg/ha; 100-200 kg/ha; 200-400 kg/ha; 400-600 kg/ha; and 600-1,000 kg/ha. As reported in Port Survey 2006, in North Lantau waters, areas of high fisheries production included the waters around the Brothers, the waters around Sha Chau and Lung Kwu Chau, and the waters around Tai O, where the adult fish fisheries production reached 200-400 kg/ha to 400-600 kg/ha (**Figure 10.2**). The fisheries

production of the grid cell adjacent to the Subject Site however was ranked as very low (> 0 & ≤ 50 kg/ha).

- 10.4.2.5** The results of Port Survey 2006 indicated that fry collection has become very limited and localized throughout Hong Kong waters. Fish fry production was concentrated in the eastern waters (Mirs Bay, Tolo Harbour and Channel, Port Shelter and Po Toi), with a smaller contribution from the East Lamma Channel (**Figure 10.3**). No fish fry production was recorded in the entire North Lantau waters.
- 10.4.2.6** The fishing operation in grid cells was categorized into 6 classes, i.e. > 0 -10 vessels; 10-50 vessels; 50-100 vessels; 100-400 vessels; 400-700 vessels; and 700-1,000 vessels. The local capture fisheries production was mainly contributed by large fishing vessels (vessels exceeding 15 m in length, i.e. > 15 m). In North Lantau waters, the distribution of fishing operations varied with vessel sizes. For large fishing vessels, the distribution was more even, with the majority of the grid cells having 50-100 vessels and most of the remaining cells having 10-50 vessels (**Figure 10.4a**). For small fishing vessels, their operations in North Lantau waters concentrated in a few areas, i.e. the waters near Ma Wan, the waters around the Brothers, the waters around Sha Chau and Lung Kwu Chau, and the waters around Tai O, where the abundance of small fishing vessels reached 100-400 per grid cell (**Figure 10.4b**). The fisheries productions of both large and small fishing vessels were low in the waters just offshore the Subject Site (≤ 50 kg/ha and 100-200 kg/ha for vessel not exceeding and exceeding 15m in length, respectively). Both large and small fishing vessels were not commonly found dominated in the coastal waters off the Subject Site.
- 10.4.2.7** Among the 10 species of major fisheries products (i.e. scad (Carangidae), shrimp, rabbit fish (Siganidae), squid, croaker (Sciaenidae), crab, mullet (Mugilidae), sardine (Clupeidae), seabream (Sparidae) and anchovy (Engraulidae)), the most abundant species was crab, of which 5 – 10 kg/ha was produced adjacent to the Subject Site. .
- 10.4.2.8** Comprehensive fisheries surveys were conducted during the 3RS EIA study, and the scopes included field surveys (adult fish and fish larvae) and interview programme. The comprehensive fisheries surveys covered a large extent of North Lantau waters (i.e. North Western WCZ) and included most of the areas of fisheries importance such as important spawning and nursery grounds in North Lantau and areas of higher fisheries production in the Brothers, and Sha Chau and Lung Kwu Chau, and such the results could sufficiently supplement any information gaps and update the general fisheries baseline conditions of the North Lantau waters. As the proposed development is only land-based in nature and no marine works will be involved, no direct impact on fisheries is anticipated. While the indirect impact if present, will be very localised, the fisheries resources nearest to the Subject Site (i.e. The Brothers) are more relevant with the present FIA.

- 10.4.2.9** Among the survey areas covered by the fisheries survey for 3RS EIA study, the Brothers is the one nearest to the Subject Site, which is the location of The Brothers Marine Park, and the Brothers lies within the identified spawning ground of commercial fisheries resources in North Lantau waters (AFCD, 1998). A total of 74 species were recorded. Most of the dominant species recorded in terms of abundance (*Thryssa kammalensis*, *Sardinella albella*, *Alepes djedaba*, *Sebastiscus marmoratus* and *Temnopleurus toreumaticus*) and yield (*Sardinella albella*, *Thryssa kammalensis*, *Konosirus punctatus*, *Sebastiscus marmoratus* and *Siganus canaliculatus*) are with low or no commercial value, except for *Sebastiscus marmoratus*, which is of high commercial value. High yield was recorded in both gill net survey during wet season and hand line survey during dry season. In summary, low to high yield were observed in this area with dominant species of no to high commercial values. Therefore, the waters around The Brothers Marine Park, when compared with other areas surveyed under that study, were considered with moderate to high level of fisheries resources.
- 10.4.2.10** From the fisheries interviews, a moderate number of vessels (~100 vessels) were recorded frequently operated around the Brothers, Nevertheless, many fishermen claimed that since the commencement of construction of Hong Kong Boundary Crossing Facilities (HKBCF) in March 2012, they have shifted their major fishing ground from North Lantau Island (i.e. The Brothers and Yan O) to South Lantau Island (i.e. Peng Chau) and West Lantau Island (i.e. Tai O), as a result of their perceived changes in water quality and current.
- 10.4.2.11** A project-specific fisheries survey was conducted for the approved EIA Study for Tung Chung New Town Extension. The fisheries surveys by gill netting and cage trapping were performed in February 2013 for dry season and August 2013 for wet season, at eight sampling locations. Two of the sampling locations were close to the Subject Site at Tai Ho and Sham Shui Kok.
- 10.4.2.12** A total of 257 individual organisms were collected from the surveys (including both commercial and non-commercial species), with 53 in the dry season survey and 204 in the wet season survey. Organisms caught represented 40 species, including 30 species of fishes and 10 species of crustaceans. In terms of weight, 16.5kg (16,495g) of catch was collected, with 1.3kg (1,340g) from dry season and 15.2kg (15,155.7g) from wet season. Commercial species recorded are mostly common fisheries species in the western or north-western waters of Hong Kong, such as *Thryssa hamiltonii*, *Nematalosa nasus*, and *Inegocia japonica*. The abundance and yield of commercial species from gill net surveys were 21 individuals and 1,940g at Tai Ho, and 29 individuals and 3,290.8g at Sham Shui Kok. The sampling location at Sham Shui Kok yielded relatively higher than the other sampling locations in the EIA study for Tung Chung New Town Extension.
- 10.4.2.13** An EM&A programme involving trawl surveys is being conducted for Contaminated Mud Pits to the South of the Brothers and at East Sha

Chau between 2012 and 2017. The EM&A programme is however conducted with the focus on bioaccumulation of contaminants by prey organisms and consequent biomagnification of contaminants up the food chain. Hence, the study is not considered relevant to the present FIA.

10.4.3 Spawning Grounds and Artificial Reefs

10.4.3.1 The North Lantau waters between the Brothers and Lung Kwu Chau were identified as important spawning grounds of fish and shrimp during a fisheries consultancy study in Hong Kong (**Figure 10.1**) (AFCD 1998), which consist of spawning individuals of high commercial value (e.g. *Lateolabrax japonicus*, *Metapenaeus affinis* and *Oratosquilla oratoria*) (*ibid*). The shortest separation distance of the spawning area is over 2 km from the Subject Site. Major species included Pony fish *Leiognathus brevisrostris*, Sea bass *Lateolabrax japonicus*, and Gizzard shad *Clupanodon punctatus*.

10.4.3.2 Embayment, especially those with mangroves and intertidal mudflats are considered as important spawning and breeding grounds for marine organisms, including species of commercial value (PlanD 2000). There are several such embayment on the North Lantau shore, namely Tai Ho Wan, Tung Chung Bay, Hau Hok Wan, Sha Lo Wan and Sham Wat. Tai Ho Wan is being the nearest to the Subject Site. The distance between the inlet of Tai Ho Wan and the Subject Site is over 1 km.

10.4.3.3 ARs, a fisheries resource enhancement measure, are considered as sites of fisheries importance as they served to enhance the fisheries resources in the area. ARs were deployed at two locations in North Lantau waters, i.e. the northeast corner of Airport Island within Marine Exclusion Zone 3 as well as Sha Chau and Lung Kwu Chau Marine Park, for conservation of Chinese White Dolphins as well as habitat quality and marine resource enhancement purposes. Both ARs were deployed in 2000. While the ARs in the Sha Chau and Lung Kwu Chau Marine Park are quite distant, the ARs in Marine Exclusion Zone 3 are still over 2 km away from the Subject area. The ARs in Marine Exclusion Zone 3 are indeed close to the on-going HKBCF construction site and are anticipated to be impacted by the HKBCF construction work, as such replacement ARs are proposed to be deployed as mitigation in the HKBCF EIA Report. Therefore, the ARs in Marine Exclusion Zone 3 are not considered as sites of fisheries importance in the present FIA.

10.4.3.4 Besides the above existing ARs, new ARs are also proposed in The Brothers Marine Park which is a mitigation measure for the marine habitat loss due to the HKBCF reclamation. As it was predicted in the HZMB EIA Report that impacts on the ARs in Marine Exclusion Zone 3 were expected, replacement ARs will be deployed as a mitigation measure, probably at The Brothers Marine Park, more than 2.2 km away from the Subject Site. In accordance with the HKBCF EIA Report, the new ARs would be at least three times the volume of the original ARs inside the Marine Exclusion Zone, and thus should be over 3,600m³.

10.4.4 Culture Fisheries

10.4.4.1 As there is no fishpond in the vicinity of Siu Ho Wan, pond fish culture is not an issue for this FIA and would not be further discussed. This FIA would only focus on mariculture of culture fisheries. The predominant type of mariculture in Hong Kong is marine fish culture. Marine Fish culture involves rearing of marine fish from fry or fingerlings to marketable size in cages suspended by floating rafts usually in sheltered coastal areas. The species cultured changed gradually over the recent years depending on the availability of imported fry mainly from Mainland, Thailand, Philippines or Indonesia. Common species under culture include green grouper, brown-spotted grouper, giant grouper, Russell's snapper, mangrove snapper, gold lined seabream, and star snapper (Information from AFCD website, 2017).

10.4.4.2 Marine fish culture is protected and regulated by the Marine Fish Culture Ordinance (Cap. 353), which requires all marine fish culture activities to operate under licence in designated FCZs. Currently, there are 26 FCZs occupying a total sea area of 209 ha with some 949 licensed operators. In 2016, the estimated production from local marine fish culture was about 1,031 tonnes (of value HK\$ 86 million), which catered about 5 percent of local demand for live marine fish (Information from AFCD website, 2017).

10.4.4.3 Water quality within Marine FCZs is regulated under the WPCO and its supporting regulations and statements. Within Fish Culture Subzones, the dissolved oxygen level should not be less than 5 mg l⁻¹ for 90% of the sampling occasions during the year; values should be calculated as water column average (arithmetic mean of at least 3 measurements at 1 metre below surface, mid-depth and 1 metre above seabed). In addition, the concentration of dissolved oxygen should not be less than 2 mg l⁻¹ per litre within 2 metres of the seabed for 90% of the sampling occasions during the year, and the annual geometric mean of *E. coli* should not exceed 610/100 ml.

10.4.4.4 There are no FCZs in the vicinity of the Subject Site. Of the 26 gazetted FCZs zones in Hong Kong, Ma Wan FCZ (**Figure 10.5**) is the one located nearest to the Subject Site, but is over 8km distance and outside the Assessment Area (northwestern WCZ).

10.5 Assessment Methodology

10.5.1 Assessment Criteria

10.5.1.1 The impacts have first been assessed before implementation of mitigation measures. Both construction and operational phase impacts on fisheries are assessed individually, then cumulatively, in combination with other existing, committed and proposed developments.

10.5.1.2 The significance of fisheries impacts has been evaluated based primarily on the criteria set forth in Annex 9 of the EIAO-TM:

- Nature of impact;
- Size of affected area;
- Loss of fisheries resources/production;
- Destruction and disturbance of nursery and spawning grounds;
- Impact on fishing activity; and
- Impact on aquaculture activity.

10.5.1.3 Impacts are generally ranked as "minor", "moderate" or "severe", although in a few cases a ranking of "insignificant" (less than "minor") may be given. The ranking of a given impact would vary, based on the criteria listed above. Wherever possible, significance of fisheries impacts would be quantified to allow ready appreciation of relative significance.

10.5.1.4 Besides adverse impacts, potential beneficial influences brought by the Project would also be considered in the assessment.

10.5.1.5 Then, the assessment would conclude whether the mitigation measures envisaged could alleviate any negative impacts of the Project and its components to within acceptable levels. The acceptability of the overall residual impacts would then be determined.

10.5.1.6 Cumulative impacts from concurrent projects (during both the construction and operational phases) would be evaluated and included in the EIA Report. Planned/on-going development projects in the North Lantau waters, in particular those would likely have cumulative fisheries impact during both the construction and operational phases of the Project would be considered and the potential cumulative fisheries impacts would be assessed. The cumulative construction phase impacts may include, cumulative water quality deteriorations (in particular suspended sediments), and cumulative disturbance impacts to fishing operations (particularly due to marine traffic of works vessels and works areas). The cumulative operational phase impacts would include, cumulative loss of fishing grounds (due to reclamation footprints, restricted areas, and other areas not available for fishing operations), changes of hydrological regime, tidal exchanges and water quality in North Lantau waters due to the presence of reclamation and marine structures, and disturbance to fishing operations due to operational phase marine traffic.

10.5.1.7 Finally, the assessment would evaluate the need for fisheries monitoring and audit, and was prescribed in detail any required EM&A programme in accordance with the EIA Study Brief.

10.6 Fisheries Impact Evaluation

10.6.1 Construction Phase – Direct Impacts

10.6.1.1 The Project is land-based in nature. Given that there will be neither marine works nor construction phase marine traffic for the Project, there will be no permanent or temporary loss of marine waters within the Assessment Area.

10.6.1.2 No direct impacts on the fisheries sensitive receivers, such as fishing ground loss or change of fishing operation locations are anticipated during the construction phase. Direct impacts to the fisheries resources and fishing operation are also not anticipated.

10.6.2 Construction Phase – Indirect Impacts

Construction Indirect Impacts due to SHD Topside Development

Site runoff

10.6.2.1 During the construction phase, the marine waters would be potentially impacted by surface runoff if it is not properly controlled, especially during rainstorm. The surface runoff might be polluted by:

- Surface sediment;
- Wheel washing water;
- Water for testing and sterilization of water pipes (commonly performed using chlorinated water);
- Wastewater from building construction and site facilities; Acid cleaning, etching and pickling wastewater; and
- Chemical spillage.

10.6.2.2 Elevated suspended solids levels caused by site runoff (if without proper control) could increase the suspended solids load in the water bodies, and could decrease dissolved oxygen levels. A lower oxygen level would affect stationary fisheries resources, whilst mobile species would tend to temporarily avoid the area. The result could be a temporary reduction in abundance of fisheries resources and/or change in distribution.

10.6.2.3 As the SHD Topside Development is constructed atop the reprovisioned SHD rather than on ground level and without extensive earth works, runoff could be easily collected by the temporary construction drainage system. The chance of surface runoff without suitable control released to marine habitats will be very low.

10.6.2.4 According to the latest construction methodology, all the foundation works for SHD Topside Development will be conducted under the SHD Replanning Works. Hence, construction of SHD Topside Development

would not generate any surface runoff contaminated by bentonite slurries which are only involved for piling works.

10.6.2.5 As, stated in Section 5, chlorinated water will be dechlorinated and acidic water will be neutralised. There will be no direct discharge of chlorinated water and acidic water.

10.6.2.6 In addition, there is an existing access road of a width about 9m between the Project and the seawall. Hence, the chance of runoff released to marine habitats will be very low. Together with the low fisheries production within the Assessment Area, the potential impact due to runoff to marine waters is considered **Insignificant**.

Marine Traffic

10.6.2.7 Construction materials and machinery will be transported to the Subject Site via land transportation. No construction vessels or construction marine traffic is anticipated and thus there will be no disturbance on fishing activities or fishing vessels due to construction marine traffic.

Construction Indirect Impacts due to Railway Development

Site runoff

10.6.2.8 Indirect impacts arising from the construction phase of Railway Development would be similar to the impacts identified for SHD Topside Development. Railway Development may also result in potential site runoff with the usage of bentonite slurries during piling, if uncontrolled. With the implementation of standard water quality control measures and good site practices for handling and disposal of construction discharges, the potential impact due to runoff to marine waters is considered **Insignificant**.

10.6.3 Operational Phase – Direct Impacts

10.6.3.1 The Project is land-based in nature, and thus there will be no loss of marine waters within the Assessment Area.

10.6.3.2 No direct impacts on the fisheries sensitive receivers as well as fishing ground loss, or indirect impacts such as change of fishing operation locations are anticipated during the operational phase.

10.6.4 Operational Phase – Indirect Impacts

Operational Phase Indirect Impacts due to SHD Topside Development

Sewage and Emergency Discharge

10.6.4.1 During operation, all sewage generated from the proposed development will be diverted to public sewage treatment facilities, i.e. Siu Ho Wan Sewage Treatment Works. No net increase of pollution loading in aquatic habitats within the Assessment Area is anticipated, and no additional mitigation measure is required.

10.6.4.2 New sewage pumping stations are proposed for the SHD Topside Development within the Subject Site. The sewage pumping stations will collect the sewage and convey the sewage to the Siu Ho Wan Sewage Treatment Works. As discussed in **Section 5**, measures and additional provisions are proposed to enhance the sewerage network reliability and minimize the environmental impacts due to system failure or in the case of emergency situations. Major emergency events include pump failure; rising main failure; and power failure.

10.6.4.3 To mitigate the risks of pump and/or power failure, several mitigation measures are proposed to cater for the emergency situations including a) 100% standby pumping capacity within each Sewage Pumping Station (SPS), with spare pump up to 50% pumping capacity stockpiled in each SPS for any emergency use; b) dual-feed power supply; c) emergency storage tank providing up to 3-hours ADWF capacity; d) Monitoring and Control System (MACS) providing real-time notification of alert signal in emergency situation; and e) MTRC's term contractor to provide 24-7 emergency repair service in case of emergency situation. Besides, it is proposed to adopt high density polyethylene (HDPE) pipe or ductile iron pipe for proposed gravity sewers and rising mains, and concrete surround for proposed rising mains, to mitigate the risk of bursting.

10.6.4.4 With the above mitigation measures in place, it is considered that the chance of emergency discharge of sewage to coastal waters of North Lantau would be minimised. As such, unacceptable impacts on fisheries resources are not anticipated.

Operational Phase Indirect Impacts due to Railway Development

10.6.4.5 The key source of potential impacts during the operational phase would be related to potential marine water quality impacts from sewage and wastewater generated from the SHO and reprovisioned SHD. With proper sewage and wastewater disposal and treatment arrangements, unacceptable impacts on fishery resources are not anticipated.

10.6.5 Summary of Fisheries Impact Evaluation

10.6.5.1 Summary of fisheries impacts are evaluated according to the criteria in Annex 9 of the EIAO-TM and are summarized in **Table 10.1**.

Table 10.1 Evaluation of fisheries impact

Evaluation Criteria	Topside Development and Railway Development
Nature of impact	All works would be land-based and neither marine works nor construction phase marine traffic is required for the Project. No direct impacts on the fisheries sensitive receivers have been identified during the construction and operational phases. With implementation of the mitigation measures, the chance of indirect water quality impact from site runoff during construction phase will be very low. The

Evaluation Criteria	Topside Development and Railway Development
	potential impact due to runoff to marine waters is considered Minor. Sewage generated during the operational phase will be conveyed to the Siu Ho Wan Sewage Treatment Works. It is considered that the chance of emergency discharge of sewage to coastal waters of North Lantau would be minimised with the adoption of mitigation measures recommended in Section 5.5.3 .
Size of affected area	Without implementation of mitigation measures, the affected area from the indirect water quality impact is expected to be localized, small scale and in the vicinity of the works area.
Loss of fisheries resources / production	The waters surround SHD are ranked as low importance in comparison to other areas in Hong Kong in terms of fisheries production and value. No direct loss of fishing resource / production is expected. Indirect impact is expected to be insignificant with the implementation of mitigation measures.
Destruction and disturbance of nursery and spawning grounds	As neither marine works nor marine traffic will be occurred, no destruction and disturbance of nursery and spawning grounds are expected.
Impact on fishing activity	No impact to the fishing activity is expected due to the absent of marine works or marine traffics.
Impact on aquaculture activity	No water quality impact is expected to the Ma Wan FCZ which is located over 8 km away from the Subject Site.

10.7 Mitigation Measures

10.7.1 Considerations for Impact Avoidance

Avoidance of marine works

- 10.7.1.1** The Project would not involve marine works and traffic. Hence, potential impact on fishing operations and fisheries resources can be avoided.

10.7.2 Considerations for Impact Minimisation

Minimisation / Mitigation for SHD Topside Development

Surface runoff from construction site

10.7.2.1 As SHD Topside Development is constructed on top of a newly constructed platform rather than on ground level, it is easier to establish drains and to collect the runoff. During the construction phase, a temporary drainage system would be implemented for the construction site of the SHD Topside Development to ensure that the surface run-off with high concentration of suspended solid (SS) would not be discharged to marine waters. Runoff would need to pass through sedimentation tanks to reduce the concentration of SS. In accordance with the Practice Note for Professional Persons on Construction Site Drainage, Environmental Protection Department, 1994 (ProPECC PN 1/94), best management practices should be implemented on site as far as practicable to control site runoff and drainage at all work sites during construction. The best practices are detailed in **Section 5** on Water Quality.

Minimise chances of emergency discharge in proposed sewage pumping station for SHD Topside Development

10.7.2.2 In order to protect the fisheries resources, the following mitigation / additional provisions are proposed to enhance the sewerage network reliability and minimize the environmental impacts due to system failure or in the case of emergency situations:

- Standby pumps;
- Spare pumps;
- Backup power supply;
- Monitoring and control system;
- Emergency repair;
- Twin rising mains; and
- Concrete surround protection for rising mains.

10.7.2.3 With the implemented mitigation measures, the chances of emergency discharge of sewage from the ultimate SPS would be minimised.

Minimisation / Mitigation for Railway Development

10.7.2.4 Measures similar to that of the SHD Topside Development would be adopted for the Railway Development to protect fishery resources.

10.8 Cumulative Impacts

10.8.1 Concurrent Projects

10.8.1.1 In order to assess the cumulative impacts, a review of best available information at the time of preparing this EIA report has been conducted to identify a number of other projects that are undergoing planning, design, construction and/or operation within the construction and/or operation period for the proposed development and a list of the

concurrent projects identified at this stage is provided in **Sections 1.7** and **9.10** of this EIA report.

10.8.1.2 Among the concurrent projects, not all of them are relevant to fisheries. Some projects would not contribute/influence to water quality impact, and some of them would have their marine works finished before the commencement of Project construction (e.g. HZMB HKBCF, TM-CLK Link, HZMB HKLR, Sediment Disposal Facility in South of Brothers) and thus not relevant with cumulative water quality and fisheries resources. The following projects listed below have been considered for fisheries resources impact.

- Expansion of HKIA into a 3RS;
- Topside development at the HKBCF Island;
- Developments at Siu Ho Wan and the Associated Transport Infrastructures;
- Tung Chung New Town Development Extension;
- Increasing Land Supply by Reclamation and Rock Cavern Development cum Public Engagement – Feasibility Study with particular reference to the Identified Potential Near Shore Reclamation Sites in Western Waters of Hong Kong;

10.8.2 Cumulative Impacts during Construction Phase

10.8.2.1 As there will be no marine works and marine traffic, the Project will not contribute to the cumulative fisheries impacts from the concurrent projects during construction phase. Surface runoff generated during construction phase will be avoided by implementation of recommended mitigation measures. Hence, unacceptable cumulative impacts to fisheries resources are not anticipated.

10.8.3 Cumulative Impacts during Operational Phase

10.8.3.1 Unacceptable operational phase impacts on fisheries resources are not expected to occur for the Project. The chance of emergency discharge of sewage to coastal waters of North Lantau would be minimised with the adoption of recommended through the design of sewage pumping station. Therefore, operational phase cumulative impacts with other developments in and around the Assessment Area are not predicted to occur.

10.9 EM&A for Fisheries

10.9.1.1 Site inspections during construction phase shall be carried out to monitor any malpractice leading to deterioration of water quality of the surrounding which may in turn affect the fisheries resources. As there is no anticipated adverse impact during operation phase, monitoring and audit requirements are not required.

10.10 Residual Impacts

10.10.1.1 No loss of fishing grounds is anticipated from the Project. The magnitude of residual impacts are considered to be negligible given the low fisheries importance of the area would be temporarily disturbed during the construction (i.e. indirect impact from surface runoff). The magnitude of this residual impact is considered to be acceptable.

10.11 Conclusion

10.11.1.1 The Assessment Area for the Fisheries Impact Assessment (FIA) included the North Western Water Control Zone as designated under the Water Pollution Control Ordinance (Cap. 358) and included any other areas likely to be impacted by the Project. Special attention have been given to loss or disturbance of fishing ground, fisheries habitat, spawning and nursery grounds, water quality deterioration at sensitive receivers such as fish culture zones or artificial reefs.

10.11.1.2 Information from literatures including Port Survey, 3RS EIA study, Tung Chung New Town Extension EIA study has been incorporated. Fisheries surveys from the 3RS EIA and Tung Chung New Town Extension EIA have also provided sufficient and updated information on fisheries resources in the Assessment Area.

10.11.1.3 The fisheries production in the vicinity of the proposed development is regarded as low and no mariculture site is located near the proposed development. As there will be no marine works and marine traffic for the Project, no direct impacts to fisheries resources and fishing operations are expected. Together with the approaches for avoidance and minimization of impacts, potential fisheries indirect impacts on fishing grounds, spawning and nursery grounds, and fisheries and mariculture activities, due to construction and operation of the Project are not anticipated.

10.11.1.4 Since no unacceptable impacts to fisheries resources and fishing operations are anticipated, no fisheries-specific mitigation measures are required.

10.12 References

- [10-1] AFCD 2017. AFCD website
- [10-2] Tung Chung New Town Extension (AEIAR-196/2016)
- [10-3] Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (AEIAR-145/2009)
- [10-4] CCPC, City University of Hong Kong 2001. Agreement No. CE 62/98 - Consultancy Study on Fisheries and Marine Ecological Criteria for Impact Assessment. Prepared for Agriculture, Fisheries and Conservation Department, HKSAR Government
- [10-5] AFCD 1998. Fisheries Resources and Fishing Operations in Hong Kong Waters
- [10-6] PlanD 2000. Study on Sustainable Development for the 21st Century: Environmental Baseline Survey on Terrestrial Habitat Mapping and Ranking Based on Conservation Value. Final Report to the Planning Department
- [10-7] Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014)