Annex 10B

Fisheries Survey Methodology

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11 November 2016

CLP Power Hong Kong Limited
Black Point Power Station
Yung Long Road,
Lung Kwu Tan,
Tuen Mun, New Territories
(Attn.: Mr. Graham Holland)

Dear Mr. Holland,

Environmental Impact Assessment (EIA) Ordinance, Cap 499
EIA Study Brief No. ESB-292/2016
Project Title: Hong Kong Offshore LNG Terminal
Methodology for Fisheries Field Surveys

I refer to the letter of 30 September 2016 from your consultants, ERM-Hong Kong Ltd, submitting on your behalf the methodology for the fisheries field surveys.

Pursuant to the section 3.4.10 and Appendix G of the EIA Study Brief No. ESB-292/2016, please be advised that the submitted methodology is agreed by us for the purpose of carrying out the fisheries field surveys and subsequently providing information to the fisheries impact assessment in the captioned EIA study.

Yours sincerely,

(Matthew W.C Chan)
Senior Environmental Protection Officer
for Director of Environmental Protection

c.c. DAFC (Attn: Dr. Chong Kit-yee) Fax: 2814 0018
ERM (Attn: Jasmine Ng) Fax: 2723 5660

Hong Kong Offshore LNG Terminal

Fisheries Survey Method Statement

Rev 2

30 September 2016

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Hong Kong Offshore LNG Terminal

Fisheries Survey Method Statement

ERM Document Code: 0359722_Fisheries Method Statement_Rev 2

Environmental Resources Management

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Client:	Project No:
CLP Power Hong Kong Limited	0359722
Summary:	Date: 30 September 2016
This document presents the method statement for the fisheries survey for the Hong Kong Offshore LNG Terminal Project	Approved by:  *Dr Robin Kennish* *Project Director*

Revision	Description	By	Checked	Approved	Date
2	Method Statement	Var	JN	RK	30/09/16
1	Method Statement	Var	JN	RK	02/09/16
0	Method Statement	Var	JN	RK	22/07/16

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1 INTRODUCTION

1.1 BACKGROUND

To support the increased use of natural gas in Hong Kong from 2020 onwards, CLP Power Hong Kong Limited (CLP) has identified that the development of an offshore liquefied natural gas (LNG) import facility in Hong Kong using Floating Storage and Regasification Unit (FSRU) technology (the 'Hong Kong Offshore LNG Terminal Project' or 'the Project') presents a viable additional gas supply option that can access competitive gas supplies from world markets. The Project will involve the construction and operation of an offshore LNG import facility to be located in the southern waters of Hong Kong, a double berth jetty, and subsea pipelines that connect to the gas receiving stations (GRS) at the Black Point Power Station (BPPS) and Lamma Island Power Station (LPS; owned and operated by Hong Kong Electric, HKE).

The Project requires an Environmental Permit from the Hong Kong SAR Government. In relation to this, CLP has prepared a Project Profile for application for an Environmental Impact Assessment (EIA) Study Brief, which was submitted to Environmental Protection Department (EPD) on 6 May 2016. The EIA Study Brief (No. ESB-292/2016) (hereafter referred to as "the Study Brief") was issued by EPD on 15 June 2016.

Environmental Resources Management (ERM) was commissioned by CLP for the EIA Study for the proposed Project. In accordance with *Clause 3.4.10* of the Study Brief, a fisheries impact assessment shall be conducted to evaluate and assess potential impacts on fisheries.

1.2 OBJECTIVE & SCOPE OF THIS METHOD STATEMENT

Baseline information for the fishing grounds, fisheries resources and habitats, spawning or nursery grounds, and fisheries sensitive receivers such as fish culture zones and artificial reefs within the Assessment Area for fisheries impact assessment, i.e. the area with reference to the locations of the two proposed subsea pipelines and the offshore LNG terminal site within the Deep Bay Water Control Zone (WCZ), Southern WCZ, Second Southern Supplementary WCZ, North Western WCZ and North Western Supplementary WCZ in accordance with Clause 3.4.10.2 of the EIA Study Brief (*Figure 1.1*), is available from the following key sources:

- ERM (2006) Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities: EIA Study (EIA Report Registered No. AEIAR-106/2007);

- ERM (2010) Black Point Gas Supply Project: EIA Study (EIA Report Registered No. AEIAR-150/2010);

- ERM (2010) Development of a 100MW Offshore Wind Farm in Hong Kong: EIA Study (EIA Report Registered No. AEIAR-152/2010);

- Mott MacDonald (2014) Expansion of Hong Kong International Airport into a Three-Runway System: EIA Study (EIA Report Registered No. AEIAR-185/2014);

- State Key Laboratory in Marine Pollution of City University of Hong Kong (2014) Fish Resources Study for the Proposed Marine Park in the Brothers Islands (Contract No. HHZMB 2/2012 (EP)): Unpublished Report;

- ERM (2016) Provision of Service on Detailed Study of the Southwest Lantau and Soko Islands Marine Parks – Design, Consultation and Implementation (Quotation Ref. AFCD/SQ/127/14): Unpublished Report;

- ERM (2016) 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)): Unpublished Report;

- ERM (2016) Environmental Monitoring and Audit for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau (2012-2017) – Investigation (Agreement No. CE 23/2012(EP));

- ERM (2016) Additional Gas-fired Generation Units Project: EIA Study (EIA Report Registered No. AEIAR-197/2016).

Some of the baseline information was collected very recently after the trawl ban which has taken effect from 31 December 2012 and is considered to be up-to-date and representative of the existing conditions of the following locations within the Assessment Area (*Figures 1.2* and *1.3*):

- North Western WCZ and northern part of North Western Supplementary WCZ [(1)(2)];

- Southern part of North Western Supplementary WCZ [(3)]; and

- Southern WCZ [(4)].

Therefore, field surveys at selected locations within the Assessment Area where potential impact could occur and up-to-date baseline information is not

(1) ERM (2016) Environmental Monitoring and Audit for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau (2012-2017) – Investigation (Agreement No. CE 23/2012(EP))

(2) Mott MacDonald (2014) Expansion of Hong Kong International Airport into a Three-Runway System: EIA Study (EIA Report Registered No. AEIAR-185/2014)

(3) ERM (2016) Provision of Service on Detailed Study of the Southwest Lantau and Soko Islands Marine Parks – Design, Consultation and Implementation (Quotation Ref. AFCD/SQ/127/14): Unpublished Report

(4) ERM (2016) 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)): Unpublished Report

present are proposed to be conducted to update the latest fisheries baseline in these locations.

In accordance with the requirements in *Appendix G* of the Study Brief, field surveys shall be conducted to fill the identified data gaps on fisheries baseline information of the Assessment Area. Subsequently, the information collected from desktop review and field surveys will be used to establish the existing conditions of fisheries of the Assessment Area. The proposed field surveys comprise:

- Adult fish production survey of nine months covering both wet and dry seasons to assess the abundance, composition and spatial distribution of fish;
- Ichthyoplankton and fish post larvae survey of nine months covering wet, dry and peak seasons to identify spawning and nursery areas important for commercial fisheries resources; and
- Vessel survey of nine months covering both wet and dry seasons to assess fishing operations.

This *Method Statement* presents the methodology of the aforementioned fisheries field surveys, in particular sampling gear type and gear specification, number and location of sampling stations, and data analysis, duration and timing for the fisheries field surveys. Reference has been made to the guidelines of fisheries impact assessment in *Annex 17* of *EIAO-TM* and approved EIA reports on the EIA Register. Pursuant to *Clause 2* of *Appendix G* of the Study Brief, this Method Statement is prepared for agreement with the Agriculture, Fisheries and Conservation Department (AFCD) and EPD.

1.3 STRUCTURE OF THIS METHOD STATEMENT

Following this introductory section, the remainder of this *Method Statement* is presented as follows:

- *Section 2* presents the methodologies for adult fish production survey;
- *Section 3* describes the methodologies for ichthyoplankton and fish post larvae survey; and
- *Section 4* presents the methodologies for vessel survey to assess fishing operations.

2 ADULT FISH PRODUCTION SURVEY

Adult fish production surveys will be conducted as described below to characterize the existing conditions of fisheries resources at selected locations within the Assessment Area, to fill the information gaps on abundance, composition and spatial distribution of adult fish stock.

2.1 SURVEY LOCATIONS

Twelve (12) survey locations along the Project's footprint within the Assessment Area where up-to-date baseline information is not present are proposed for the adult fish production survey (*Figure 2.1*). These locations are proposed to avoid the areas of heavy marine traffic, such as near the marine vessel fairway, in order to minimise potential confounding factors which may affect the survey results and to ensure that surveys can be undertaken in a safe manner.

Actual survey locations will be recorded using global positioning system (GPS) and water depth will be measured using portable sonar system.

2.2 METHODOLOGY

Two fishing methods, gill-netting and hand-lining, will be used to sample pelagic and demersal fisheries resources at each survey location. All these methods are commonly used by local fishermen in Hong Kong.

2.2.1 *Gill Netting*

At each location, two trammel (gill) nets will be deployed once for one (1) hour at each station. The nets will be 1 m deep, 30 m in length and comprised of three (3) layers, with two 20 cm mesh stretches sandwiching a 5 cm mesh stretch. This sampling gear is selected for its ability to capture pelagic fisheries resources in a wide range of sizes and is commonly used in other similar baseline fisheries surveys.

2.2.2 *Hand Lining*

At each location, hand-line fishing will be conducted by four (4) fishers (i.e. the fishing group), each using one (1) hand-line and hook, on a sampan for one (1) hour Same group of fishers and similar fishing baits will be used in each survey to standardize the fishing techniques.

2.3 SPECIMEN PROCESSING AND DATA ANALYSIS

The catches from the adult fish production survey will be washed and recorded immediately and will be identified to species level as far as practicable. The specimens will be analysed for species composition and

diversity, abundance, size (total length, standard length and fork length as appropriate), biomass in weight, and estimated catch value of commercial species [(1)]. Diversity of fisheries resources will be presented as species richness, Shannon-Weiner diversity (*H'*) and Pielou's evenness (*J'*).

Descriptive statistics for the measured parameters described above, including sum, mean value and standard deviation, will be analysed for the survey locations over the dry and wet seasons as appropriate.

2.4 PROPOSED SURVEY SCHEDULE

In accordance with the requirements in *Appendix G* of the Study Brief, adult fish production survey is proposed to be conducted over a period of nine months including both the wet and dry seasons. Each location will be surveyed once per month over the 9-month survey period, covering both wet and dry seasons. All surveys will be conducted during daytime at each of the selected locations. *Table 2.1* presents the tentative survey schedule for the proposed adult fish production survey.

Table 2.1 Tentative Survey Schedule for Adult Fish Production Survey

Method	Location	Survey Frequency
Gill Netting	12 locations along the Project's footprint within the Assessment Area	Monthly over a duration of 9 months, from September 2016 to May 2017 (inclusive)
Hand Lining	12 locations along the Project's footprint within the Assessment Area	Monthly over a duration of 9 months, from October 2016 to June 2017 (inclusive)

(1) Value of commercial species will be estimated based on the best available data on published by Fish Marketing Organization (FMO). Available at http://www.fmo.org.hk/index/lang_tc/page_price/Cat_1/ (FMO)

3 ICHTHYOPLANKTON ANF FISH POST-LARVAE SURVEY

Ichthyoplankton (i.e. eggs and larvae in planktonic phase and drift with the water currents) and fish post-larvae (i.e. post-settlement stages when fish have attained a larger size, are no longer planktonic and are capable of swimming against currents) surveys will be conducted as described below to determine if spawning or nursery ground important for commercial fisheries resources is present in the area where the offshore LNG terminal would be located (1).

3.1 SURVEY LOCATIONS

Twelve (12) survey locations along the Project's footprint within the Assessment Area where up-to-date baseline information is not present are proposed for the ichthyoplankton and fish post-larvae survey (*Figure 2.1*). These locations cover areas both within the proposed offshore LNG terminal site and the broader Assessment Area to examine the level of ichthyoplankton and fish post-larvae resources. Actual survey locations will be recorded using global positioning system (GPS) and water depth will be measured using portable sonar system.

3.2 METHODOLOGY

Ichthyoplankton and fish post-larvae survey will be conducted using plankton towing. A bongo plankton net of 50 cm mouth diameter and with 0.5 mm mesh size will be deployed for ichthyoplankton survey, while a bongo plankton net of 50 cm mouth diameter and with 1 mm mesh size will be deployed for fish post-larvae survey. A flow meter will be fitted at mouth of the net to record the volume of water filtered.

At each site, two (2) replicate tows will be conducted and each tow with a duration of at least 10 minutes. The net will be deployed in a single oblique tow to a depth of 2 m off the seabed and towed at a speed of 1-2 knots. Subsequently the net will be gradually winched up towards the water surface in order to sample the entire water column. The plankton will be immediately fixed in 70% ethanol (2) (3) (4).

Fish post-larvae are able to swim at a faster speed than 1-2 knots. With a coarser-mesh net of 1 mm, it is possible to tow at higher speeds of 3-4 knots to

(1) A potential impact of the Project is impingement and entrainment of fish, fish eggs and larvae at the seawater intake of the offshore LNG terminal. Therefore the identification of signification spawning or nursery ground of fish resources is of particular relevance to the potential site of the offshore LNG terminal and its proximity.

(2) Theilacker, G. H. (1980). Changes in body measurements of larval northern anchovy, *Engraulis mordax*, and other fishes due to handling and preservation. Fishery Bulletin 78: 685–692.

(3) Takizawa K, Fujita Y, Ogushi Y, Matsuno S (1994) Relative change in body length and weight in several fish larvae due to formalin fixation and preservation. Fisheries Science, 60(4): 355-359.

(4) Leis J.M. and Carson-Ewart B.M. (eds) (2004). The larvae of Indo-Pacific coastal fishes: a guide to identification (Fauna Malesiana Handbook 2, 2nd edition). Brill: Leiden. 850 pp.

have a better chance of catching the fish post-larvae. The coarser mesh size also allowed small zooplankton to extrude through the net mesh and thus avoided the zooplankton from clogging up the net.

3.3 *SPECIMEN PROCESSING AND DATA ANALYSIS*

Standard and accepted techniques will be used for sorting the ichthyoplankton and fish post-larvae in laboratory (1). The specimens will be held in the fixative solution for a minimum of 24 hours to ensure adequate fixation of the organisms. Identification of ichthyoplankton and fish post-larvae will be made under dissecting stereomicroscopes according to the observed morphological characteristics such as body shape, cloacal location, pigmentation pattern, and other special structures. Larval fish individuals without distinctive morphological features for taxonomic identification will be examined with the aid of DNA sequencing. The DNA sequencing procedure, database alignment, and subsequent taxa establishment will follow Ko et al. (2013) (2).

The specimens will be identified to the lowest taxonomic level, where possible, using available identification keys and literatures (3), and number as well as size range will also be recorded. After taxa establishment, data will be standardized to the number of individuals per 1000 m^3 for data analyses. Species composition, abundance and diversity of taxa will be recorded.

Descriptive statistics for the measured parameters described above, including sum, mean value and standard deviation, will be analysed for the survey locations over the dry, wet and peak seasons as appropriate.

3.4 *PROPOSED SURVEY SCHEDULE*

In accordance with the requirements in *Appendix G* of the Study Brief, ichthyoplankton and fish post-larvae survey is proposed to be conducted over a period of nine months including wet, dry and peak seasons. Each location will be surveyed once per month over the 9-month survey period (tentatively between November 2016 and July 2017), covering wet, dry and peak seasons (4). All surveys will be conducted during daytime at each of the selected locations. *Table 3.1* presents the tentative survey schedule for the proposed ichthyoplankton and fish post-larvae survey.

(1) Situ Y (2007) Ichthyoplankton assemblages at Cape d'Aguilar: seasonal variability and family composition. MPhil thesis. University of Hong Kong. pp 199.

(2) Ko HL, Wang YT, Chiu TS, Lee MA, Leu MY, Chang KZ, Chen WY and Shao KT (2013) Evaluating the Accuracy of Morphological Identification of Larval Fishes by Applying DNA Barcoding. PLoS ONE 8(1): 1 – 7.

(3) Leis JM, Carson-Ewart BM (2004) The larvae of Indo-Pacific coastal fishes: a guide to identification. Brill, Leiden

(4) With reference to the *Study on Fisheries Resources and Fishing Operations in Hong Kong Waters* conducted in 1998, the results indicated that commercial fish species such as seabass and gizzard shad etc. spawned mainly in January - April in Northeast Lantau waters whilst those such as ponyfish, croaker etc. spawned mainly in February - July in waters off South Lantau and South Cheung Chau. The proposed survey period has hence covered these peak seasons identified in the literature.

Table 3.1 Tentative Survey Schedule for Ichthyoplankton and Fish Post-larvae Survey

Method	Location	Survey Frequency
Plankton Tow by Bongo Net (0.5mm mesh size for ichthyoplankton sampling; 1 mm mesh size for fish post-larvae sampling)	12 locations along the Project's footprint within the Assessment Area	Monthly over a duration of 9 months, from November 2016 to July 2017 (inclusive)

4 VESSEL SURVEY

Vessel surveys will be conducted as described below to assess the level of fishing operations in the Assessment Area, by recording the fishing effort of both commercial and recreational fishing activities with a view to identifying significant fishing grounds and sites of fisheries importance.

4.1 SURVEY LOCATIONS

Visual observation of fishing operations will be conducted from the 12 locations proposed for the adult fish production survey (*Section 2.1*). The sea area covered within the visible range (usually a few hundred metres) from the survey location will be observed.

4.2 METHODOLOGY

The detailed fishing operation information on both recreational and commercial fishing activities, including the types and operating location of the fishing vessels, will be collected as far as possible during the adult fish production surveys. Vessel license number and fishing operation method will also be recorded where possible. Location will be estimated based upon GPS coordinate and position relative to the shoreline and marked on a map of the survey area.

4.3 PROPOSED SURVEY SCHEDULE

In accordance with the requirements in *Appendix G* of the Study Brief, vessel survey is proposed to be conducted over a period of nine months including both the wet and dry seasons. Vessel survey will be conducted at the same time as the adult fish production survey, monthly over the 9-month survey period (tentatively between September 2016 and May 2017), covering both wet and dry seasons. All surveys will be conducted during daytime at each of the selected locations. *Table 4.1* presents the tentative survey schedule for the proposed vessel survey.

Table 4.1 Tentative Survey Schedule for Vessel Survey

Method	Location	Survey Frequency
Visual observation	12 locations along the Project's footprint within the Assessment Area	Monthly over a duration of 9 months, from September 2016 to May 2017 (inclusive)

Legend

- Boundary of HKSAR
- Proposed GRS at BPPS
- Proposed GRS at LPS
- Indicative Gas Pipeline Route to BPPS
- Indicative Gas Pipeline Route to LPS
- Study Area for the Proposed Hong Kong Offshore LNG Terminal

Water Control Zone

- North Western WCZ
- North Western Supplementary WCZ
- Southern WCZ
- Second Southern Supplementary WCZ

NEW TERRITORIES

Tsing Yi

KOWLOON

Hong Kong International Airport

LANTAU ISLAND

HONG KONG ISLAND

Lamma Island

N

Kilometers

0 5 10

Figure 1.1

Relevant Water Control Zones for the Hong Kong Offshore LNG Terminal

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Date: 14/7/2016

Environmental Resources Management

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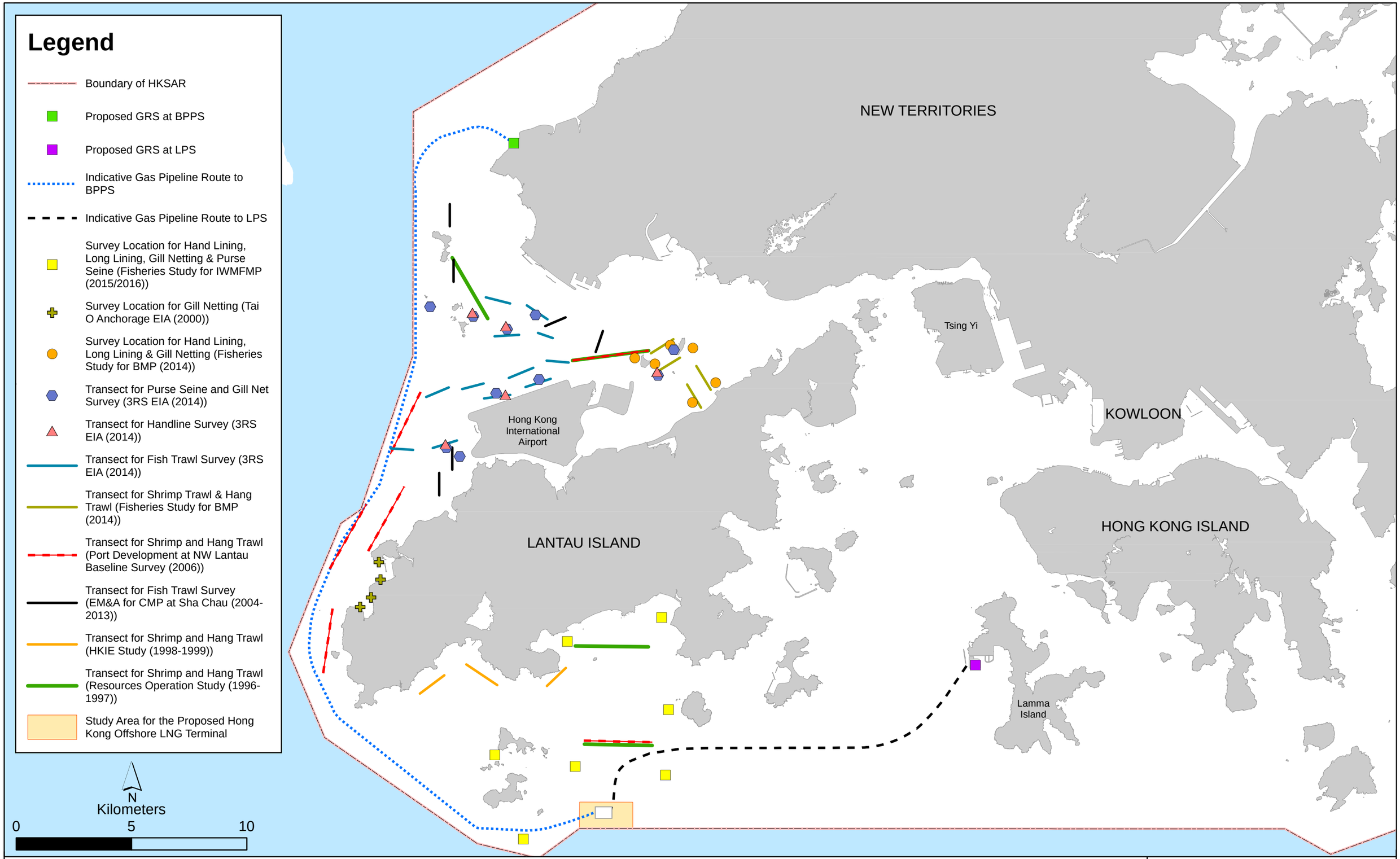

Figure 1.2

Previous Fisheries Resources Surveys

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Date: 18/8/2016

Environmental Resources Management

ERM

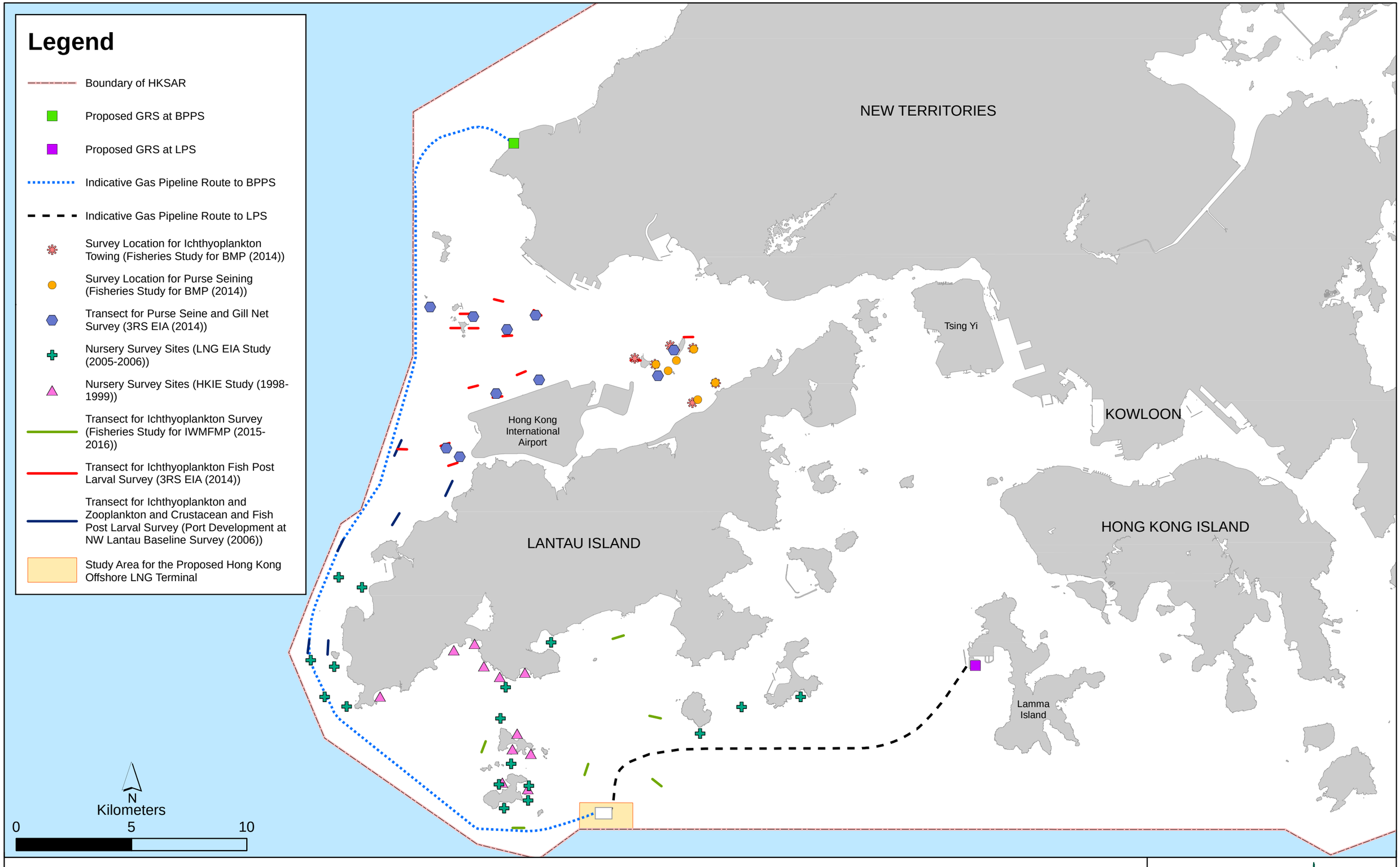

Figure 1.3

Previous Studies on Spawning and Nursery Grounds

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Legend

- Boundary of HKSAR
- Adult Fish and Fishing Vessel Survey
- Ichthyoplankton & Fish Post-Larvae Survey
- Marine Vessel Fairway
- Lantau Channel Traffic Separation Scheme
- Study Area for the Proposed Hong Kong Offshore LNG Terminal

X: 807290.816
Y: 831528.866

X: 804750.955
Y: 824646.913

X: 802631.952
Y: 814806.600

X: 800745.010
Y: 809045.955

X: 803368.156
Y: 804632.020

X: 808449.304
Y: 801086.160

X: 812392.238
Y: 801673.079

X: 813815.856
Y: 801644.245

X: 816612.526
Y: 803574.005

X: 820738.007
Y: 804326.349

X: 824282.227
Y: 804618.177

X: 827582.059
Y: 806499.660

NEW TERRITORIES

Sha Chau and Lung Kwu Chau Marine Park

Tsing Yi

KOWLOON

HONG KONG ISLAND

LANTAU ISLAND

Cheung Chau

Lamma Island

N

Kilometers

0 5 10

Figure 2.1

Proposed Locations for Fisheries Surveys

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Date: 31/8/2016

Environmental Resources Management

ERM