ANNEX 5A FISHERIES – LITERATURE REVIEW

5A.1 Introduction

A literature review was conducted to review the baseline fisheries conditions within the Assessment Area and to identify information gaps to determine whether field surveys are required to provide sufficient information for the Fisheries Impact Assessment. This ***Annex*** presents the findings of this literature review.

5A1.1 Information Reviewed

Baseline information for the fishing grounds, fisheries resources and habitats, spawning or nursery grounds, and fisheries sensitive receivers such as fish culture zones (FCZs) and artificial reefs (ARs) within the Assessment Area for the fisheries impact assessment is available from the following key sources:

- AFCD Port Survey 2016/17;
- EIA Report for Development of a 100MW Offshore Wind Farm in Hong Kong (Register No.: AEIAR-152/2010);
- EIA Report for Development of the Integrated Waste Management Facilities Phase 1 (Register No.: AEIAR-163/2012);
- EIA Report for Hong Kong Offshore LNG Terminal (Register No.: AEIAR-218/2018);
- EIA Report for Improvement Dredging for Lamma Power Station Navigation Channel (Register No.: AEIAR-212/2017);
- Fisheries Baseline Review Report for Lamma Power Station Navigation Channel (Environmental Permit No. EP-535/2017);
- EIA Report for Outlying Islands Sewerage Stage 2 - South Lantau Sewerage Works (Register No.: AEIAR-210/2017);
- Provision of Compensatory Marine Park for Integrated Waste Management Facilities at an Artificial Island near Shek Kwu Chau – Investigation (Agreement No. CE 14/2012 (EP));
- ERM (1998). Fisheries Resources and Fishing Operations in Hong Kong Waters. Final Report. Prepared for the Agriculture, Fisheries and Conservation Department;
- South China Sea Fisheries Research Institute (SCSFRI) (2017). Hong Kong Fisheries Resources Monitoring Report (2010-2015). Prepared for the Agriculture, Fisheries and Conservation Department; and
- Hong Kong Artificial Reef Project. Access via https://www.artificial-reef.net/English/main.htm.

5A.2 Baseline Fisheries Conditions of the Assessment Area

Baseline information for capture fisheries, fisheries resources and habitats, spawning or nursery grounds, artificial reefs and culture fisheries within the Assessment Area is summarised below.

5A2.1 Fisheries Operation

As of 2020, the Hong Kong fishing industry produced an estimated 116,000 tonnes of fisheries products, the value of these capture fisheries products was around $2.7 billion. AFCD reported that the capture fisheries industries consist of around 5,040 fishing vessels that employ an estimated 10,150 local fishermen [(1)]. The statutory ban on trawling in Hong Kong waters that was implemented

(1) AFCD (2021). Overview of Capture Fisheries. Available at https://www.afcd.gov.hk/english/fisheries/fish_cap/fish_cap_latest/fish_cap_latest.html

on 31 December 2012 [2] has resulted in the majority of fishing activities in Hong Kong to be conducted on sampans utilising an array of fishing gear and on other non-trawler vessels such as gill netters, long liners, purse seiners, etc. The latest available information regarding the current type and number of fishing vessels in Hong Kong was produced in AFCD's 2018-2019 Department Annual Report (***Table 5A.1***).

Table 5A.1 Estimated Number of Fishing Vessels by Type in 2018 (Source: AFCD)

Type of Vessel	Quantity
Pair Trawler	560
Stern Trawler	140
Shrimp Trawler	240
Hang Trawler	40
Gill Netter	270
Long Liner	100
Hand Liner	40
Purse Seiner	100
Miscellaneous	3560
Total	**5050**

To assess the status of fisheries operations of the Assessment Area, the most up-to-date information was made reference to AFCD Port Survey 2016/17, which provides the latest available survey information on the current fishing operations and fisheries production in Hong Kong waters. The survey was conducted from 2016 to 2017 through a comprehensive interview survey of local fishermen by AFCD [3]. The survey achieved a sampling rate of about 36% which included various fishing vessels from different homeports. The homeports of local fishing vessels that are in the vicinity to the Study Area include Yung Shue Wan, Lo Tik Wan, Sok Kwu Wan, Cheung Chau, Silver Mine Bay and Peng Chau. The distribution of overall fishing operations in Hong Kong from 2016-2017 is presented in ***Figure 5A.1***. The survey results showed that the Study Area falls within an area with moderate to high (>400-600 vessels) level of fishing operations.

5A2.2 Fisheries Production

The status of fisheries production in Hong Kong can be made reference to the latest available fisheries information from AFCD Port Survey 2016/17 conducted through a comprehensive interview survey of local fishermen [4] and the top 10 fish catches in Hong Kong waters is shown in ***Table 5A.2***. The distribution of overall fisheries production in Hong Kong from 2016-2017 is presented in ***Figure 5A.2***. The survey results indicated that the Study Area provides low to moderate level of capture fisheries production (>100-300 kg/ha). Furthermore, based on the findings of the Hong Kong Fisheries Resources Monitoring Report (2010-2015) [5], the main commercial families of fisheries resources around the Study Area are provided in ***Table 5A.3***.

(2) AFCD (2017). Hong Kong Fisheries Resources Monitoring Report (2010-2015) Executive Summary. Available at https://www.afcd.gov.hk/english/fisheries/fish_cap/fish_cap_con/files/Executive_Summary_English_3.pdf.

(3) AFCD Port Survey 2016/17.

(4) AFCD Port Survey 2016/17. *Op. Cit.*

(5) South China Sea Fisheries Research Institute (SCSFRI) (2017). Hong Kong Fisheries Resources Monitoring Report (2010-2015). Prepared for the Agriculture, Fisheries and Conservation Department

Legend

- Boundary of HKSAR
- Key Area
- Study Area

Number of Vessels

- >0 - 50
- >50 - 100
- >100 - 200
- >200 - 400
- >400 - 600
- >600 - 800

N

Kilometres

0 5 10

Figure 5A.1

Distribution of Fishing Operations (Overall) in HKSAR Waters
(Source: AFCD Port Survey 2016/17)

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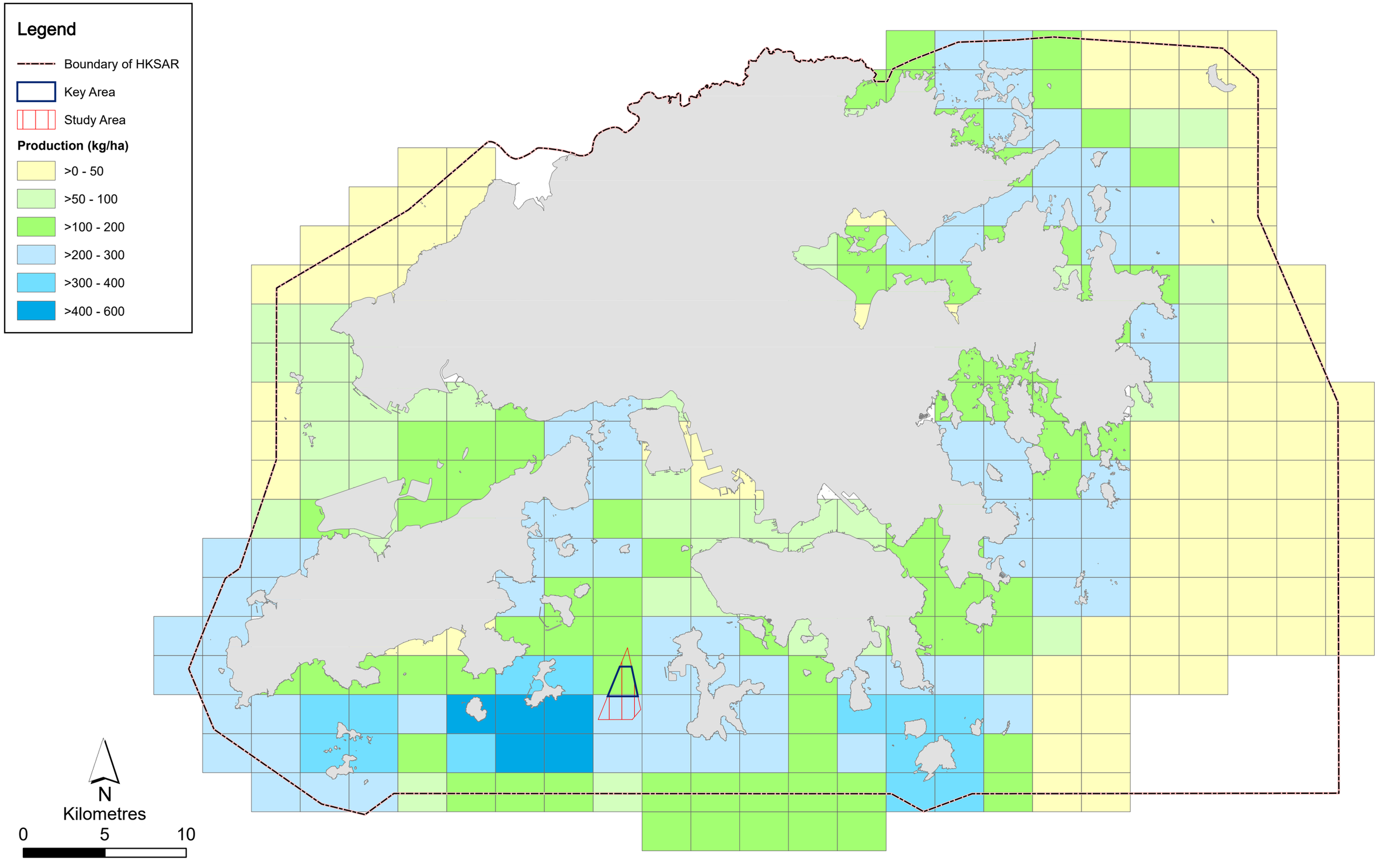

Figure 5A.2

Distribution of Fisheries Production (Overall) (Adult Fish) in HKSAR Waters in 2015 and 2016
(Source: AFCD Port Survey 2016/17)

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Table 5A.2 The Top 10 Fish Catch in Hong Kong Waters (Source: AFCD Port Survey 2016/17)

Rank	Family/Group	Common Name of Fish Catch
1	Mugilidae	Mullet
2	Clupeidae	Sardine, Shad
3	Carangidae	Scad, Jack
4	Sparidae	Seabream
5	Sciaenidae	Croaker
6	Mixed squid	Squid
7	Mixed crab	Crab
8	Siganidae	Rabbitfish
9	Mixed shrimp	Shrimp
10	Platycephalidae	Flathead

Notes:

(1) Other common fish captured include Muraenesocidae (conger-pike eel), Scombridae (mackerel), Polynemidae (threadfin), Scorpaenidae (common rock fish) and Cynoglossidae (tongue sole), etc.

(2) Ranking is based on the estimated weight of production of each family/group of fish catch.

Table 5A.3 Main Commercial Families of Fisheries Resources in Southern Hong Kong waters (Source: AFCD Hong Kong Fisheries Resources Monitoring Report (2010-2015))

Rank	Main Commercial Families from Shrimp Trawl Surveys	Main Commercial Families from Stern Trawl Surveys	Main Commercial Families from Purse-Seine Surveys
1	Leiognathidae	Leiognathidae	Carangidae
2	Sciaenidae	Engraulidae	Clupeidae
3	Platycephalidae	Carangidae	Trichiuridae
4	Squillidae	Sciaenidae	Engraulidae
5	Portunidae	Clupeidae	Leiognathidae
6	Penaeidae	Sparidae	
7	Cynoglossidae	Squillidae	
8	Clupeidae	Stromateidae	
9	Polynemidae	Polynemidae	
10	Sparidae	Trichuridae	

Notes:

(1) Consolidated ranking based on the biomass of each family collected in the surveys.

(2) The data above represent the main commercial families of fisheries resources obtained from South-Western Hong Kong waters from shrimp trawl and stern trawl surveys and from Southern Hong Kong waters from purse-seine surveys.

5A2.3 Fisheries Resources

Historically, the majority of species captured in the southern waters (South Lamma, South Cheung Chau, Soko Islands, South Lantau, North Lamma) were mantis shrimp (Squillidae). Results of

gillnetting surveys indicated high biomass of croaker (Sciaenidae) were recorded at Shek Kwu Chau, South Lamma and Peng Chau [6].

Fisheries surveys were conducted for the Hong Kong Offshore LNG Terminal Project between October 2016 and July 2017 and the survey locations covered Cheung Chau and West Lamma in the vicinity of the Study Area [7]. The results showed that mean biomass, abundance, species richness, species diversity and species evenness of the fisheries resources (including fish and crustaceans) were moderate in both wet and dry seasons, comparing to other stations located in western waters and southern Lantau waters. The dominant fish species recorded in the surveys, in terms of both biomass and abundance, was the croaker *Johnius belangerii* which is of low commercial value according to the Fish Marketing Organisation (FMO) [8] and other published references [9]. The dominant crustacean species recorded in the survey, in terms of both biomass and abundance, was the crab *Charybdis (Charybdis) affinis* which has been identified as of no commercial value [10].

Another gillnet and hand-line surveys were conducted between February and May 2018 around the Lamma Power Station for the Improvement Dredging for Lamma Power Station Navigation Channel Project. A total of 187 individual fishes, crustaceans and cuttlefish weighing 12.87kg from 26 species of 19 families were collected from the surveys. All the species caught in this study are commonly found and widespread across the waters of Hong Kong. Most of the catches are species with low commercial value [11].

5A2.4 Spawning Grounds

The southern Hong Kong waters were previously identified in 1998 as fisheries spawning grounds for high value commercial species (***Figure 5A.3***). In Hong Kong, spawning period differs among fisheries species with the majority of commercial species aggregate and spawn in the open waters during the period from June to September [12]. Some fish species, including flathead (*Platycephalus indicus*) and shad (*Clupanodon (Konosirus) punctatus*), spawn in the late winter/early spring (i.e., February to April) and a few are known to spawn in January. Shrimp scad (*Alepes djedaba*) spawns in the early summer (around June) whilst pony fish (*Leiognathus brevirostris*) and croakers were found to be reproductive throughout most of the year from May to December. The spawning period of most of the crustacean species was found to be from April to November, with spawning concentrated between June and August.

The recognised spawning ground in southern Hong Kong waters is over 30 km long and approximately 10 km wide, extending across southern waters from Fan Lau Kok all the way east pass Soko Islands and beyond Lamma Island, abutting the southern boundary of the HKSAR. Pony fish (*Leiognathus brevirostris*), croakers (*Johnius belangerii* and *Protonibea diacanthus*), mantis shrimps (*Oratosquilla* spp.) and prawn (*Metapenaeus joyneri* and *M. affinis*) were some of the examples of major commercial species recorded in this spawning ground. The Study Area is located within the recognised southern Lantau spawning ground (***Figure 5A.3***).

Ichthyoplankton and fish post-larvae surveys were conducted from July 2005 to March 2006 as part of the proposed LNG receiving terminal and associated facilities EIA study. The survey locations covered Cheung Chau and Lamma Island in the vicinity of the Study Area. The study found that the fish eggs and fish post-larvae densities were generally low in southern Lantau waters. Results showed that the highest fish densities were obtained between July and September and decreased significantly in October, suggesting that the peak spawning period for most fishes in southern waters of Hong Kong occurred during the summer. Samples were dominated by Ambassidae (glass

(6) ERM (1998). *Op cit.*
(7) ERM (2018). EIA Report for the Hong Kong Offshore LNG Terminal (Register No.: AEIAR-218/2018)
(8) Fish Marketing Organization (FMO). Available at https://www.fmo.org.hk/uploads/AR2015-2016.pdf
(9) Mott MacDonald (2014). *Op Cit.*
(10) Mott MacDonald (2014). *Op Cit.*
(11) Mott MacDonald (2018). Fisheries Baseline Review Report for Improvement Dredging for Lamma Power Station Navigation Channel.
(12) ERM (1998) Study of Fisheries Resources and Fishing Operations in Hong Kong Waters, AFD.

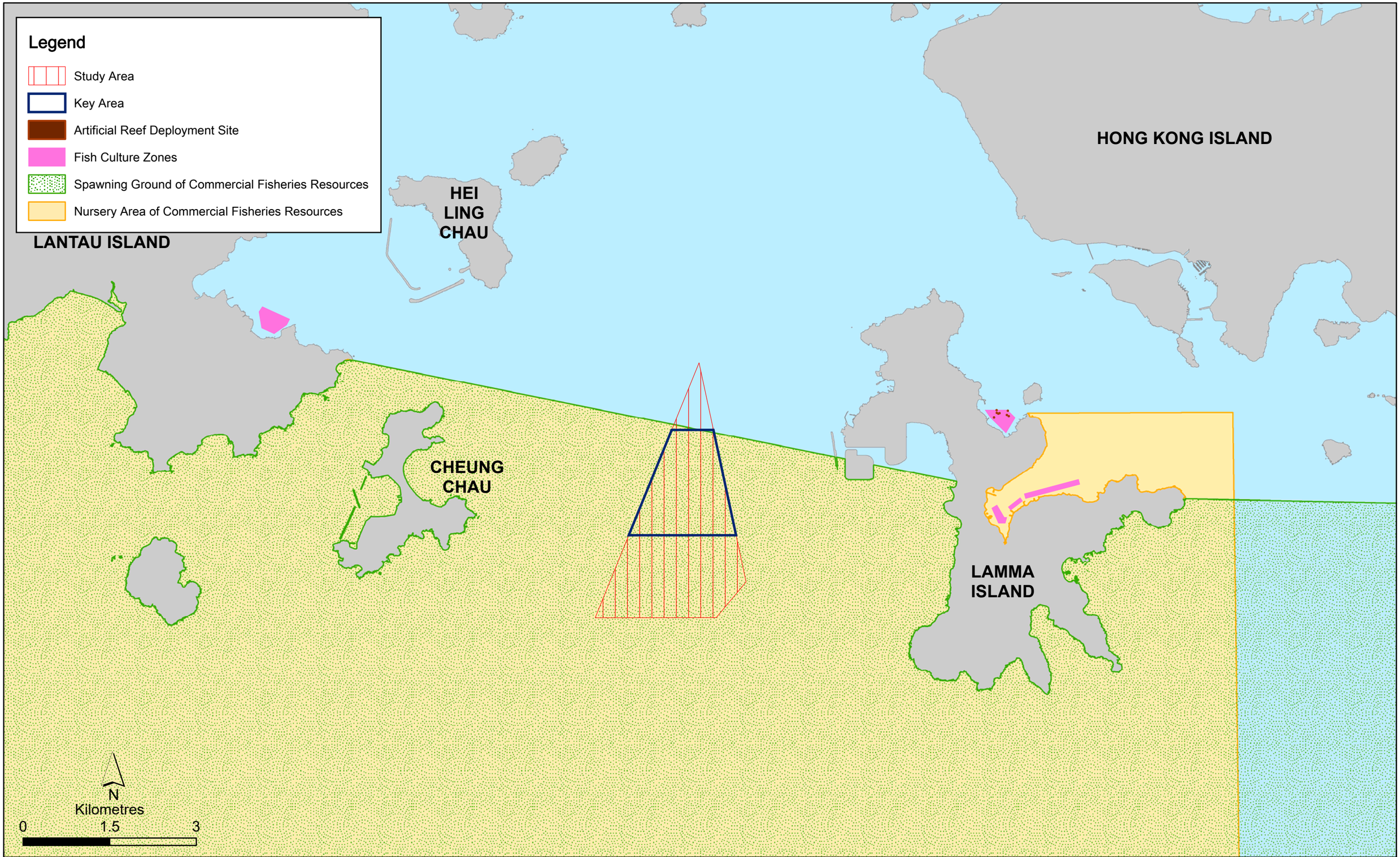

Figure 5A.3

Fisheries Sensitive Receivers

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perches), Engraulidae (anchovies), Gobiidae (gobies) and Sciaenidae (croakers) in the wet season. In the dry season, the major families included Callionymidae, Gobiidae, Scorpaenidae (rockfishes) and Syngnathidae (pipefishes) in the vicinity of southwestern Lantau and Soko Islands. A total of 40 different families have been recorded in the surveys, with mean family richness of 10.8 – 16.8. Even in the wet season when the highest fish densities were obtained, the fish densities recorded were generally low (0.21 – 1.82 larvae m^{-3}) and there were no observable difference in fish or fish egg densities between waters of the identified spawning /nursery grounds for commercial fisheries of the southern waters of Hong Kong and those of western Lantau not identified as important spawning / nursery grounds.

Another ichthyoplankton and fish post-larvae surveys were conducted from November 2016 to July 2017 as part of the proposed Hong Kong Offshore LNG Terminal Project. The survey locations covered Cheung Chau and West Lamma in the vicinity of the Study Area. The study found that the levels of ichthyoplankton (eggs and larvae in planktonic phase) and fish post-larvae resources at Cheung Chau and West Lamma were generally low, ranged from ~0.087 to ~104 m^{-3} for ichthyoplankton (fish egg and fish larvae) and from 0 to 0.083 m^{-3} for fish post-larvae resources. The dominant species of fish eggs and fish larvae recorded was the glass perchlet (family Ambassidae) which is of low commercial value [13]. Whilst the top ten dominant species of fish eggs included some species with medium to high commercial values, including pony fishes (family Leiognathidae), sole (family Soleidae), sweetlips (family Haemulidae) and sillago (family Sillaginidae), the top ten dominant species of fish larvae were mostly of low commercial value. Fish post-larvae of the Assessment Area were also dominated by species of low commercial value such as scads (family Carangidae), dragonets (family Callionymidae), gobies (family Gobiidae), anchovies (family Engraulidae) and rabbitfish (family Siganidae).

5A2.5 Nursery Area

The southern Lantau waters extending across southern waters from Fan Lau Kok all the way east pass Soko Islands and beyond Lamma Island and abutting the southern boundary of the HKSAR was also previously identified in 1998 as a fisheries nursery area for high value commercial species (***Figure 5A.3***). This recognised nursery area is an important habitat area for a number of commercial juvenile fish and crustacean species, with major species of mantis shrimp (*Oratosquilla anomala*, *Dictyosquilla foveolata*), Sciaenid fry, Serranid fry, *Squilla* fry, prawn (*Metapenaeopsis barbata*, *M. palmensis*) and goby (*Oxyurichthys tentacularis*). Majority of fry and juveniles were recorded during the summer months. The Study Area located within this recognised nursery area (***Figure 5A.3***).

5A2.6 Artificial Reef Deployment

An Artificial Reef (AR) programme has been implemented in Hong Kong's waters by AFCD since 1996 in an effort to enhance fisheries resource whilst promoting biodiversity [14]. ARs are recognised worldwide as having the ability to encourage growth and development of a great number and variety of marine organisms, which in turn provide food, shelter and protection for fishes. Therefore, the ARs are considered to be fisheries sensitive receivers. Deployment sites of ARs include marine parks, FCZs, important spawning and nursery grounds and feeding stations for the CWDs. There has been a total of 673 units of ARs with a total volume of over 179,200 m^3 [15] deployed, the location of all AR's deployed is recorded by the Hong Kong Artificial Reef Project.

In the vicinity of the Study Area, eight units of artificial reefs with total volume of 330 m^3 were deployed within Lo Tik Wan FCZ as biofilter to enhance habitat quality and marine resources (***Figure 5A.3***). The AR at Lo Tik Wan FCZ is located >4.5 km from the Project.

(13) Mott MacDonald (2014) Expansion of Hong Kong International Airport into a Three-Runway System: EIA Study (EIA Report Registered No. AEIAR-185/2014)
(14) AFCD (2019) Conservation of Fisheries Resources. Available at https://www.afcd.gov.hk/english/fisheries/fish_cap/fish_cap_con/fish_cap_con.html
(15) AFCD (2019) *Op. Cit.*

5A2.7 Culture Fisheries

Mariculture is protected and regulated by the Marine Fish Culture Ordinance (Cap. 353), which stipulates that licences must be obtained in order for marine fish culture activity to occur and that the activity must occur within designated fish culture zones. AFCD's Departmental Annual Report 2018-2019 outlined that as of 2018 there were 26 fish cultures zones which covered 209 hectares with 931 licensed operators [16]. The most recent estimated production in 2020 from licensed farms was 687 tonnes that accounted for about 5% of local demand for live marine fish and was valued at $52 million [17].

There is no FCZ located close to the Project (***Figure 5A.3***). Four FCZs are located in the Assessment Area and their separation distances to the Project (by sea distance) are presented in ***Table 5A.4***.

Table 5A.4 Separation Distances between the FCZs in the Assessment Area and the Project

Fish Culture Zone (FCZ)	Sea Distance from Key Area (km)
Sok Kwu Wan FCZ	8.8
Lo Tik Wan FCZ	7.0
Cheung Sha Wan FCZ	6.9
Ma Wan FCZ	14.3

(16) AFCD (2020) Departmental Annual Report 2018-2019.
(17) AFCD (2021) Marine fish culture, pond fish culture and oyster culture. Available at https://www.afcd.gov.hk/english/fisheries/fish_aqu/fish_aqu_mpo/fish_aqu_mpo.html