

Capco 青山發電有限公司
Castle Peak Power Company Limited

Hong Kong Offshore LNG Terminal Project

 **港燈**
HK Electric  推動永續未來
Powering for Sustainability

Updated Environmental Monitoring and Audit (EM&A) Manual

 **HKLTL**

23 May 2022

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23 May 2022

Hong Kong Offshore LNG Terminal Project

Updated Environmental Monitoring and Audit (EM&A) Manual



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青山發電有限公司
Castle Peak Power Co. Ltd.



港燈
HK Electric



**Hong Kong Offshore LNG Terminal
Environmental Certification Sheet**
FEP-01/558/2018/A, FEP-02/558/2018/A and FEP-03/558/2018/B


Reference Document/Plan

Document/ Plan to be Certified/ Verified :	Updated Environmental Monitoring and Audit (EM&A) Manual
Date of Report:	23 May 2022
Date prepared by ET:	23 May 2022
Date received by IEC:	24 May 2022


Reference EP Requirement

EP Condition:	Condition No. 2.5 of FEP-01/558/2018/A, FEP-02/558/2018/A & FEP-03/558/2018/B
Content:	<i>Updated EM&A Manual</i>
The Permit Holder shall, no later than 3 months before the commencement of construction of the Project, submit 3 hard copies and 1 electronic copy of the updated EM&A Manual to the Director for approval.	

ET Certification

I hereby certify that the above referenced document/ plan complies with the above referenced condition of FEP-01/558/2018/A, FEP-02/558/2018/A & FEP-03/558/2018/B.	
Mr Raymond Chow, Environmental Team Leader:	 Date: 23 May 2022

IEC Verification

I hereby verify that the above referenced document/ plan complies with the above referenced condition of FEP-01/558/2018/A, FEP-02/558/2018/A & FEP-03/558/2018/B.	
Ms Lydia Chak, Independent Environmental Checker:	 Date: 26 May 2022

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1. INTRODUCTION

1.1 Background

To support the increased use of natural gas in Hong Kong from 2020 onwards, Castle Peak Power Company Limited (CAPCO) and The Hongkong Electric Co., Ltd. (HK Electric) have identified that the development of an offshore liquefied natural gas (LNG) receiving terminal in Hong Kong using Floating Storage and Regasification Unit (FSRU) technology ('the Project') presents a viable additional gas supply option that will provide energy security through access to 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 the Lamma Power Station (LPS).

The Environmental Impact Assessment (EIA) Report for the Project was submitted to the Environmental Protection Department (EPD) of the HKSAR Government in May 2018. The EIA Report (EIAO Register No. AEIAR-218/2018) was approved by EPD and the associated Environmental Permit (EP) (EP-558/2018) was issued in October 2018.

An application for Further Environmental Permits (FEP) was made on 24 December 2019 to demarcate the works between the different parties. The following FEPs were issued on 17 January 2020 and the EP under EP-558/2018 was surrendered on 5 March 2020:

- the double berth jetty at LNG Terminal under the Hong Kong LNG Terminal Limited, joint venture between CAPCO and HK Electric (FEP-01/558/2018/A)⁽¹⁾;
- the subsea gas pipeline for the BPPS and the associated GRS in the BPPS under CAPCO (FEP-03/558/2018/B)⁽²⁾; and
- the subsea gas pipeline for the LPS and the associated GRS in the LPS under HK Electric (FEP-02/558/2018/A)⁽³⁾.

This Updated EM&A Manual shall be applicable to fulfilling Condition 2.5 of all three FEPs.

1.2 Purpose of the Updated Environmental Monitoring and Audit (EM&A) Manual

This updated *Environmental Monitoring and Audit (EM&A) Manual* ("the Manual") incorporates the updates to the EM&A activities, including those required under Condition 2.5 of the three FEPs (FEP-01/558/2018/A, FEP-02/558/2018/A and FEP-03/558/2018/B):

- Update on post-construction marine mammal monitoring (detailed in **Section 7.2**); and
- Update on the implementation schedule of recommended mitigation measures with reference to the latest Pipeline Laying Method Plan for BPPS Pipeline submitted under FEP-03/558/2018/B (detailed in **Annex A**).

The Manual is a supplementary document to the EIA Report of the Project and has been prepared in accordance with the *EIA Study Brief (No. ESB-292/2016)*, the *Technical Memorandum of the Environmental Impact Assessment Process (EIAO-TM)* and the FEPs. The purpose of the Manual is to provide information, guidance and instruction to personnel charged with environmental duties and

(1) Application for variation of an environmental permit for FEP-01/558/2018 was undertaken and the latest FEP (FEP-01/558/2018/A) was issued on 6 November 2020.

(2) Application for variation of an environmental permit for FEP-03/558/2018/A was undertaken and the latest FEP (FEP-03/558/2018/B) was issued on 25 August 2021.

(3) Application for variation of an environmental permit for FEP-02/558/2018 was undertaken and the latest FEP (FEP-02/558/2018/A) was issued on 22 December 2020.

those responsible for undertaking EM&A work during Project construction and operation. It provides systematic procedures for monitoring and auditing the environmental performance of the Project.

This Manual contains the following information:

- Responsibilities of the Contractor(s) for Project construction, Environmental Team (ET), and the Independent Environmental Checker (IEC) with respect to the EM&A requirements during the course of the Project;
- Project organisation;
- Requirements with respect to the construction and operational programme schedule and the necessary EM&A programme to track the environmental impact;
- Details of the methodologies to be adopted including field, laboratory and analytical procedures, and details on quality assurance and quality control programme;
- Definition of Action and Limit levels;
- Establishment of Event and Action plans;
- Requirements for reviewing pollution sources and working procedures required in the event of exceedances of applicable environmental criteria and/or receipt of complaints;
- Requirements for presentation of EM&A data and appropriate reporting procedures; and
- Requirements for review of EIA predictions and the effectiveness of the mitigation measures/environmental management systems and the EM&A programme.

1.3 Project Background

CLP Power Hong Kong Limited (CLP) and HK Electric are both responsible for providing a safe, highly reliable and clean supply of electricity to Hong Kong's population at reasonable cost.

CLP operates three power stations that supply electricity to the population in Kowloon, the New Territories and most of the outlying islands, namely the Castle Peak Power Station (CPPS), the BPPS and the Penny's Bay Power Station (PBPS) which are owned by the CAPCO, a joint venture between CLP and China Southern Power Grid International (HK) Co., Limited, of which CLP holds a 70% interest.

HK Electric operates the LPS that supplies electricity to the population on Hong Kong and Lamma Island.

Hong Kong has no indigenous energy resources and all energy for Hong Kong needs to be imported. Dependable fuel sources are critical to maintaining reliable power supply for the Hong Kong population, while providing environmental benefits. The Hong Kong Special Administrative Region (HKSAR) Government plans to increase the percentage of natural gas used for power generation to around 50 per cent by 2020 to meet its pledged environmental targets.

The Hong Kong Climate Action Plan 2030+ Report states that the HKSAR Government will work closely with CLP and HK Electric; to ensure they can secure adequate supplies of natural gas and put the required infrastructure in place in the coming decade to handle the larger quantities of natural gas that will be required to be imported into Hong Kong in order to meet these HKSAR Government emissions targets.

To support the HKSAR Government in the increased use of natural gas in Hong Kong to reduce carbon intensity from 2020 onwards, CLP and HK Electric have identified that the development of an offshore LNG receiving terminal in Hong Kong based on Floating Storage and Regasification Unit (FSRU) technology presents an additional gas supply option that will provide long-term energy security for Hong Kong, as well as access to competitive gas supplies from world markets.

The purpose of CLP and HK Electric's current proposal is to consider the development of an offshore LNG receiving terminal (LNG Terminal) in Hong Kong based on FSRU technology that is located in HKSAR waters to serve as a gas supply source to meet Hong Kong's future power generation fuel supply needs (hereinafter referred to as the '**Hong Kong Offshore LNG Terminal**' or the '**Project**'). The Project will increase CLP and HK Electric's options regarding the sourcing of future gas supplies for Hong Kong, and provide the flexibility to directly access competitively priced gas from the global LNG market, including its associated spot market, therefore improving the Hong Kong LNG buyers' future negotiating position, and diversity of gas supply sources. The Project is planned to be a 'shared-use' import facility that has the capability to receive and store LNG and then deliver regasified LNG (natural gas) by subsea pipeline to the BPPS and the LPS.

The implementation of this Project is therefore a critical step for ensuring a gas supply source is made available to meet Hong Kong's future power generation fuel supply needs and supporting air quality improvements and environmental performance in Hong Kong.

1.4 Project Components

The Project is comprised of the following key components which are discussed in detail in **Section 3** of the EIA Report:

- An offshore LNG receiving terminal (LNG Terminal) that comprises of the Jetty and the FSRU Vessel, under FEP-01/558/2018/A;
- Two subsea gas pipelines, namely:
 - The BPPS Pipeline, connecting the LNG Terminal with the GRS at the Black Point Power Station (BPPS), under FEP-03/558/2018/B; and
 - The LPS Pipeline, connecting the LNG Terminal with the GRS at the Lamma Power Station (LPS), under FEP-02/558/2018/A;
- The gas receiving station (GRS) facilities, namely:
 - The GRS located within the BPPS, under FEP-03/558/2018/B; and
 - The GRS located within the LPS, under FEP-02/558/2018/A.

The location of these components is shown in **Figures 1.1 to 1.3**.

The following elements of the Project are classified as Designated Projects under the *Environmental Impact Assessment Ordinance (EIAO) (Cap. 499)*:

- Construction of a storage, transfer and trans-shipment facility of liquefied natural gas with a storage capacity of not less than 200 tonnes (*Item L.2 of Part I of Schedule 2 of EIAO*) (under FEP-01/558/2018/A);
- Dredging operations for the construction and maintenance of the LNG Terminal Jetty (under FEP-01/558/2018/A), the construction of the BPPS Pipeline and the LPS Pipeline that exceeds 500,000m³ or are less than 500m from the nearest boundary of an existing or planned marine park (*Item C.12 of Part I of Schedule 2 of EIAO*) (under FEP-03/558/2018/B and FEP-02/558/2018/A respectively); and
- Construction of the subsea gas BPPS Pipeline and LPS Pipeline connecting the LNG Terminal with the GRS at the BPPS and the GRS at the LPS (*Item H.2 of Part I of Schedule 2 of EIAO*) (under FEP-03/558/2018/B and FEP-02/558/2018/A respectively).

1.5 Objective of the EM&A

The broad objective of this Manual is to define the procedures of the EM&A programme for monitoring the environmental performance of the Project during design, construction and operation. The construction and operational impacts arising from the implementation of the Project are specified in

Legend

- Boundary of HKSAR
- Proposed GRS Location at BPPS
- Proposed GRS Location at LPS
- Proposed Route of BPPS Pipeline
- Proposed Route of LPS Pipeline
- Proposed Site for LNG Terminal
- Proposed LNG Terminal Safety Zone

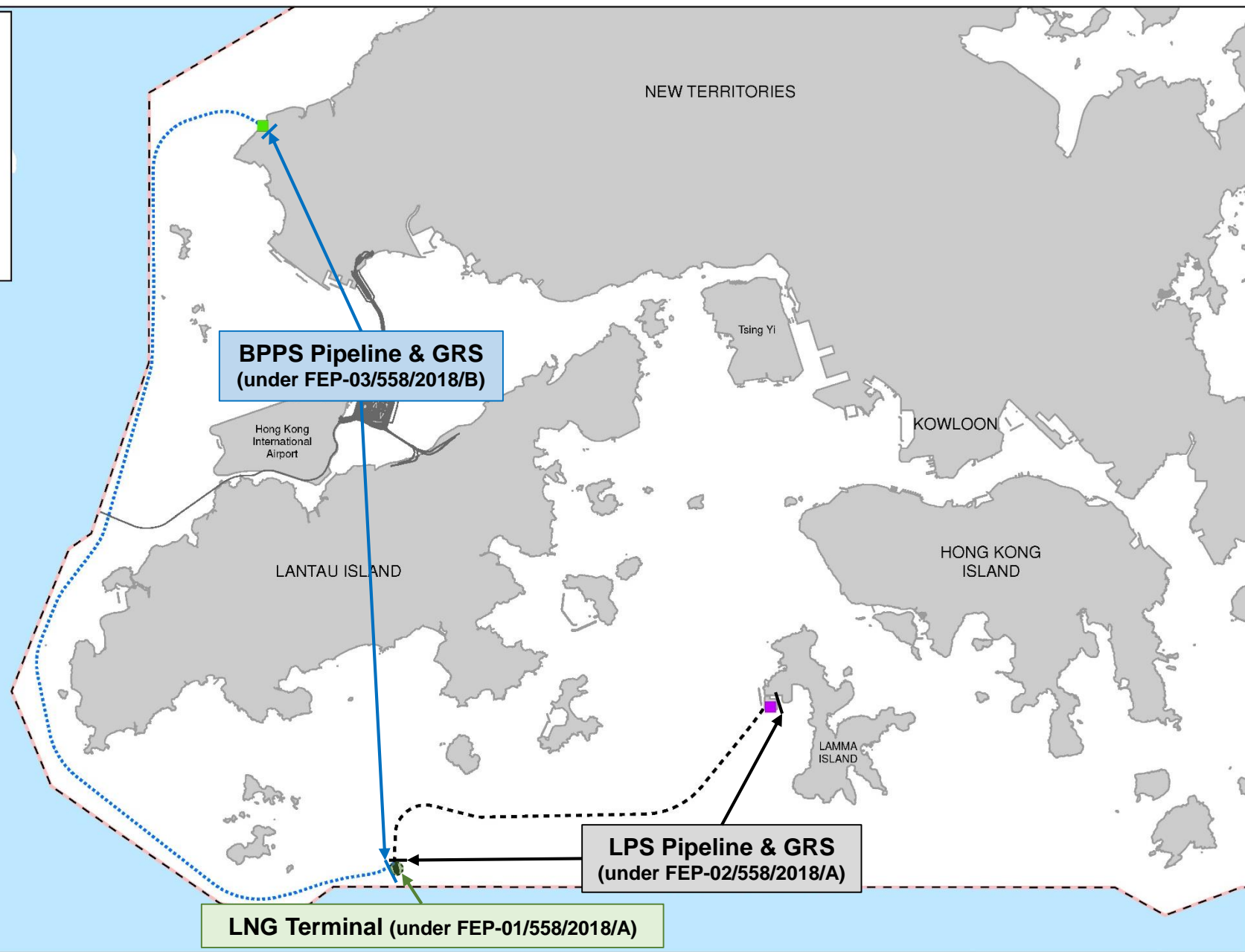
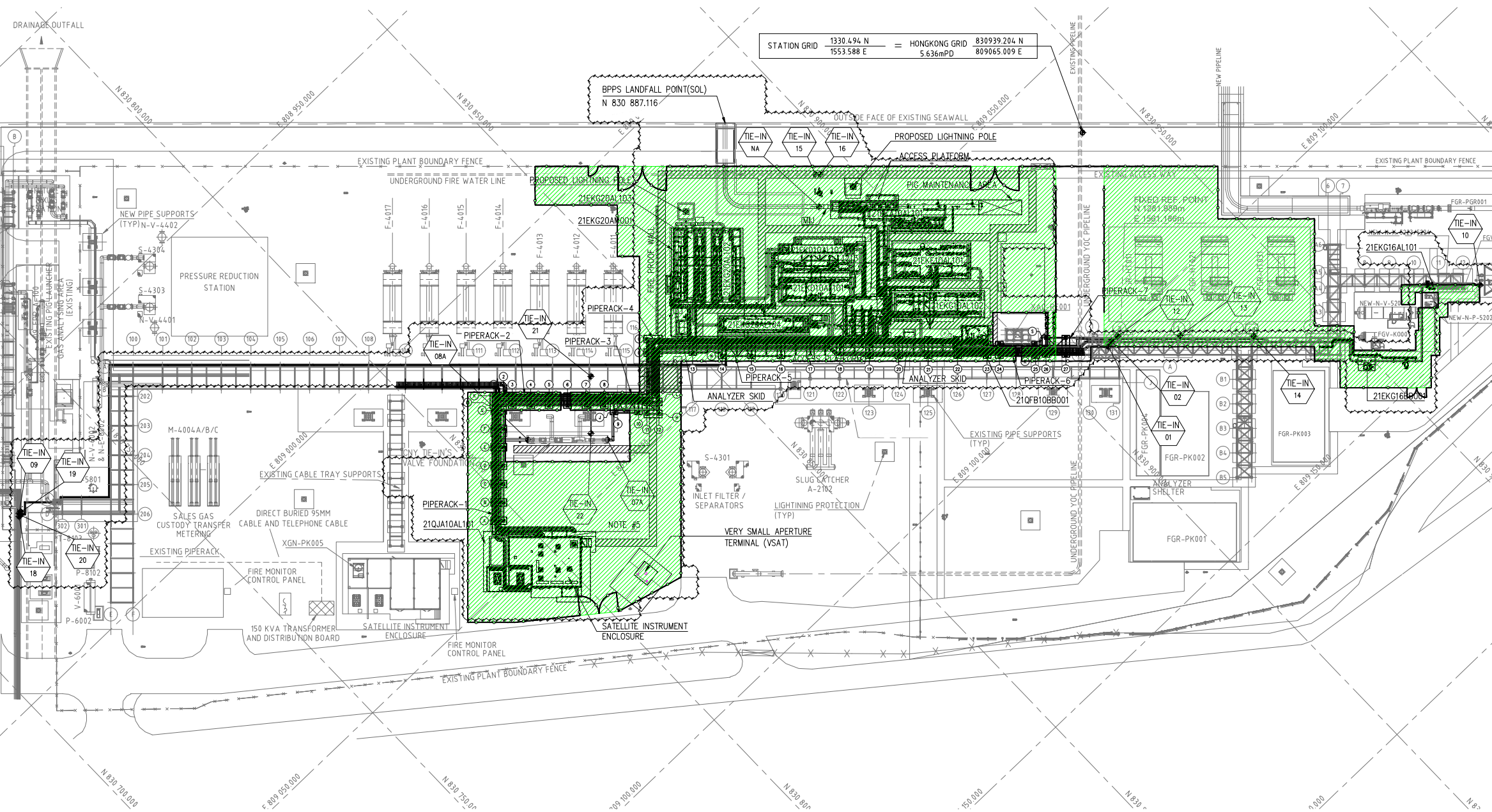
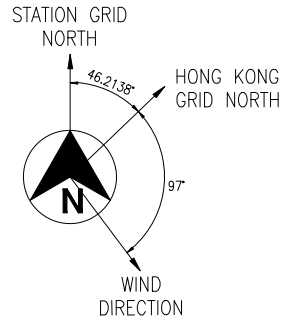


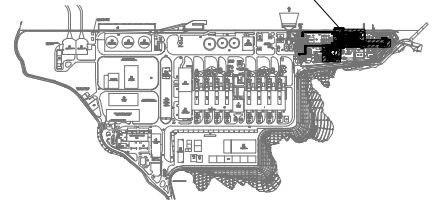
Figure 1.1

Indicative Location of Key Project Components



KEY PLAN

THIS DRAWING



GENERAL NOTES

1. ALL DIMENSIONS ARE IN mm, ELEVATIONS & COORDINATES ARE IN m.
2. NOMINAL GRADE (PIPING DATUM) 0.000m = NOMINAL GRADE (HONG KONG DATUM) 5.700m.
3. RELATIONSHIP OF HONG KONG GRID TO STATION GRID.
H.K. GRID 808 950.493 E = STATION GRID 0.000 E
828 896.966 N = STATION GRID 0.000 N
4. PIG RECEIVER DESIGNED FOR INTELLIGENT PIGGING.
5. EXISTING HOSE REEL CABINET AT NEW SIE BUILDING SHALL BE RELOCATED.

LEGEND

- ESCAPE /ACCESS CLEAR WIDTH OF NOT LESS THAN 1.525m AND CLEAR HEIGHT OF 2.3m.
- NEW BPPS GRS SCOPE OF WORK
- SITE BOUNDARY AT THE BPPS GRS

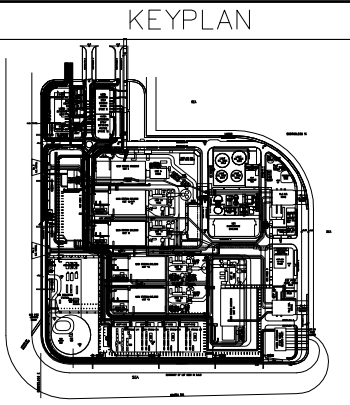
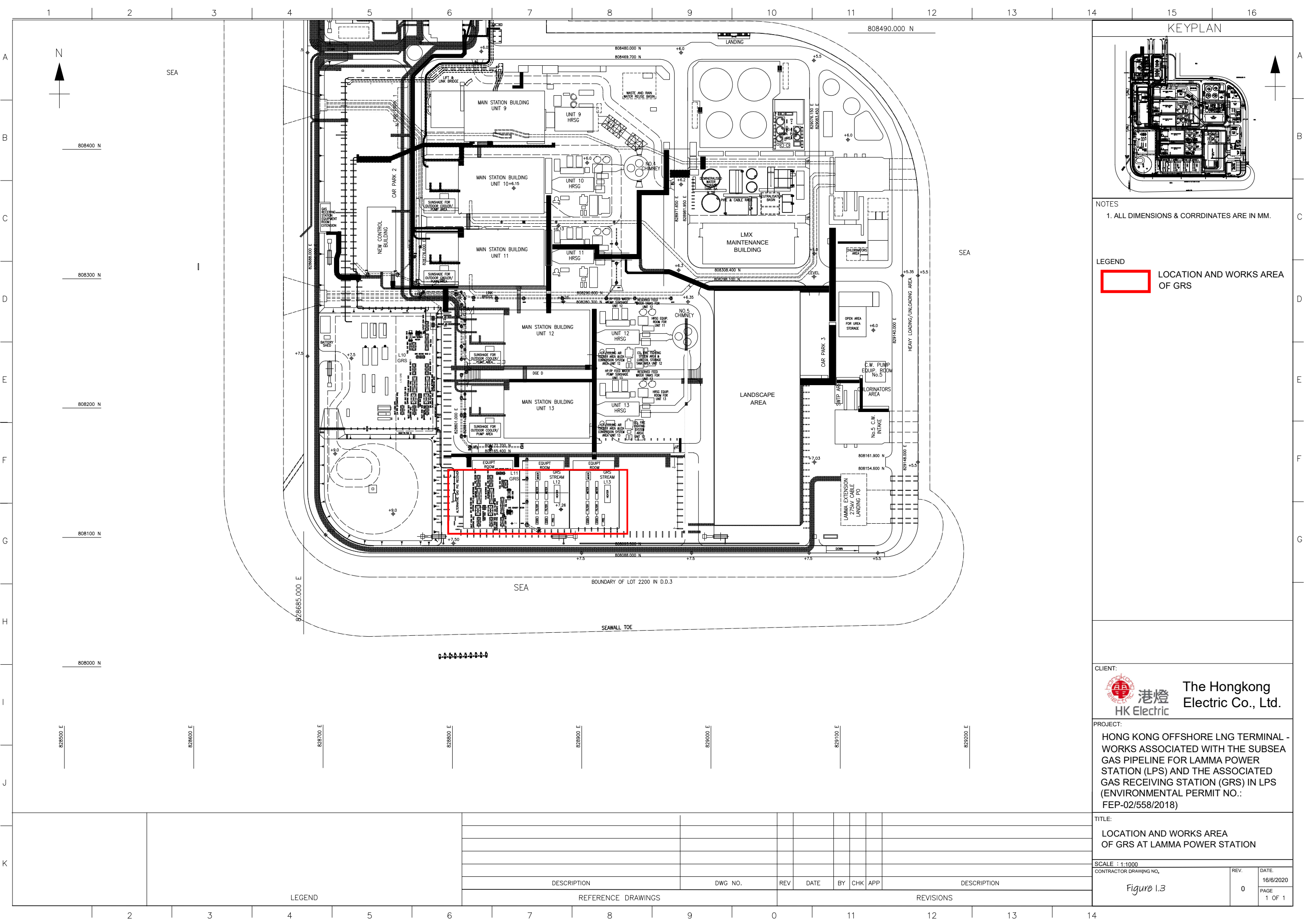
HKOLNG-COEEC-21EKG-MPD010-9101 HKOLNG GRS - EQUIPMENT LIST
 DWG. NO. DRAWING TITLE

REFERENCE DOCUMENTS

REVISION	No.	DATE	DESCRIPTION	BY	CHK.	APP'D	CLP
C	03JUN2020	ISSUED FOR REVIEW		AKR	ASD	MF	
B	17APR2020	INTERNALLY APPROVED		AKR	ASD	MF	
A	21FEB2020	DISCIPLINE INTERNAL CHECK		AKR	ASD	MF	

CLIENT	Capco 香港中華煤氣有限公司 Cable Peak Power Co. Ltd.	Offshore Oil Engineering Co., Ltd.	JOB No. 20ZB-DD02
SIGNATURE	DATE	PROJECT: HONG KONG OFFSHORE LNG TERMINAL PROJECT PACKAGE B	CERTIF. No. A112002816
DRAWN	SGB	20AUG2020	SCALE (A3) 1 : 1000
DESIGNED	AKR	20AUG2020	
CHECKED	ASD	20AUG2020	Figure 1.2
REVIEWED	TWC	20AUG2020	
EXAMINED	TWC	20AUG2020	REV. C
APPROVED	MF	20AUG2020	

DWG No. HKOLNG-COEEC-21EKG-MLDO20-9112



NOTES
1. ALL DIMENSIONS & CORRDNATES ARE IN MM.

LEGEND
 LOCATION AND WORKS AREA OF GRS

CLIENT:
 The Hongkong Electric Co., Ltd.

PROJECT:
 HONG KONG OFFSHORE LNG TERMINAL - WORKS ASSOCIATED WITH THE SUBSEA GAS PIPELINE FOR LAMMA POWER STATION (LPS) AND THE ASSOCIATED GAS RECEIVING STATION (GRS) IN LPS (ENVIRONMENTAL PERMIT NO.: FEP-02/558/2018)

TITLE:
 LOCATION AND WORKS AREA OF GRS AT LAMMA POWER STATION

SCALE : 1:1000
 CONTRACTOR DRAWING NO. REV. DATE
0 16/6/2020
 Figure 1.3 PAGE 1 OF 1

0-0-0-0-0-0-0-0

DESCRIPTION	DWG NO.	REV	DATE	BY	CHK	APP	DESCRIPTION
REFERENCE DRAWINGS							
REVISIONS							

LEGEND

the EIA Report. The EIA Report also specifies mitigation measures and construction practices that may be needed to confirm compliance with the environmental criteria. These mitigation measures and their implementation requirements are presented in the Implementation Schedule of Mitigation Measures (**Annex A**).

The main objectives of the EM&A programme are to:

- provide a database of environmental parameters against which to determine any short term or long term environmental impacts;
- provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards;
- confirm that the mitigation recommendations of the EIA are included in the design of the Project;
- clarify and identify potential sources of pollution, impact and nuisance arising from the works for the responsible parties;
- confirm compliance with regulatory requirements, contract specifications and EIA study recommendations;
- confirm compliance of environmental designs during the design phase of the Project with the specifications stated in the EIA Report and the Environmental Permit (EP)/ Further Environmental Permits (FEPs);
- monitor performance of the mitigation measures and to assess their effectiveness;
- take remedial action if unexpected issues or unacceptable impacts arise;
- verify the environmental impacts predicted in the EIA; and
- audit environmental performance.

This EM&A Manual is a working document which will be reviewed periodically and updated if necessary during the course of implementing the project.

1.6 Scope of the EM&A Programme

The scope of this EM&A programme is to:

- establish baseline water quality levels at specified locations and implement monitoring requirements for water quality monitoring programme;
- implement monitoring requirements for marine mammal monitoring programme;
- implement inspection and audit requirements for waste management;
- liaise with, and provide environmental advice (as requested or when otherwise necessary) to construction site staff on the significance and implications of the environmental monitoring data;
- identify and resolve environmental issues and other functions as they may arise from the works;
- check and quantify the Contractor(s)'s overall environmental performance, implementation of Event and Action Plans (EAPs), and remedial actions taken to mitigate adverse environmental effects as they may arise from the works;
- conduct regular reviews of monitored impact data as the basis for assessing compliance with the defined criteria and to verify that necessary mitigation measures are identified and implemented, and to undertake additional ad hoc monitoring and auditing as required by special circumstances;
- evaluate and interpret environmental monitoring data to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards, and to verify the environmental impacts predicted in the EIA;

- manage and liaise with other individuals or parties concerning other environmental issues deemed to be relevant to the construction process;
- conduct regular site inspections and audits of a formal or informal nature to assess:
 - (i) the level of the Contractor(s)'s general environmental awareness;
 - (ii) the Contractor(s)'s implementation of the recommendations in the EIA and their contractual obligations;
 - (iii) the Contractor(s)'s performance as measured by the EM&A;
 - (iv) the need for specific mitigation measures to be implemented or the continued usage of those previously agreed;
 - (v) to advise the site staff of any identified potential environmental issues; and
- produce monthly EM&A reports which summarise project monitoring and auditing data, with full interpretation illustrating the acceptability or otherwise of any environmental impacts and identification or assessment of the implementation status of agreed mitigation measures.

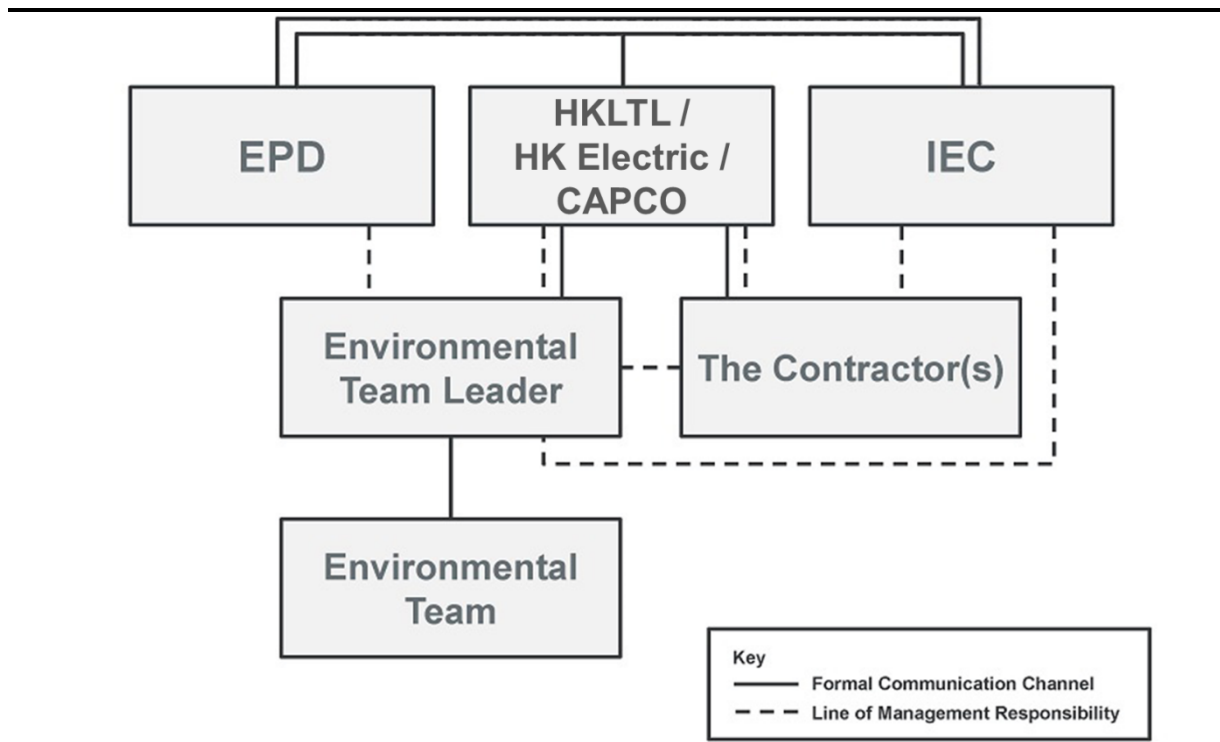
1.7 Works Programme & Works Locations

The updated construction programme is provided under the respective Construction Works Schedules submitted under the three FEPs. The locations of works are shown in **Figures 1.1 to 1.3**.

1.8 Organisation & Structure of the EM&A

The EM&A will require the involvement of the Project Proponents (HKLTL / HK Electric / CAPCO, under the three FEPs), Environmental Team (ET), Independent Environmental Checker (IEC) and the Contractor(s). The roles and responsibilities of the various parties involved in the EM&A process are further expanded in the following sections and in **Figure 1.4**.

Figure 1.4 Indicative Project Organisation Chart



The Project Proponents will appoint ET to conduct the site inspection and monitoring and, to provide specialist advice on the undertaking and implementation of environmental responsibilities. The ET will be led and managed by the ET Leader (ETL). The ETL will have relevant education, training, knowledge, experience and professional qualifications. Suitably qualified staff will be included in the ET, and the ET should not be in any way an associated body of the Contractor(s) for Project construction. For the purpose of this Manual, the ETL, who will be responsible for, and in charge of, the ET, is referred to as the person delegated the role of executing the EM&A requirements.

To maintain strict control of the EM&A process, the Project Proponents will appoint independent environmental consultants to act as IEC to verify and validate/ audit the environmental performance of the Project Proponents' Contractor(s) for Project construction and effectiveness of ET. The IEC will have previous relevant experience with checking and auditing similarly sized EM&A programmes and the IEC will be a recognised environmental professional. Sufficient and suitably qualified professional and technical staff will be employed by the IEC, as required under the EM&A programme for the duration of the Project.

1.8.1 Roles & Responsibilities

The Project Proponents will:

- employ ET as described above;
- employ IEC as described above;
- supervise the Contractor(s)' activities and confirm that the requirements in the EM&A Manual are fully complied with;
- inform the Contractor(s) when action is required to reduce impacts in accordance with the Event and Action Plans;
- adhere to the procedures for carrying out complaint investigation; and
- participate in joint site inspections undertaken by the ET and IEC.

The Contractor(s) for Project construction will:

- implement the EIA recommendations and requirements where applicable;
- provide assistance to the ET in carrying out monitoring and site inspections;
- submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event and Action Plans;
- implement measures to reduce impact where Action and Limit levels are exceeded;
- implement the corrective actions instructed by the Project Proponents/ET/IEC;
- participate in the site inspections undertaken by the ET and the IEC, as required, and undertake any corrective actions instructed by the Project Proponents/ETL/IEC; and
- adhere to the procedures for carrying out complaint investigation.

The ET will:

- monitor various environmental parameters as required in this EM&A Manual;
- assess the EM&A data and review the success of the EM&A programme determining the adequacy of the mitigation measures implemented and the validity of the EIA predictions as well as identify any adverse environmental impacts before they arise;
- carry out regular site inspection to investigate the Contractor(s)'s site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and effect proactive action to pre-empt issues;
- review the Contractor(s)'s working programme and methodology, and comment as necessary;
- review and prepare reports on the environmental monitoring data and site environmental conditions;
- report on the environmental monitoring results and conditions to the IEC, Contractor(s), EPD and the Project Proponents;
- recommend suitable mitigation measures and/or review the proposals of mitigation measure from the Contractor(s) in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans; and
- adhere to the procedures for carrying out complaint investigation.

The IEC will:

- review and audit the implementation of the EM&A programme and the overall level of environmental performance being achieved;
- arrange and conduct regular independent site audits of the works;
- validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring stations, monitoring procedures and locations of sensitive receivers;
- audit the EIA recommendations and requirements against the status of implementation of environmental protection measures on site;
- on an as needed basis, audit the Contractor(s)'s construction methodology and agree the appropriate, reduced impact alternative in consultation with the Project Proponents, the ET and the Contractor(s);
- adhere to the procedures for carrying out complaint investigation;
- review the effectiveness of environmental mitigation measures and project environmental performance including the proposed corrective measures;

- review EM&A report submitted by the ETL and feedback audit results to ET by signing off relevant EM&A proformas; and
- report the findings of site audits and other environmental performance reviews to the Project Proponents, ET, EPD and the Contractor(s).

1.9 Structure of the Updated EM&A Manual

The remainder of the Manual is set out as follows:

- **Section 2** sets out the EM&A requirements for air quality;
- **Section 3** sets out the EM&A requirements for hazard to human life;
- **Section 4** sets out the EM&A requirements for noise;
- **Section 5** details the EM&A requirements for water quality baseline and impact monitoring, and lists relevant monitoring equipment, compliance and Event and Action Plans (EAPs);
- **Section 6** details the EM&A requirements for waste management;
- **Section 7** details the EM&A requirements for ecology;
- **Section 8** details the EM&A requirements for fisheries;
- **Section 9** sets out the EM&A requirements for visual;
- **Section 10** sets out the EM&A requirements for cultural heritage;
- **Section 11** describes the scope and frequency of site environmental inspection;
- **Section 12** details the reporting requirements for the EM&A;
- **Annex A** contains the implementation schedule summarising all mitigation measures proposed in the EIA Report; and
- **Annex B** contains the proforma for the EM&A programme, including monitoring and complaint log sheets.

2. AIR QUALITY

2.1 Construction Phase

The EIA Study concluded that no adverse fugitive dust impact is anticipated during the construction phase, and dust monitoring is considered not necessary. However, it is recommended to conduct regular environmental site inspections, i.e. on a monthly basis, at the GRSs at the BPPS and the LPS to check the implementation of the dust control measures and good site practices as recommended in **Section 4.10.1** of the EIA Report throughout the construction phase.

These measures are also summarised in the Implementation Schedule provided in **Annex A**.

2.2 Operation Phase

No adverse air quality impact is anticipated during the operation of the GRSs at the BPPS or the LPS. Environmental monitoring and audit during the operation phase is not considered necessary.

3. HAZARD TO LIFE

This EIA Study concluded that no unacceptable risks are foreseen as a result of the construction and operation of the proposed Project with safety management measures and safety systems outlined in **Section 5.3.3** and **Annex 5B** of the EIA Report in place to further manage and minimise the external hazards from construction and operational activities.

For operation of the LNG Terminal, implementation of safety management measures and safety systems outlined in **Section 5.3.3** and **Annex 5B** of the EIA Report is recommended, including conducting safety inspections and audits.

These safety measures are summarised in the Implementation Schedule provided in **Annex A**.

4. NOISE

The EIA study of the Project concluded that no unacceptable impacts will be associated with the construction or operation of the Project. Based on this, no construction or operational noise monitoring is considered necessary. Nevertheless, regular site inspections and audits are recommended to be carried out during the construction phase in order to confirm that regulatory requirements are being met.

5. WATER QUALITY

5.1 Introduction

A number of mitigation measures and standard site practice measures for marine and land-based construction activities have been recommended to reduce potential impacts to water quality sensitive receivers. These measures are summarised in the Implementation Schedule provided in **Annex A**.

In accordance with the recommendations of the EIA, water quality EM&A is required during construction phase and operation phase. The following sections provide details of the water quality monitoring to be undertaken by the ET to detect any deterioration of water quality and indirect impacts at water and ecological sensitive receivers. The water quality monitoring programme will be carried out to allow any deteriorating water quality to be readily detected and timely action taken to rectify the situation. The status and locations of water quality sensitive receivers and the marine works location may change after issuing this Manual. If required, the ET in consultation with the IEC will propose updated monitoring locations and seek approval from EPD.

Water quality monitoring for the Project can be divided into the following stages:

- Marine water quality monitoring for dredging and jetting activities during construction phase of the BPPS Pipeline and the LPS Pipeline;
- Verification of efficiency of silt curtain systems;
- Marine water quality monitoring for hydrotesting for the subsea gas pipelines;
- Marine water quality monitoring at selected nearby location during the first year of operation of the LNG Terminal ⁽⁴⁾; and
- Marine water quality monitoring for maintenance dredging during operation phase of the LNG Terminal.

5.2 Sampling & Testing Methodology

5.2.1 Water Quality Parameters

The parameters that have been selected for measurement *in situ* and in the laboratory are those that were either determined in the EIA to be those with the highest potential to be affected by the construction works or are a standard check on water quality conditions. Parameters to be measured in the construction phase and operation phase are listed in **Table 5.1**.

(4) The ETL and IEC shall review the operational and monitoring data by the end of the first year of monitoring and make recommendations on whether an extension is required and for how long the extension should be. The extension may not be continuous if no major increase in operation load is expected in the subsequent year(s) of operation.

Table 5.1 Parameters Measured in the Marine Water Quality Monitoring

Parameters	Unit	Abbr.	Marine Water Quality Monitoring			
			Baseline	Construction Phase and Maintenance Dredging for Jetty	Hydrotesting for the Subsea Gas Pipelines	First-year Operation
<i>In situ</i> measurements						
Dissolved oxygen	mg/L	DO	✓	✓	✓	✓
Dissolved oxygen saturation	%	DOS	✓	✓	✓	✓
Temperature	°C	-	✓	✓	✓	✓
pH	-	-	✓	✓	✓	✓
Turbidity	NTU	-	✓	✓	✓	✓
Salinity	‰	-	✓	✓	✓	✓
Total Residual Chlorine	mg/L	TRC	✓			✓
Laboratory measurements						
Suspended Solids (SS)	mg/L	SS	✓	✓		✓
Total Inorganic Nitrogen (TIN)	mg/L	TIN				✓
5-day Biochemical Oxygen Demand (BOD ₅)	mg/L	BOD ₅				✓

In addition to the water quality parameters, other relevant data will also be measured and recorded in Water Quality Monitoring Logs, including the location of the monitoring stations, water depth, time, weather conditions, sea conditions, tidal state, current direction and velocity, special phenomena and work activities undertaken around the monitoring and works area that may influence the monitoring results. A sample data record sheet is shown in **Annex B** for reference.

5.2.2 Monitoring Equipment

For water quality monitoring, the following equipment will be used:

- **Dissolved Oxygen and Temperature Measuring Equipment** - The instrument will be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and will be operable from a DC power source. It will be capable of measuring: dissolved oxygen levels in the range of 0 - 20 mg L⁻¹ and 0 - 200% saturation; and a temperature of 0 - 45 degrees Celsius. It will have a membrane electrode with automatic temperature compensation complete with a cable of not less than 35m in length. Sufficient stocks of spare electrodes and cables will be available for replacement where necessary.
- **Turbidity Measurement Equipment** - The instrument will be a portable, weatherproof turbidity-measuring unit complete with cable, sensor and comprehensive operation manuals. The equipment will be operated from a DC power source, it will have a photoelectric sensor capable of measuring turbidity between 0 - 1000NTU and will be complete with a cable with at least 35m in length.
- **pH Measurement Instrument** - A portable pH meter capable of measuring a range between 0.0 and 14.0 will be provided for measuring pH.
- **Salinity Measurement Instrument** - A portable salinometer capable of measuring salinity in the range of 0 - 40‰ will be provided for measuring salinity of the water at each monitoring location.
- **Water Depth Gauge** – A portable, battery-operated echo sounder will be used for the determination of water depth at each designated monitoring station. This unit will preferably be

affixed to the bottom of the work boat if the same vessel is to be used throughout the monitoring programme.

- **Current Velocity and Direction** – Acoustic Doppler Current Profilers (ADCP) will be used for measuring the current velocity and direction.
- **Positioning Device** – A hand-held or boat-fixed type differential Global Positioning System (dGPS) with way point bearing indication or other equivalent instrument of similar accuracy will be used to check that the monitoring vessel is at the correct location before taking measurements.
- **Water Sampling Equipment** - A water sampler, consisting of a PVC or glass cylinder of not less than two litres, which can be effectively sealed with cups at both ends, will be used. The water sampler will have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth. A rosette multibottle (each bottle with no less than two litres volume) array water sampler could be used for the monitoring. With the use of this equipment, the sonde for measuring *in situ* water quality parameters could be attached together and the closure of each water sampler could be controlled remotely at the required sampling depth without the need to release messenger physically. This could enhance safety of the water quality monitoring especially at offshore locations where the sea condition could be rough.
- **Total Residual Chlorine** - Total residual chlorine (TRC) shall be measured *in situ* using an approved test kit. The ET proposed and the IEC approved to use a portable test kit which is capable of detecting total chlorine level between 0.001 - 0.500 mg/L or equivalent. Calibration check set recommended by the test kit manufacturer will also be used to check the equipment as part of QA/QC procedures.

5.2.3 Sampling / Testing Protocols

In situ monitoring equipment for the measurement of temperature, dissolved oxygen, turbidity, pH and salinity will be checked, calibrated and certified by a laboratory accredited under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) or any other international accreditation scheme before use, except the test kit for TRC will be checked against the calibration check set provided by the manufacturer before commencement of monitoring. The *in situ* monitoring equipment for the measurement of temperature, dissolved oxygen, turbidity, pH and salinity will be subsequently re-calibrated every three months throughout the stages of the water quality monitoring. Responses of sensors and electrodes will be checked with certified standard solutions before each use. Wet bulb calibration for dissolved oxygen meter will be carried out before commencement of monitoring and after completion of all measurements each day.

On-site calibration of field equipment will follow the “*Guide to On-Site Test Methods for the Analysis of Waters*”, BS 1427: 2009. Sufficient stocks of spare parts will be maintained for replacements when necessary. Backup monitoring equipment will also be made available so that monitoring can proceed uninterrupted even when equipment is under maintenance, calibration etc.

5.2.4 Laboratory Measurement and Analysis

All laboratory work shall be carried out in a HOKLAS accredited laboratory. Sufficient volume of each water sample shall be collected at the monitoring stations for carrying out the laboratory analyses. Using chain of custody forms, collected water samples will be transferred to an HOKLAS accredited laboratory for immediate processing. The determination work for SS, TIN and BOD₅ shall start within 24 hours after collection of the water samples. The laboratory measurements shall be provided to the client as soon as the results are available. Analytical methodology and sample preservation of monitoring parameters will be based on the latest edition of Standard Methods for the Examination of Waste and Wastewater published by American Public Health Association (APHA), American Water Works Association (AWWA) and methods by USEPA, or suitable method in accordance with requirements of HOKLAS or another internationally accredited scheme. The submitted information

should include pre-treatment procedures, instrument use, Quality Assurance/Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per-batch etc.), detection limits and accuracy. The QA/QC details shall be in accordance with requirements of HOKLAS or another internationally accredited scheme.

Parameters for laboratory measurements, their standard methods and their detection limits are presented in **Table 5.2**.

Table 5.2 Standard Methods and Corresponding Detection Limits of Marine Water Quality Monitoring

Parameters	Standard Methods	Detection Limit	Reporting Limit
Baseline			
Dissolved oxygen (mg L ⁻¹)	Instrumental, CTD	0.1	–
Temperature (°C)	Instrumental, CTD	0.1	–
pH	Instrumental, CTD	0.1	–
Turbidity (NTU)	Instrumental, CTD	0.1	–
Salinity (‰)	Instrumental, CTD	0.1	–
SS (mg L ⁻¹)	APHA 2540D	1.0	–
TRC (mg L ⁻¹)	Test-kit *	0.001	*
Construction Phase and Maintenance Dredging			
Dissolved oxygen (mg L ⁻¹)	Instrumental, CTD	0.1	–
Temperature (°C)	Instrumental, CTD	0.1	–
pH	Instrumental, CTD	0.1	–
Turbidity (NTU)	Instrumental, CTD	0.1	–
Salinity (‰)	Instrumental, CTD	0.1	–
SS (mg L ⁻¹)	APHA 2540D	1.0	–
Hydrotesting for the Subsea Gas Pipelines			
Dissolved oxygen (mg L ⁻¹)	Instrumental, CTD	0.1	–
Temperature (°C)	Instrumental, CTD	0.1	–
pH	Instrumental, CTD	0.1	–
Turbidity (NTU)	Instrumental, CTD	0.1	–
Salinity (‰)	Instrumental, CTD	0.1	–
Operation Phase			
Dissolved oxygen (mg L ⁻¹)	Instrumental, CTD	0.1	–
Temperature (°C)	Instrumental, CTD	0.1	–
pH	Instrumental, CTD	0.1	–
Turbidity (NTU)	Instrumental, CTD	0.1	–
Salinity (‰)	Instrumental, CTD	0.1	–
SS (mg L ⁻¹)	APHA 2540D	1.0	–
TIN (mg L ⁻¹)	By calculation (APHA 22ed 4500-NO ²⁻ B (FIA), APHA 22ed 4500-NO ³⁻ I(FIA), ASTM D3590-11 B (FIA))	0.02	–
BOD ₅ (mg L ⁻¹)	APHA 5210b	0.1	–
TRC (mg L ⁻¹)	Test-kit *	0.001 *	–

*Note: The testing methods, Quality Assurance/Quality Control (QA/QC) details, detection limits and accuracy shall be submitted by ET to IEC for agreement prior to the commencement of monitoring programme. A portable test kit which is capable of detecting total chlorine level between 0.001 - 0.500 mg/L or equivalent. Calibration check set recommended by the test kit manufacturer will also be used to check the equipment as part of QA/QC procedures.

5.2.5 Monitoring Locations

The water quality monitoring locations for baseline, construction, post-construction, and first-year operation phases are shown in **Figure 5.1** and the locations for hydrotesting for the subsea gas pipelines is shown in **Figure 5.2** and detailed in **Table 5.3** and **Table 5.4** below. A schedule for water quality monitoring shall be prepared by the ET and approved by IEC and EPD prior to the commencement of the monitoring.

Table 5.3 Location of Water Quality Monitoring Stations

Station	Easting	Northing	Description	Baseline	Construction and Post-Construction
During construction at the pipeline shore approach at LPS (KP18.2 - 17.4), West Lamma Channel (KP14.5 - 17.4)					
IM1	829453	806896	Impact Station for Coastline of South Lamma	✓	✓
IM2	828235	810347	Impact Station for Coastline of North Lamma	✓	✓
E1	827317	811510	Control Station for Ebb Tide	✓	✓
F1	827892	804243	Control Station for Flood Tide	✓	✓
During construction at the Double Berth Jetty to West Lamma Channel (KP0.0 - 14.5)					
IM3	820683	805931	Impact Station for Coastline of South Cheung Chau	✓	✓
IM4	816997	805153	Impact Station for Coastline of South Shek Kwu Chau	✓	✓
IM5	814068	804100	Boundary of Proposed South Lantau Marine Park (MP)	✓	✓
IM6	814073	802029	Boundary of Proposed South Lantau MP	✓	✓
E2	813367	808213	Control Station for Ebb Tide	✓	✓
F2	822532	802161	Control Station for Flood Tide	✓	✓
F3	815032	801161	Control Station for Flood Tide	✓	✓
During construction at the Jetty Approach (KP0.0 - 5.0), South of Soko Islands (KP5.0 - 8.9), Southwest of Soko Islands (KP8.9 - 12.1)					
IM6	814073	802029	Boundary of Proposed South Lantau MP	✓	✓
IM7	811652	802029	Boundary of Proposed South Lantau MP	✓	✓
IM8	810833	801430	Boundary of Proposed South Lantau MP	✓	✓
IM9	807101	801595	Boundary of Proposed South Lantau MP	✓	✓
E3	802686	804123	Control Station for Ebb Tide	✓	✓
F3	815032	801161	Control Station for Flood Tide	✓	✓
During construction at the Adamasta Channel (KP12.1 - 15.6), Southwest Lantau (KP15.6 - 21.3)					
IM10	803145	806407	Boundary of Southwest Lantau MP	✓	✓
IM11A	801914	806510	Boundary of Southwest Lantau MP	✓	✓
IM12	801041	807024	Boundary of Southwest Lantau MP	✓	✓
IM13	800386	810750	Boundary of Southwest Lantau MP	✓	✓
IM14	801376	810750	Boundary of Southwest Lantau MP	✓	✓
E4	801571	811923	Control Station for Ebb Tide	✓	✓
F4	809058	806567	Control Station for Flood Tide	✓	✓
During construction at the West of Tai O to West of HKIA (KP21.3 - 31.5)					

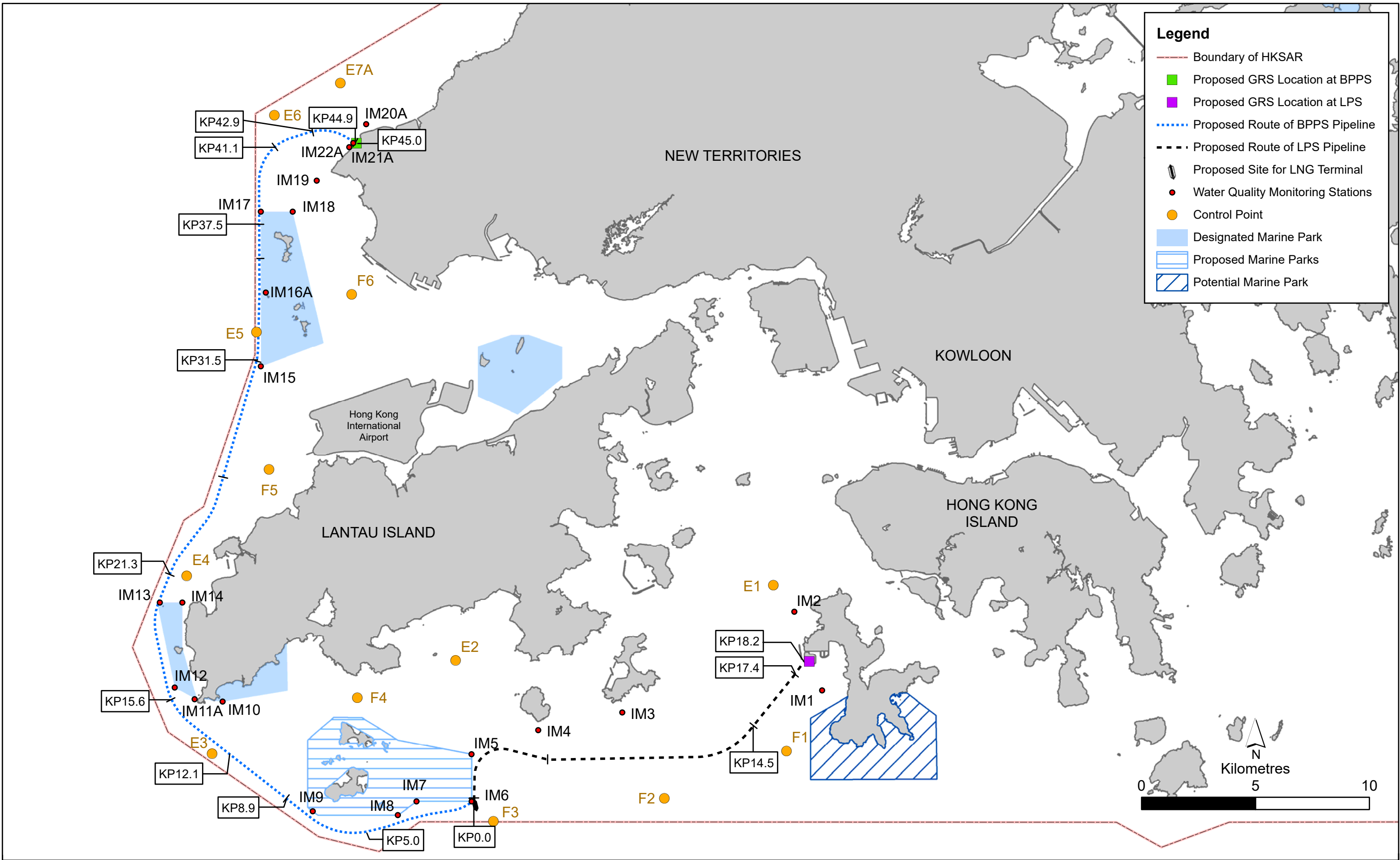


Figure 5.1

Water Quality Monitoring Locations

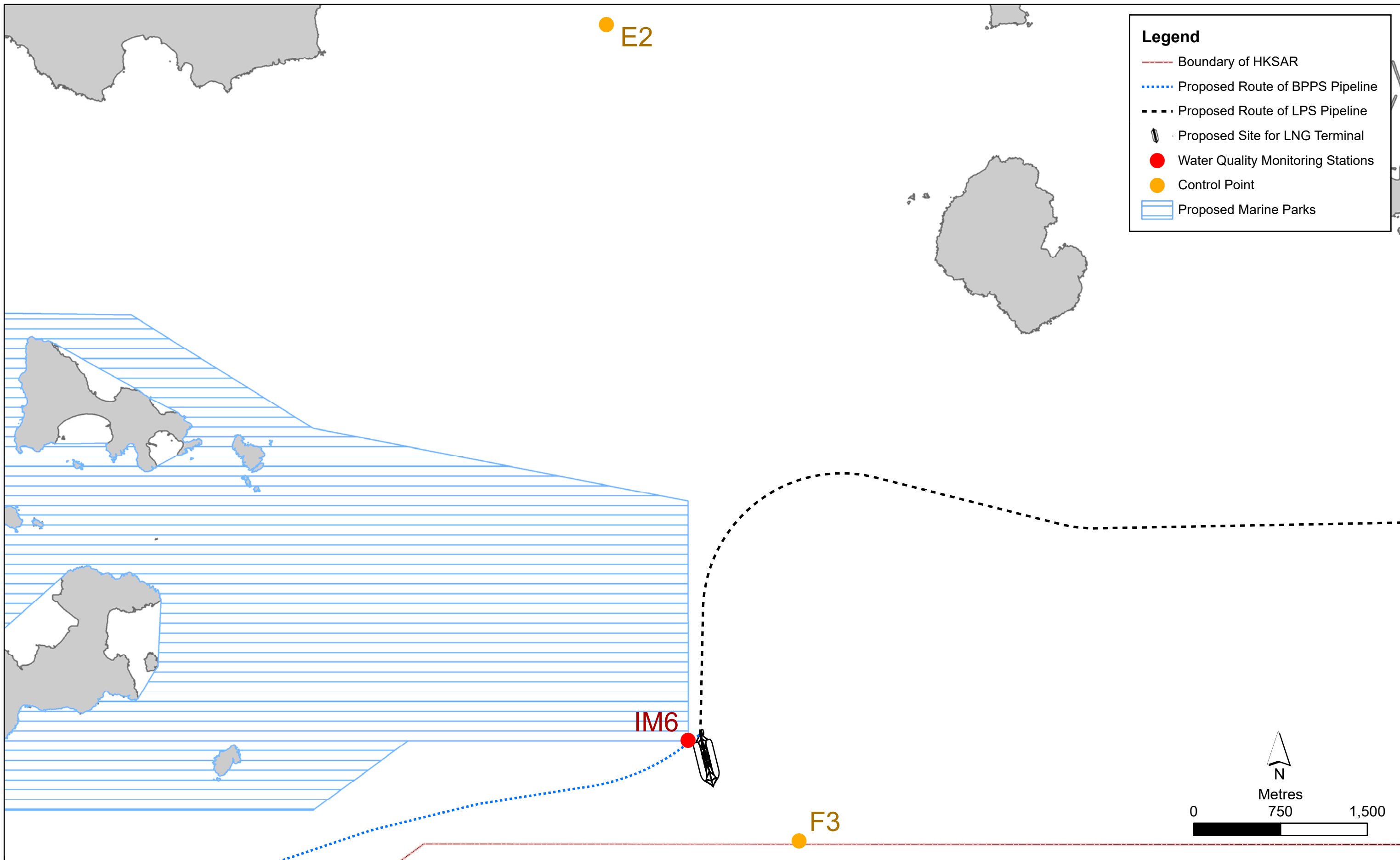


Figure 5.2

Proposed Water Quality Monitoring Locations for Hydrotesting for the Subsea Gas Pipelines

Station	Easting	Northing	Description	Baseline	Construction and Post-Construction
IM15	804820	821110	Boundary of Sha Chau and Lung Kwu Chau MP	✓	✓
E5	804634	822606	Control Station for Ebb Tide	✓	✓
F5	805185	816591	Control Station for Flood Tide	✓	✓
During construction at the West of HKIA to Lung Kwu Chau (KP31.5 - 37.5)					
IM15	804820	821110	Boundary of Sha Chau and Lung Kwu Chau MP	✓	✓
IM17	804865	827855	Boundary of Sha Chau and Lung Kwu Chau MP	✓	✓
IM16A	805039	824343	Coral Colonies at Pak Chau	✓	✓
E6	805418	832113	Control Station for Ebb Tide	✓	✓
F5	805185	816591	Control Station for Flood Tide	✓	✓
During construction at the Lung Kwu Chau to Urmston Anchorage (37.5 - 41.1), Urmston Road (KP41.1 - 42.9)					
IM17	804865	827855	Boundary of Sha Chau and Lung Kwu Chau MP	✓	✓
IM18	806220	827890	Boundary of Sha Chau and Lung Kwu Chau MP	✓	✓
IM19	807274	829250	Impact Station for Coastline of Lung Kwu Tan	✓	✓
E6	805418	832113	Control Station for Ebb Tide	✓	✓
F6	808812	824266	Control Station for Flood Tide	✓	✓
E5	804634	822606	Control Station for Flood Tide	✓	✓
During construction at the West of BPPS (KP42.9 - 44.9), Pipeline shore approach at BPPS (KP44.9 - 45.0)					
IM19	807274	829250	Impact Station for Coastline of Lung Kwu Tan	✓	✓
IM20A	809445	831728	Impact Station for Coastline of Deep Bay	✓	✓
IM21A	808879	830900	Coral Colony at Artificial Seawall at BPPS	✓	✓
IM22A	808703	830717	Coral Colony at Artificial Seawall at BPPS	✓	✓
E7A	808313	833524	Control Station for Ebb Tide	✓	✓
F6	808812	824266	Control Station for Flood Tide	✓	✓

Note:

- (1) TRC will be measured only at monitoring stations IM6, F3 and E2 during baseline monitoring for the purpose of comparing against the operation phase monitoring.
- (2) Alternative monitoring stations (E7A, IM11A, IM16A, IM20A, IM21A and IM22A) were proposed by the ET in consultation with the IEC and approved by EPD in accordance with the provision in Section 5.1 and Section 5.2.5 of the *EM&A Manual*.

Table 5.4 Location of Water Quality Monitoring Station for Hydrotesting for the Subsea Gas Pipelines and Operation Phase

Station	Easting	Northing	Description	Hydrotesting for the Subsea Gas Pipelines	Operation		
					Maintenance Dredging	First of Terminal	Year LNG
During operation phase							
IM6	814073	802029	Boundary of Proposed South Lantau MP	✓	✓	✓	
F3	815032	801161	Control Station for Flood Tide	✓ (during Flood Tide)	✓	✓	
E2	813367	808213	Control Station for Ebb Tide	✓ (during Ebb Tide)	✓	✓	

The status and locations of water quality sensitive receivers and the monitoring sites may change after issuing this Manual. If such cases exist, the ET in consultation with the IEC will propose updated monitoring locations and seek approval from EPD. The above exercise of reviewing the list of water quality monitoring stations should be conducted prior to each maintenance dredging.

When alternative monitoring locations are proposed, they shall be chosen based on the following criteria:

- at locations close to and preferably at the boundary of the site activities as indicated in the EIA Report, which are likely to have water quality impacts;
- close to the sensitive receptors which are directly or likely to be affected;
- for monitoring locations located in the vicinity of the sensitive receptors, care should be taken to cause minimal disturbance during monitoring; and
- control stations which are at locations representative of the project site in its undisturbed condition.

5.3 Sampling Frequency

5.3.1 Baseline Monitoring

Baseline conditions for water quality shall be established and agreed with the IEC and the EPD prior to the commencement of marine construction works for the BPPS Pipeline and the LPS Pipeline. The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of the marine construction works and to demonstrate the suitability of the proposed control monitoring stations. The baseline conditions shall normally be established by measuring the water quality parameters specified above.

The measurements shall be taken at all designated monitoring stations including control stations, at both mid-ebb and mid-flood tides for a minimum of three days per week for four weeks prior to the commencement of the marine construction works. Measurements shall be taken at each station at any time. The interval between two sets of monitoring shall not be less than 36 hours.

No construction activities of the Project shall be on-going in the vicinity of the stations during the baseline monitoring. The ET shall be responsible for undertaking the baseline monitoring and shall consider if baseline monitoring needs to be extended or repeated to take into account the seasonal variations in water quality, and seek agreement with the IEC and EPD. In exceptional cases when insufficient baseline monitoring data or questionable results are obtained, the ET shall seek agreement with the IEC and the EPD on an appropriate set of data to be used as baseline reference.

The baseline monitoring schedule shall be issued to the IEC and EPD at least 2 weeks before the first day of the monitoring event for agreement. The baseline water quality conditions shall be established and agreed with EPD before commencement of marine construction works. EPD shall also be notified immediately for any changes in schedule.

5.3.2 Efficiency of Silt Curtain System

Different silt curtain arrangements have been recommended for marine dredging and jetting works under this Project, including (1) single silt curtain at grab dredger (with silt removal efficiency of 75%), (2) silt curtain at jetting machine (with silt removal efficiency of 85%) and (3) double layer of silt curtains at sensitive receivers (with silt removal efficiency of 80%). The ET shall conduct pilot tests to confirm the efficiency of the silt curtain system to be adopted to satisfy the requirements in the EIA Report.

At the early stage of marine dredging and jetting works, the ET shall prepare the methodology for such pilot test for determination of silt removal efficiency of different silt curtain systems required, for agreement with the IEC and the EPD.

Regardless of the measured efficiency of the silt curtain system, the Event and Action Plan shall only be based on the monitoring results at the proposed monitoring stations.

5.3.3 Construction Phase

During periods when there are pipeline dredging or jetting works, impact monitoring shall be undertaken at the monitoring stations as shown in **Figure 5.2** and **Table 5.3** three times a week. Monitoring at each station would be undertaken at both mid-ebb and mid-flood tides. The interval between two sets of monitoring would not be less than 36 hours. The monitoring frequency would be increased in the case of exceedances of Action/Limit Levels if considered necessary by ET. Monitoring frequency would be maintained as far as practicable.

The monitoring location/position, time, water depth, water temperature, salinity, weather conditions, sea conditions, tidal state, special phenomena and work underway at the marine works site will be recorded.

5.3.4 Post-Construction Monitoring

Upon completion of all marine construction activities, a post-construction water quality monitoring exercise would be carried out for four weeks, in the same manner as the baseline monitoring, except TRC would not be measured during post-construction monitoring.

5.3.5 Monitoring for Hydrotesting for the Subsea Gas Pipelines

Based on the latest design of hydrotesting procedure for the two subsea gas pipelines, seawater added with corrosion inhibitor compound WFT9371 from Weatherford or equivalent, would be used for hydrotesting and the discharge concentration would be less than 10 mg/L. As discussed in the EIA Report, the discharge of hydrotest water may result in DO depletion but toxicity-related water quality impact would not be expected from the discharge of hydrotest water. The hydrotest water will be injected into the two subsea gas pipelines from the respective GRS facilities and discharged at the pipeline risers at the double berth jetty.

Measurement of water quality parameters as stated in **Table 5.1** will be conducted before, during and after discharge of hydrotest water for the two subsea gas pipelines at the nearest sensitive receiver (i.e. IM6) and nearby control station(s) (i.e. E2 and / or F3 depending on the tidal state) (see **Table 5.4** and **Figure 5.2**). The details of sampling depths and replication are discussed in **Section 5.4**. The monitoring location/position, time, water depth, water temperature, salinity, weather conditions, sea conditions, tidal state, special phenomena and work underway around the monitoring stations will be recorded.

The monitoring frequency is subject to further review upon receiving the detailed hydrotesting procedures and schedule from the Contractor(s). The Action and Limit Levels and the Event and Action Plan for the hydrotesting of the subsea gas pipelines will also be developed by ET and agreed with IEC and EPD prior to commencement of the hydrotesting.

5.3.6 First-year of LNG Terminal Operation

Upon commencement of the LNG Terminal's operation, an operation phase water quality monitoring exercise shall be carried out for one year, in the same manner as the baseline monitoring except at a frequency of once per week. Monitoring shall be conducted at proposed locations stated in **Table 5.4**. In case of non-compliance, suitable actions shall be undertaken to notify the plant operator for the non-compliance and identify the cause for the non-compliance. Corrective and remedial actions shall be implemented to improve the effluent quality. The non-compliance events and preventive measures shall be documented. This discharge is subject to the control under WPCO. Thus, a licence under WPCO should be obtained in due course.

5.3.7 Maintenance Dredging

In case maintenance dredging at the LNG Terminal is required, the same water quality monitoring exercise, including baseline monitoring (**Section 5.3.1**), impact monitoring (**Section 5.3.3**) and post-construction monitoring (**Section 5.3.4**) shall be conducted before, during and after the dredging works. Monitoring shall be conducted at proposed locations stated in **Table 5.4**.

5.4 Sampling Depths & Replication

For baseline, construction phase, monitoring for hydrotesting for the subsea gas pipelines and operation phase monitoring, each applicable station will be sampled and measurements/ water samples will be taken at three depths, 1m below the sea surface, mid-depth and 1m above the seabed. For stations that are less than 3m in depth, only the mid-depth sample shall be taken. For stations that are less than 6m in depth, only the surface and bottom samples shall be taken. For *in situ* measurements, duplicate readings shall be made at each water depth at each station. Duplicate water samples shall be collected at each water depth at each station.

5.5 Water Quality Compliance

Water quality monitoring will be evaluated against Action and Limit Levels. The key assessment parameters are dissolved oxygen (DO), temperature, suspended solids (SS), total inorganic nitrogen (TIN), biochemical oxygen demand (BOD₅) and total residual chlorine (TRC), and thus Action and Limit Levels based on the assessment criteria are identified for these. However, turbidity can also provide valuable instantaneous information on water quality and thus Action and Limit Levels are also recommended for this parameter to facilitate quick responsive action in the event of any apparent unacceptable deterioration attributable to the works. The proposed Action and Limit Levels are shown in **Table 5.5** and the Action and Limit Levels for construction phase marine water quality monitoring based on the work locations as presented in the Baseline Monitoring Report approved by EPD are presented in **Table 5.6**.

Action and Limit levels are used to determine whether operational modifications are necessary to mitigate impacts to water quality. In the event that the levels are exceeded, appropriate actions in Event and Action Plan (**Table 5.7**) should be undertaken and a review of works will be carried out by the Contractor(s).

Any noticeable change to water quality will be recorded in the monitoring reports and will be investigated and remedial actions will be undertaken to reduce impacts. Particular attention will be paid to the Contractor(s)'s implementation of the recommended mitigation measures.

Site audit will be conducted throughout the construction phase of the land and marine-based works to confirm the implementation of the water pollution control measures and good site practices as recommended in **Annex A**.

Table 5.5 Action and Limit Levels for Water Quality

Parameter	Action Level	Limit Level
Construction Phase and Maintenance Dredging Marine Water Monitoring		
DO in mg L ⁻¹ ^a	<u>Surface and Middle</u> 5 th %-ile of baseline data for surface and middle layers	<u>Surface and Middle</u> 4 mg L ⁻¹ or 1%ile of baseline for surface and middle layers
	<u>Bottom</u> 5 th %-ile of baseline data for bottom layer	<u>Bottom</u> 2 mg L ⁻¹ or 1%ile of baseline for bottom layer

Parameter	Action Level	Limit Level
Turbidity in NTU (Depth-averaged ^b) ^c	95 th -ile of baseline data, and 120% of the relevant control station's turbidity at the same tide of the same day	99 th -ile of baseline data, and 130% of the relevant control station's turbidity at the same tide of the same day
SS in mg L ⁻¹ (Depth-averaged ^b) ^c	95 th -ile of baseline data, and 120% of the relevant control station's SS at the same tide of the same day	99 th -ile of baseline data, and 130% of the relevant control station's SS at the same tide of the same day
First-year Operation Phase Marine Water Monitoring		
DO in mg L ⁻¹ ^a	<u>Surface and Middle</u> 5 th -ile of baseline data for surface and middle layers	<u>Surface and Middle</u> 4 mg L ⁻¹ or 1%ile of baseline for surface and middle layers
	<u>Bottom</u> 5 th -ile of baseline data for bottom layer	<u>Bottom</u> 2 mg L ⁻¹ or 1%ile of baseline for bottom layer
Water temperature in °C (Depth-averaged ^b) ^c	±1.5 °C of baseline data, and ±1.5 °C of the relevant control station's water temperature at the same tide of the same day	±2.0 °C of baseline data, and ±2.0 °C of the relevant control station's water temperature at the same tide of the same day
Turbidity in NTU (Depth-averaged ^b) ^c	95 th -ile of baseline data ^d , and 120% of the relevant control station's turbidity at the same tide of the same day	99 th -ile of baseline data ^d , and 130% of the relevant control station's turbidity at the same tide of the same day
SS in mg L ⁻¹ (Depth-averaged ^b) ^c	95 th -ile of baseline data ^d , and 120% of the relevant control station's SS at the same tide of the same day	99 th -ile of baseline data ^d , and 130% of the relevant control station's SS at the same tide of the same day
TIN in mg L ⁻¹ (Depth-averaged ^b) ^c	95 th -ile of baseline data ^d , and 120% of the relevant control station's TIN at the same tide of the same day	99 th -ile of baseline data ^d , and 130% of the relevant control station's TIN at the same tide of the same day
BOD ₅ in mg L ⁻¹ (Depth-averaged ^b) ^c	95 th -ile of baseline data ^d , and 120% of the relevant control station's BOD ₅ at the same tide of the same day	99 th -ile of baseline data ^d , and 130% of the relevant control station's BOD ₅ at the same tide of the same day
TRC in mg L ⁻¹ (Depth-averaged ^b) ^c	0.02 mg L ⁻¹	0.02 mg L ⁻¹

Notes:

- For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
- For water temperature, salinity, SS, turbidity, BOD₅, TIN and TRC, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
- Baseline data from EPD Marine Water Quality Monitoring Station SM17 should be referred. The proposed monitoring data shall be submitted to EPD for approval prior to the commencement of monitoring programme.

Table 5.6 Action and Limit Levels for Construction Phase Marine Water Quality Monitoring

Parameter	Action Level	Limit Level
Group 1 – During construction at the pipeline shore approach at LPS (LPS KP18.2 - 17.4), West Lamma Channel (LPS KP14.5 - 17.4)		
DO in mg L ⁻¹ ^a	<u>Surface and Middle</u> 4.2 mg L ⁻¹	<u>Surface and Middle</u> 2.9 mg L ⁻¹
	<u>Bottom</u> 2.4 mg L ⁻¹	<u>Bottom</u> 1.6 mg L ⁻¹
Turbidity in NTU (Depth-averaged ^b) ^c	14.4 NTU, and 120% of the relevant control station's turbidity at the same tide of the same day	19.9 NTU, and 130% of the relevant control station's turbidity at the same tide of the same day
SS in mg L ⁻¹ (Depth-averaged ^b) ^c	20.8 mg L ⁻¹ , and 120% of the relevant control station's SS at the same tide of the same day	29.6 mg L ⁻¹ , and 130% of the relevant control station's SS at the same tide of the same day
Group 2 – During construction at the Double Berth Jetty to West Lamma Channel (LPS KP0.0 - 14.5)		
DO in mg L ⁻¹ ^a	<u>Surface and Middle</u> 3.4 mg L ⁻¹	<u>Surface and Middle</u> 2.4 mg L ⁻¹
	<u>Bottom</u> 1.8 mg L ⁻¹	<u>Bottom</u> 1.4 mg L ⁻¹
Turbidity in NTU (Depth-averaged ^b) ^c	17.1 NTU, and 120% of the relevant control station's turbidity at the same tide of the same day	26.8 NTU, and 130% of the relevant control station's turbidity at the same tide of the same day
SS in mg L ⁻¹ (Depth-averaged ^b) ^c	25.7 mg L ⁻¹ , and 120% of the relevant control station's SS at the same tide of the same day	37.1 mg L ⁻¹ , and 130% of the relevant control station's SS at the same tide of the same day
Group 3 – During construction at the Jetty Approach (BPPS KP0.0 - 5.0), South of Soko Islands (BPPS KP5.0 - 8.9), Southwest of Soko Islands (BPPS KP8.9 - 12.1)		
DO in mg L ⁻¹ ^a	<u>Surface and Middle</u> 4.1 mg L ⁻¹	<u>Surface and Middle</u> 3.0 mg L ⁻¹
	<u>Bottom</u> 2.7 mg L ⁻¹	<u>Bottom</u> 2.0 mg L ⁻¹
Turbidity in NTU (Depth-averaged ^b) ^c	17.0 NTU, and 120% of the relevant control station's turbidity at the same tide of the same day	30.9 NTU, and 130% of the relevant control station's turbidity at the same tide of the same day
SS in mg L ⁻¹ (Depth-averaged ^b) ^c	22.3 mg L ⁻¹ , and 120% of the relevant control station's SS at the same tide of the same day	36.9 mg L ⁻¹ , and 130% of the relevant control station's SS at the same tide of the same day
Group 4 – During construction at the Adamasta Channel (BPPS KP12.1 - 15.6), Southwest Lantau (BPPS KP15.6 - 21.3)		

Parameter	Action Level	Limit Level
DO in mg L ^{-1 a}	<u>Surface and Middle</u> 3.4 mg L ⁻¹	<u>Surface and Middle</u> 2.5 mg L ⁻¹
	<u>Bottom</u> 2.8 mg L ⁻¹	<u>Bottom</u> 2.0 mg L ⁻¹
Turbidity in NTU (Depth-averaged ^{b) c})	63.1 NTU, and 120% of the relevant control station's turbidity at the same tide of the same day	165.7 NTU, and 130% of the relevant control station's turbidity at the same tide of the same day
SS in mg L ⁻¹ (Depth-averaged ^{b) c})	75.4 mg L ⁻¹ , and 120% of the relevant control station's SS at the same tide of the same day	121.8 mg L ⁻¹ , and 130% of the relevant control station's SS at the same tide of the same day
Group 5 – During construction at the West of Tai O to West of HKIA (BPPS KP21.3 - 31.5)		
DO in mg L ^{-1 a}	<u>Surface and Middle</u> 4.6 mg L ⁻¹	<u>Surface and Middle</u> 4.0 mg L ⁻¹
	<u>Bottom</u> 4.0 mg L ⁻¹	<u>Bottom</u> 2.0 mg L ⁻¹
Turbidity in NTU (Depth-averaged ^{b) c})	31.9 NTU, and 120% of the relevant control station's turbidity at the same tide of the same day	46.6 NTU, and 130% of the relevant control station's turbidity at the same tide of the same day
SS in mg L ⁻¹ (Depth-averaged ^{b) c})	64.9 mg L ⁻¹ , and 120% of the relevant control station's SS at the same tide of the same day	72.5 mg L ⁻¹ , and 130% of the relevant control station's SS at the same tide of the same day
Group 6 – During construction at the West of HKIA to Lung Kwu Chau (BPPS KP31.5 - 37.5)		
DO in mg L ^{-1 a}	<u>Surface and Middle</u> 4.4 mg L ⁻¹	<u>Surface and Middle</u> 3.9 mg L ⁻¹
	<u>Bottom</u> 3.9 mg L ⁻¹	<u>Bottom</u> 2.0 mg L ⁻¹
Turbidity in NTU (Depth-averaged ^{b) c})	30.7 NTU, and 120% of the relevant control station's turbidity at the same tide of the same day	47.0 NTU, and 130% of the relevant control station's turbidity at the same tide of the same day
SS in mg L ⁻¹ (Depth-averaged ^{b) c})	49.2 mg L ⁻¹ , and 120% of the relevant control station's SS at the same tide of the same day	74.0 mg L ⁻¹ , and 130% of the relevant control station's SS at the same tide of the same day
Group 7 – During construction at the Lung Kwu Chau to Urmston Anchorage (BPPS KP37.5 - 41.1), Urmston Road (BPPS KP41.1 - 42.9)		
DO in mg L ^{-1 a}	<u>Surface and Middle</u> 3.8 mg L ⁻¹	<u>Surface and Middle</u> 3.4 mg L ⁻¹
	<u>Bottom</u> 3.1 mg L ⁻¹	<u>Bottom</u> 2.0 mg L ⁻¹

Parameter	Action Level	Limit Level
Turbidity in NTU (Depth-averaged ^{b)} ^c	34.5 NTU, and 120% of the relevant control station's turbidity at the same tide of the same day	79.2 NTU, and 130% of the relevant control station's turbidity at the same tide of the same day
SS in mg L ⁻¹ (Depth-averaged ^{b)} ^c	37.8 mg L ⁻¹ , and 120% of the relevant control station's SS at the same tide of the same day	98.2 mg L ⁻¹ , and 130% of the relevant control station's SS at the same tide of the same day
Group 8 – During construction at the West of BPPS (BPPS KP42.9 - 44.9), Pipeline shore approach at BPPS (BPPS KP44.9 - 45.0)		
DO in mg L ⁻¹ ^a	<u>Surface and Middle</u> 4.3 mg L ⁻¹	<u>Surface and Middle</u> 3.4 mg L ⁻¹
	<u>Bottom</u> 3.6 mg L ⁻¹	<u>Bottom</u> 2.0 mg L ⁻¹
Turbidity in NTU (Depth-averaged ^{b)} ^c	34.3 NTU, and 120% of the relevant control station's turbidity at the same tide of the same day	58.5 NTU, and 130% of the relevant control station's turbidity at the same tide of the same day
SS in mg L ⁻¹ (Depth-averaged ^{b)} ^c	42.4 mg L ⁻¹ , and 120% of the relevant control station's SS at the same tide of the same day	78.2 mg L ⁻¹ , and 130% of the relevant control station's SS at the same tide of the same day

Notes:

- a. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- b. "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
- c. For Turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

Table 5.7 Event and Action Plan for Water Quality Monitoring

Event	Action			
	ET	IEC	Contractor(s)	Project Proponents
Action Level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat <i>in-situ</i> measurement to confirm findings; 2. Check monitoring data, plant, equipment and Contractor(s)'s working methods; 3. Identify source(s) of impact and record in notification of exceedance; 4. Inform IEC, Contractor(s) and Project Proponents. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor(s)'s working methods. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance in writing; 2. Check plant and equipment and rectify unacceptable practice. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance in writing.
Action Level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat <i>in-situ</i> measurement to confirm findings; 2. Check monitoring data, plant, equipment and Contractor(s)'s working methods; 3. Identify source(s) of impact and record in notification of exceedance; 4. Inform IEC, Contractor(s) and Project Proponents; 5. Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor(s)'s working methods; 2. Discuss with ET and Contractor(s) on additional mitigation measures and advise Project Proponents accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance in writing; 2. Check plant and equipment and rectify unacceptable practice; 3. Consider changes of working methods; 4. Discuss with ET and IEC on additional mitigation measures and propose them to Project Proponents within 3 working days; 5. Implement the agreed mitigation measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance in writing; 2. Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented; 3. Ensure additional mitigation measures are properly implemented.

Event	Action			
	ET	IEC	Contractor(s)	Project Proponents
Limit Level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat <i>in situ</i> measurement to confirm findings; 2. Check monitoring data, plant, equipment and Contractor(s)'s working methods; 3. Identify source(s) of impact and record in notification of exceedance; 4. Inform IEC, Contractor(s), Project Proponents and EPD; 5. Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor(s)'s working methods; 2. Discuss with ET and Contractor(s) on additional mitigation measures and advise Project Proponents accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance in writing; 2. Check plant and equipment and rectify unacceptable practice; 3. Critically review the need to change working methods; 4. Discuss with ET and IEC on additional mitigation measures and propose them to Project Proponents within 3 working days; 5. Implement the agreed mitigation measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance in writing; 2. Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented; 3. Ensure additional mitigation measures are properly implemented; 4. Request Contractor(s) to critically review the working methods.
Limit Level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat <i>in situ</i> measurement to confirm findings; 2. Check monitoring data, plant, equipment and Contractor(s)'s working methods; 3. Identify source(s) of impact and record in notification of exceedance; 4. Inform IEC, Contractor(s), Project Proponents and EPD; 5. Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor(s)'s working methods; 2. Discuss with ET and Contractor(s) on additional mitigation measures and advise Project Proponents accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance in writing; 2. Check plant and equipment and rectify unacceptable practice; 3. Critically review the need to change working methods; 4. Discuss with ET and IEC on additional mitigation measures and propose them to Project Proponents within 3 working days; 5. Implement the agreed mitigation measures; 6. As directed by Project Proponents, slow down or stop all or part of the marine construction works until no exceedance of Limit Level. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance in writing; 2. Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented; 3. Ensure additional mitigation measures are properly implemented; 4. Request Contractor(s) to critically review the working methods; 5. Consider and instruct, if necessary, the Contractor(s) to slow down or to stop all or part of the marine construction works until no exceedance of Limit Level.

6. WASTE MANAGEMENT

6.1 Introduction

The construction of the Project is expected to generate the following types of waste during the construction phase:

- Dredged marine sediment;
- Construction & demolition (C&D) materials;
- Chemical waste; and
- General refuse.

Mitigation measures, where appropriate, have been recommended as part of the EIA to avoid or reduce potential adverse environmental impacts associated with handling, collection, transport and disposal of waste arising from the construction of the proposed Project.

Waste management will be the Contractor(s)'s responsibility and wastes produced during the construction phase will be managed in accordance with appropriate waste management practices and EPD's regulations and requirements.

Auditing of waste management practices during regular site inspections on land-based work sites (at the GRSs at the BPPS and the LPS), and at marine-based work sites (on marine vessels and at the Jetty) will be conducted to determine if wastes are being managed in accordance with the approved procedures and the site Waste Management Plans. The construction Contractor(s) will be responsible for the implementation of any mitigation measures to reduce waste or redress issues arising from the waste materials.

6.2 Waste Management Practices

The waste management practices and recommended mitigation measures will be incorporated into a Waste Management Plan (WMP) as stated in the *Practice Notes for Authorised Persons, Registered Structural Engineers and Registered Geotechnical Engineers (PNAP) ADV-19 Construction and Demolition waste* for the Project for managing the different types of wastes by the Contractors on site. The WMP will become a part of the Environmental Management Plan (EMP). The contractor is required to prepare the EMP and submit it to the Project Proponents for approval and then implement the EMP accordingly.

The WMP shall describe the arrangements for avoidance, reuse, recovery and recycling, handling, collection, transport, the estimated rate of C&D materials generation and disposal, and the recommended mitigation measures on waste management as set out in **Section 8.5** of the EIA Report. The WMP shall indicate the disposal arrangements and locations of C&D materials and other wastes.

A Trip Ticket system will be included in the WMP. Surplus excavated spoil and other wastes will not be disposed at any other designated disposal locations unless otherwise approved in writing by EPD, Secretary of Public Fill Committee and/or other authorities as appropriate.

The Implementation Schedule (**Annex A**) provides details on the appropriate mitigation measures for avoiding and preventing adverse environmental impacts associated with dredged marine sediment, C&D materials, chemical wastes, general refuse and sewage from the workforce; as well as industrial wastes from maintenance activities and material from maintenance dredging. The WMP will be refined and updated as more detailed information is generated on the volume of dredged marine sediment and the agreed disposal arrangements. Similarly, it will be regularly reviewed, and updated as appropriate, throughout the course of the construction works to confirm that it remains current with the latest detailed information and works practices.

The WMP will also outline the requirements for a waste audit program to verify that the measures outlined in the plan are effectively implemented and adhered to.

6.3 Methodology and Criteria

The construction Contractor(s) must confirm that the necessary disposal permits or licences are obtained from appropriate authorities in accordance with the various Ordinances. In addition to the monthly joint inspections/ audits, each construction Contractor(s) will designate a member of staff as being responsible for routine inspections and audits of on-site waste management practices, with reference to the relevant legislation and guidelines as well as the recommendations given in the Implementation Schedule contained in **Annex A** of this Manual, and defined below:

(1) General Legislation

- *Waste Disposal Ordinance (WDO) (Cap 354);*
- *Waste Disposal (Chemical Waste) (General) Regulation (Cap 354C);*
- *Buildings Ordinance (Cap 123);*
- *Land (Miscellaneous Provisions) Ordinance (Cap 28);*
- *Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances Regulations;*
- *Dumping at Sea Ordinance (DASO) (Cap. 466); and*
- *Merchant Shipping (Prevention and Control of Pollution) Ordinance (Cap 413).*

(2) Other Relevant Guidelines

- *Waste Disposal Plan for Hong Kong (December 1989), Planning, Environment and Lands Branch Government Secretariat, HKSAR Government;*
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992), EPD, HKSAR Government;*
- *Hong Kong Planning Standards and Guidelines Planning (2014), Planning Department, HKSAR Government;*
- *WBTC No. 2/93 - Public Dumps, Works Branch, HKSAR Government;*
- *WBTC No. 2/93B - Public Filling Facilities, Works Branch, HKSAR Government;*
- *WBTC No. 16/96 - Wet Soil in Public Dumps, Works Branch, HKSAR Government;*
- *Waste Reduction Framework Plan, 1998 to 2007, Planning, Environment and Lands Bureau, Government Secretariat, 5 November 1998;*
- *WBTC No. 4/98 and 4/98A - Use of Public Fill in Reclamation and Earth Filling Projects, Works Bureau, HK SAR Government;*
- *Project Administration Handbook for Civil Engineering Works, Section 3.3(i) of Chapter 2 and Section 4.13 of Chapter 4 - Incorporation of Information on Construction and Demolition Material Management in Public Works Subcommittee Papers, Hong Kong SAR Government;*
- *WBTC No. 12/2000 - Fill Management, Works Bureau, HKSAR Government;*
- *WBTC No. 19/2001 - Metallic Site Hoardings and Signboards; Works Bureau, HKSAR Government;*
- *Project Administration Handbook for Civil Engineering Works, Section 21.25 of Chapter 7 and Section 9.12 of Chapter 5 - Control of Site Crushers, HKSAR Government;*

- *WBTC No. 12/2002 - Specifications Facilitating the Use of Recycled Aggregates, Works Bureau, HKSAR Government;*
- *Project Administration Handbook for Civil Engineering Works, Section 4.1.3 of Chapter 4 - Management of Construction and Demolition Material Including Rock, HKSAR Government;*
- *ETWB TC(W) No. 19/2005 - Environmental Management on Construction Sites, Environment, Transport and Works Bureau, HKSAR Government;*
- *DevB TC(W) No. 6/2010 - Trip Ticket System for Disposal of Construction & Demolition Materials, Development Bureau, HKSAR Government;*
- *Practice Notes for Authorised Persons, Registered Structural Engineers and Registered Geotechnical Engineers (PNAP) ADV-19 Construction and Demolition Waste; and*
- *PNAP ADV-21 Management Framework for Disposal of Dredged/ Excavated Sediment.*

The Contractor(s)'s waste management practices will be audited with reference to the checklist detailed in **Table 6.1** below.

Details of the required mitigation measures are included in the Implementation Schedule of **Annex A** of this **EM&A Manual**.

Table 6.1 Waste Management Checklist

Activities	Timing	Checking Frequency	If non-compliance noted, Action Required
Necessary waste disposal permits or licences have been obtained.	Before the commencement of works	Once	The ET will inform the Contractor(s), IEC and Project Proponents. The Contractor(s) will apply for the necessary permits/ licences prior to disposal of the waste. The ET will verify that corrective action has been taken.
Dredged sediments are managed and disposed in accordance with PNAP ADV-21: Management Framework for Disposal of Dredged/ Excavated Sediment and Dumping at Sea Ordinance (DASO).	Throughout the dredging works	Each Month	The ET will inform the Contractor(s), IEC and Project Proponents. Project Proponents will instruct the Contractor(s) to manage and dispose the dredged materials properly. The Contractor(s) will immediately suspend dredging until the dredging materials are properly managed and disposed.
Waste are collected by licensed waste hauliers and disposed of at licensed sites.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and Project Proponents. Project Proponents will instruct the Contractor(s) to comply. The Contractor(s) will temporarily suspend waste collection of that particular waste until a licensed waste haulier is used. Corrective action will be undertaken within 48 hours.
Records of quantities of wastes generated, recycled and disposed of and the disposal sites are properly kept.	Throughout the works	Each Month	The ET will inform the Contractor(s), IEC and Project Proponents. The Contractor(s) will estimate the missing data based on previous records and the activities carried out. The ET will review the results and forward to Project Proponents for approval.
Sufficient waste disposal points are provided. Wastes are collected and removed from site in a timely manner. General refuse is collected on a regular basis.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and Project Proponents. Project Proponents will instruct the Contractor(s) to remove waste accordingly.
Waste storage areas are properly cleaned and do not cause windblown litter and dust nuisance. Appropriate measures to reduce windblown litter and dust nuisance of waste will be adopted, e.g. by either covering trucks or by transporting wastes in enclosed containers.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and Project Proponents. Project Proponents will instruct the Contractor(s) to clean the storage area and/or cover the waste.

Activities	Timing	Checking Frequency	If non-compliance noted, Action Required
Different types of waste are segregated in different containers or skip to enhance reuse and recycling of material and proper disposal of waste.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and Project Proponents. Project Proponents will instruct the Contractor(s) to provide separate skips/ containers. The Contractor(s) will verify that the workers place the waste in the appropriate containers.
Chemical wastes are stored, handled and disposed of in accordance with the <i>Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes</i> , published by the EPD. Chemical wastes are separated for special handling and appropriate treatment at the Chemical Waste Treatment Centre at Tsing Yi.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and Project Proponents. Project Proponents will instruct the Contractor(s) to rectify the issues immediately. Warning will be given to the Contractor(s) if corrective actions are not taken within 24 hrs.

Note: ET – Environmental Team, IEC – Independent Environmental Checker

7. ECOLOGY

7.1 Introduction

The EIA indicates that construction phase impacts with recommended mitigation, and operation phase impacts are not expected to be unacceptable to terrestrial and marine ecological resources. Appropriate mitigation measures are proposed in the EIA to control the environmental impacts to marine and terrestrial ecology to within acceptable levels.

The following sections provide details of the measures to be undertaken by the ET to confirm that the measures recommended in the EIA are carried out.

7.2 Marine Mammal Monitoring

In order to determine the efficacy of the recommended mitigation measures and provide verification of impact prediction/ evaluation results, monitoring of marine mammal is recommended. Monitoring shall cover a baseline period, the construction and post-construction monitoring. The monitoring will be conducted using vessel-based line transect survey and passive acoustic monitoring (PAM) method. All monitoring should be led by suitably qualified persons (degree in biology or equivalent).

Details on the vessel-based line transect survey and PAM survey are presented below. The ET liaised with Agriculture, Fisheries and Conservation Department (AFCD) to finalise the baseline and construction phase marine mammal monitoring programme in June 2019 and the post-construction marine mammal monitoring programme in May 2022 prior to the respective monitoring being undertaken.

7.2.1 Vessel-based Line Transect Survey

7.2.1.1 General Approach, Schedule and Survey Area

Vessel-based marine mammal survey by means of systematic line-transect boat survey will be undertaken to examine the distribution and encounter rate of Finless Porpoise in southern Lantau where a majority of Project construction works would take place. Survey transects are proposed to cover three survey areas for line-transect boat surveys, namely Southwest Lantau (SWL), Southeast Lantau (SEL) and Lamma (LM) are presented in **Figure 7.1**. The methodology of the survey will be consistent and compatible with that adopted in the EIA baseline surveys as well as the long-term marine mammal monitoring programme conducted by AFCD since 1995 to allow potential comparisons and pooling data for analysis.

The transect boat survey will be conducted from a 15m inboard vessels (with an open upper deck above the pilothouse, providing a mostly unobstructed 180° view of the area ahead of the vessel), weather permitting (Beaufort 0-5, no heavy rain, and visibility > 1,200m). The marine mammal observer (MMO) team will conduct searches and observations from the flying bridge area, 4-5m eye height above the water surface. In order to ensure the quality of the data and allow consistency with the long-term AFCD database, and take consideration of the sea conditions of the monitoring site, a team of three qualified and trained MMOs will make up the survey team.

As the vessel transits the transect lines at a relatively constant speed of 13-15km hr⁻¹, the primary MMO searches for marine mammals continuously through 7 X 50 marine binoculars. A second MMO searches with unaided eye and fills out data sheets. Both MMOs search ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°). MMOs rotate positions approximately every 30 minutes. There will be an additional MMO on the boat, who rotate into position to give observers a rest after each hour of search effort, thereby minimizing fatigue.

Effort data collected during on-effort monitoring periods includes time and position for the start and end of search effort, vessel speed, sea state (Beaufort scale), visibility, and distance travelled in each series (a continuous period of search effort). When marine mammals are sighted, the MMO fills out a

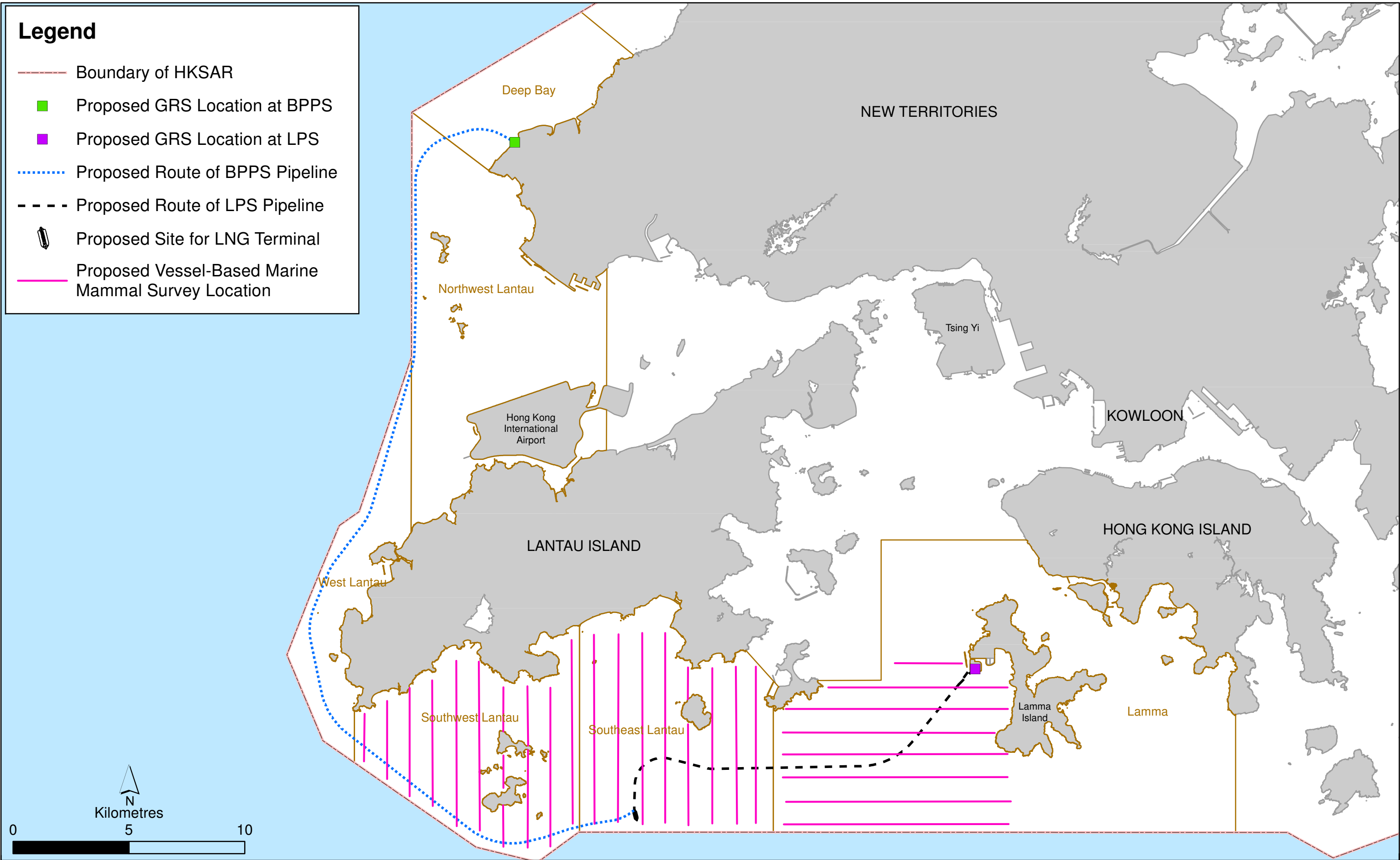


Figure 7.1

Proposed Vessel-Based Marine Mammal Survey Location

sighting sheet (**Annex B**), and generally the team is taken off-effort and the vessel is diverted from its course to approach the marine mammal group for group size estimation, behavioural observations, and collection of identification photos. The sighting sheet includes information on initial sighting angle and distance, position of initial sighting, sea state, group size and composition, and behaviour, such as response to the survey vessel and associations with vessels. Position, distance travelled, and vessel speed are obtained from a hand-held Global Positioning System (GPS) unit.

All records of marine mammal sightings will be collated, compiled and integrated with Geographic Information System (GIS). Positions of sightings together with group sizes, activities and calf occurrence will be plotted on figures for illustration of spatial and temporal patterns of porpoise distribution, if any. The method for line transect analysis of porpoise encounter rate will follow the established approach for AFCD long-term marine mammal monitoring ⁽⁵⁾. It should be noted that as Finless Porpoises are cryptic and difficult to identify as unique individuals with no useful natural markings, the potential of double counting cannot be eliminated and hence rendering any abundance or density estimation confounded with serious violation of assumption under the line-transect survey method; therefore such analysis is not proposed to be completed for Finless Porpoise, which is the same approach for the AFCD long-term marine mammal monitoring.

Vessel-based line transect marine mammal surveys are proposed to be conducted during the 6-month baseline monitoring, construction of the LNG Terminal and for a period of one year post-construction after completion of marine-based construction works of the Project. Each transect line is proposed to be surveyed twice per month.

The final survey method, survey areas and duration of the survey have been agreed in consultation with a marine mammal expert with experience in vessel-based line transect surveys and the AFCD.

7.2.1.2 Determination of Action and Limit Levels

The EIA predicts that marine mammals would avoid the vicinity of the works areas during the construction period and would return to the areas upon cessation of the disturbance. Consequently, there may be a decline of Finless Porpoise usage of some waters of the Southeast Lantau survey area where the LNG Terminal is located, while the animals are expected to move to the broader southern Lantau waters including the Southwest Lantau and Lamma survey areas and continue to use the broader areas to a similar degree.

To detect unacceptable/ unforeseen changes in Finless Porpoise distribution as construction work progresses, it is proposed to establish the Action Level and Limit Level for construction phase marine mammal monitoring using encounter rate calculated from the vessel-based line transect surveys from the three survey areas as a whole. For each monthly reporting period, encounter rate from construction phase monitoring will be calculated using the last three months' monitoring data, i.e. a running quarterly value, and compared with the encounter rate from baseline monitoring to check if the threshold values are triggered for remedial actions to be undertaken. This approach would allow natural seasonal fluctuations in Finless Porpoise encounter rate to be accounted for, and allow porpoise data to be reviewed every month such as appropriate actions could be taken timely.

The Action and Limit Levels for marine mammal monitoring as determined in the Baseline Monitoring Report approved by EPD are presented in **Table 7.1**. The Event and Action Plan for marine mammal monitoring describing the appropriate actions to be undertaken in the event that the Action and Limit Levels are exceeded, with a view to mitigating unacceptable/ unforeseen changes in Finless Porpoise distribution as a result of Project construction works is shown in **Table 7.2**.

(5) Samuel K.Y. Hung (2015) *Monitoring of Marine Mammals in Hong Kong Waters (2014-15): Final Report (1 April 2014 to 31 March 2015)*. Submitted to the Agriculture, Fisheries and Conservation Department of the Hong Kong SAR Government Tender Re.: AFCD/SQ/177/13

Table 7.1 Action and Limit Levels for Marine Mammal Monitoring

Monitoring Area	Action Level	Limit Level
Criteria for establishing Action and Limit Levels		
SWL, SEL and LM as a whole	Running quarterly STG & ANI < combined encounter rates from the six-month baseline monitoring data	Two consecutive running quarterly STG & ANI < combined encounter rates from the six-month baseline monitoring data
Derived Values from the data obtained during the 6-month baseline vessel-based marine mammal surveys		
SWL, SEL and LM as a whole	Running quarterly STG < 1.12 & ANI < 2.18	Two consecutive running quarterly STG < 1.12 & ANI < 2.18

Note: Action / Limit Levels will be triggered if both STG and ANI fall below the criteria.

Table 7.2 Event and Action Plan for Marine Mammal Monitoring

Event	Action			
	ET	IEC	Contractor(s)	Project Proponents
Action Level exceeded	<ol style="list-style-type: none"> 1. Check monitoring data and repeat data analysis to confirm findings; 2. Review available AFCD data and relevant EM&A data to check if the exceedance is due to natural variation or works related; 3. Identify potential source(s) of impact; 4. Inform the IEC, Project Proponents and Contractor; 5. Increase site inspection and audit frequency to ensure all the marine mammal protective and/or precautionary measures are properly implemented. 	<ol style="list-style-type: none"> 1. Check monitoring data and analysis and investigation by ET; 2. Conduct additional site inspection and audit with ET to ensure all the marine mammal protective and/or precautionary measures are properly implemented and advise Project Proponents the audit results and findings accordingly. 	<ol style="list-style-type: none"> 1. Inform the Project Proponents and confirm notification of the non-compliance in writing; 2. Conduct site inspection and audit with the ETL and IEC; 3. Ensure all the marine mammal protective and/or precautionary measures are properly implemented. 	<ol style="list-style-type: none"> 1. Discuss the need for increased site inspection and audit frequency proposed by ET with IEC and the Contractor; 2. Check the audit results and findings from ET and IEC.
Limit Level exceeded	<ol style="list-style-type: none"> 1. Check monitoring data and repeat data analysis to confirm findings; 2. Review available AFCD data and relevant EM&A data to check if the exceedance is due to natural variation or works related; 3. Identify potential source(s) of impact; 4. Inform the IEC, Project Proponents and Contractor; 5. Increase site inspection and audit frequency to ensure all the marine mammal protective and/or precautionary measures are properly implemented; 6. Review previous occurrence of non-compliance events to investigate if there is a longer term trend that needs attention; 7. ET to discuss and confirm with Project Proponents, IEC and Contractor on the need for further mitigation measures (e.g. consider controlling and, if necessary suspending marine works associated with the suspected source of impact). 	<ol style="list-style-type: none"> 1. Check monitoring data and analysis and investigation by ET; 2. Conduct additional site inspection and audit with ET to ensure all the marine mammal protective and/or precautionary measures are properly implemented and advise Project Proponents the audit results and findings accordingly 3. Discuss and confirm further mitigation measures with Project Proponents, ET and Contractor; 4. Supervise / audit the implementation of further mitigation measures and advise Project Proponents the results and findings accordingly. 	<ol style="list-style-type: none"> 1. Inform the Project Proponents and confirm notification of the non-compliance in writing; 2. Conduct site inspection and audit with the ETL and IEC; 3. Ensure all the marine mammal protective and/or precautionary measures are properly implemented; 4. Discuss and confirm further mitigation measures with the ETL, IEC and Project Proponents; 5. Carry out further measures when advised by ET and agreed by Project Proponents and IEC. 	<ol style="list-style-type: none"> 1. Discuss the need for increased site inspection and audit frequency proposed by ET with IEC and the Contractor; 2. Check the audit results and findings from ET and IEC; 3. Discuss and confirm further mitigation measures with the ET, IEC and Contractor; 4. Supervise the implementation of further mitigation measures.

7.2.2 Passive Acoustic Monitoring

7.2.2.1 General Approach, Schedule and Survey Area

Underwater PAM survey is a tool for detecting the high frequency clicks of marine mammals as these are easily-distinguished from sounds of other marine animals. Recent experience includes specific C-POD (Cetacean-Porpoise Detector) devices that more accurately records vocalizations of finless porpoises plus all other echolocating toothed whales and dolphins. The deployment of such devices would allow the activity of finless porpoises to be monitored both day and night over 24 hours in all weather conditions. As such, C-PODs are proposed to be deployed as part of the EM&A for this Project to provide supplementary information on porpoise usage of southern Lantau waters.

As porpoise clicks are substantially above 100 kHz in frequency, it is noted that the detection distance is likely to be on the order of low 100's of meters from bottom-mounted C-PODs, initially, C-PODs are proposed to be deployed at five (5) locations (**Figure 7.2**) on the seabed within and in the vicinity of the LNG Terminal site in consideration of the followings:

- The locations are selected that can be deployed over the baseline, construction and post-construction periods of the Project;
- Avoid encroaching other nearby utilities and facilities (e.g. submarine cables, South Cheung Chau Sediment Disposal Facility);
- Avoid overlapping with existing C-POD deployment locations by others; and
- Dolphins Per Survey Effort (DPSE) / Sightings Per Survey Effort (SPSE) of finless porpoise in 2007-2017

C-PODs should be left in place during the 6-month baseline monitoring, construction of the LNG Terminal and for a period of one year post-construction after completion of marine-based construction works of the Project. Such duration should allow for a robust record of marine mammal usage of the area to be obtained and allow for the inter-seasonal differences already known for finless porpoises. The C-PODs deployed will need to be serviced every two to four months, subject to review on an as-needed basis, to download accumulated data and replace batteries.

The downloaded record from the C-PODs will be examined to identify vocalisation of finless porpoises. Analysis shall be undertaken to obtain information on finless porpoises such as:

- Number of clicks: calculated per hour to detect diel patterns, and per day to determine activity level at a site;
- Detection positive minutes (DPM): indicates the total amount of minutes where at least one click train was detected within a one minute time period, to measure the duration the finless porpoises spent in an area;
- Duration of click trains: provides an indication of the average density of finless porpoises at a site; and
- Encounter rates: represents the number of porpoise echolocation click train (>5 clicks) encounters per hour of acoustic measurement with the C-POD.

Any spatial or temporal trends (especially the 24-hour activity patterns) in changes of the above parameter will be determined.

The final number, positioning and duration of the deployment of devices have been agreed in consultation with a marine mammal expert with experience in PAM / C-POD application and the AFCD.

Legend

- Boundary of HKSAR
- Proposed Route of BPPS Pipeline
- Proposed Route of LPS Pipeline
- Proposed Site for LNG Terminal
- Proposed South Lantau Marine Park
- Open Sea Disposal Area
- Proposed Safety Zone
- Proposed C-POD Deployment Location
- Submarine Cable
- Power Lines
- Pipeline

Proposed C-POD Deployment Location			
ID	Longitude	Latitude	Water Depth (m)
1	113° 55' 10.201" E	22° 09' 46.379" N	13
2	113° 56' 43.723" E	22° 09' 30.563" N	14
3	113° 57' 09.118" E	22° 09' 30.592" N	14.7
4	113° 57' 13.030" E	22° 10' 23.959" N	14.1
5	113° 59' 50.741" E	22° 11' 26.794" N	14

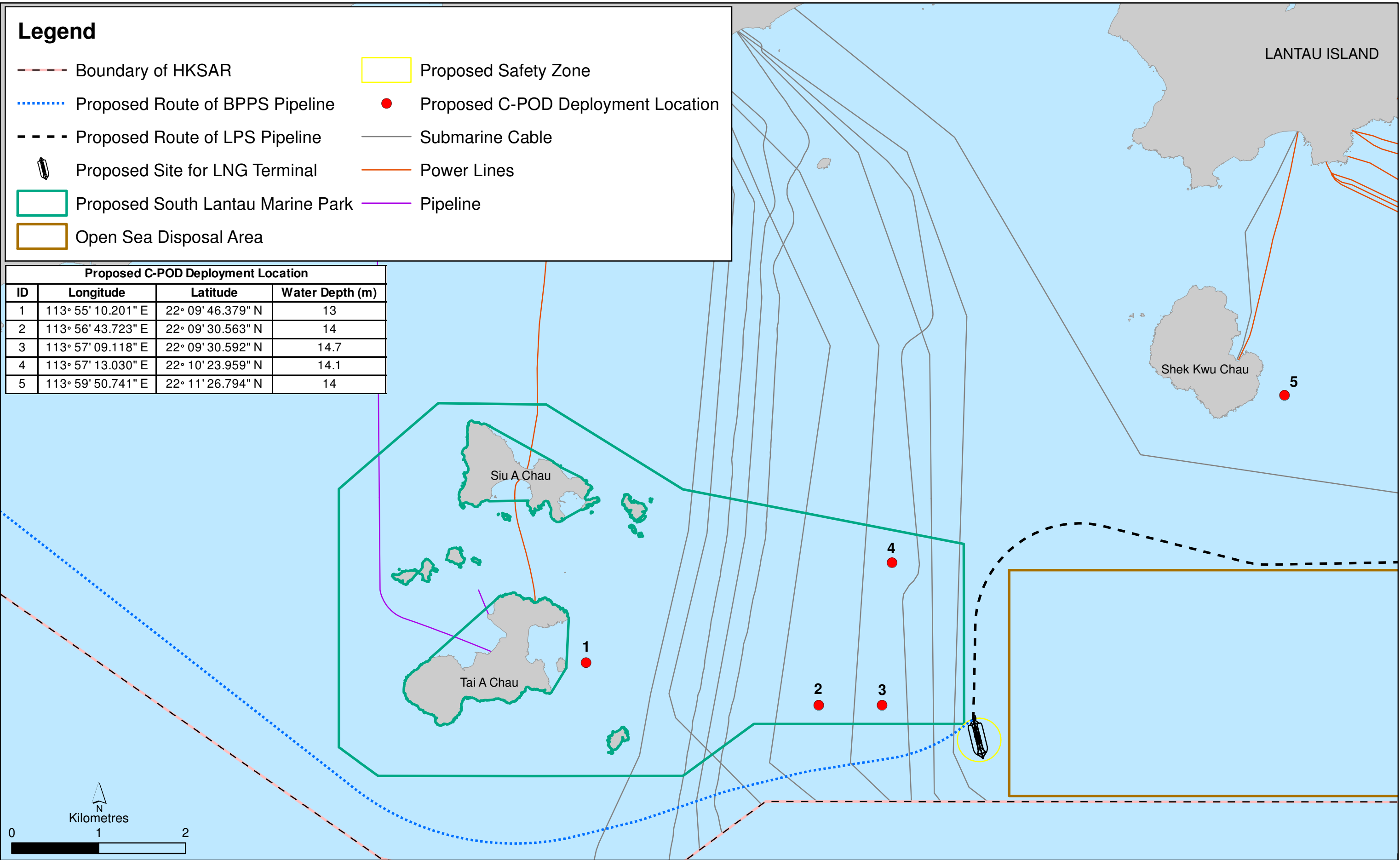


Figure 7.2

Proposed Underwater PAM Survey Location

7.2.2.2 Monitoring Results

Should finless porpoise detection numbers ⁽⁶⁾ be significantly different (taking into account naturally occurring alterations to distribution patterns such as due to seasonal change) between the baseline, construction and post construction monitoring, recommendations for further post-construction monitoring survey will be made. Data should then be re-assessed and the need for any further monitoring established. Prior to the commencement of monitoring, the monitoring methodology will be agreed with the AFCD.

7.3 Marine Mammal Exclusion Zone Monitoring

Marine mammal exclusion zones for various construction activities are listed in **Table 7.3**.

Table 7.3 Marine Mammal Exclusion Zone Requirements for Various Activities

Activity	Exclusion Zone	Requirement
Percussive Piling Works for construction of Jetty	500m	Before percussive piling commences, the exclusion zone must have been continuously clear of marine mammals for 30 minutes. During percussive piling, if marine mammals are spotted within the exclusion zone, percussive piling works will cease and will not resume until the observer confirms that the zone has been continuously clear of marine mammals for a period of 30 minutes.
Marine dredging or jetting operations	250m	Before pipeline dredging or jetting commence, the exclusion zone must have been continuously clear of marine mammals for 30 minutes. During pipeline dredging/ jetting, if marine mammals are spotted within the exclusion zone, pipeline dredging/ jetting works will cease and will not resume until the observer confirms that the zone has been continuously clear of marine mammals for a period of 30 minutes.

Note: If necessary, for night-time works, exclusion zone monitoring for FP by underwater acoustic means would be explored to supplement the exclusion zone monitoring by trained observers. A site trial will be conducted to demonstrate its practicability/ effectiveness before actual implementation during the night-time works.

7.4 Ecology Mitigation Measures

Details of all the recommended mitigation measures for ecology are summarised in the Implementation Schedule provided in **Annex A**.

(6) Detections (in terms of DPM) by PAM are used as a proxy to evaluate the occurrence of marine mammals and expressed as DPM/day.

8. FISHERIES

As no unacceptable impacts are anticipated to occur during the construction and operation of this Project, therefore, monitoring of fisheries resources during these project phases is not considered necessary.

Monitoring activities designed to detect and mitigate impacts to water quality during construction and operation phases are also expected to serve to protect against impacts to fisheries. The details of the water quality monitoring programme are presented in this **EM&A Manual (Section 5)**.

The recommended construction and operational phase mitigation measures are summarised in the Implementation Schedule provided in **Annex A**.

9. VISUAL

The VIA recommended a series of measures for the design, construction and operation phase to further enhance the visual impacts of the Project. Details of all the recommended mitigation measures are summarised in the Implementation Schedule provided in **Annex A**. No environmental monitoring is required.

10. CULTURAL HERITAGE

As no impacts to marine archaeological resources are expected, no mitigation measures and environmental monitoring is required.

11. ENVIRONMENTAL SITE INSPECTION

11.1 Site Inspections

Site inspections provide a direct means to assess and confirm that the Contractor(s)'s environmental protection and pollution control measures are in compliance with the contract specifications. The site inspection will be undertaken routinely by the ET throughout the construction phases of the Project to verify that appropriate environmental protection and pollution control mitigation measures are properly implemented in accordance with the EIA. In addition, the ET will be responsible for defining the scope of the inspections, detailing any deficiencies that are identified, and reporting any necessary action or additional mitigation measures that were implemented as a result of the inspection.

Regular site inspections will be carried out by the ET each month. The IEC will also undertake regular site audit to assess the performance of the Contractor(s). The areas of inspection will not be limited to the site area and should also include the environmental conditions outside the site which are likely to be affected, directly or indirectly, by the site activities. The ET will make reference to the following information while conducting the inspections:

- the EIA and EM&A recommendations on environmental protection and pollution control mitigation measures;
- ongoing results of the EM&A programme;
- work progress and programme;
- individual works methodology proposals;
- the contract specifications on environmental protection;
- the relevant environmental protection and pollution control laws; and
- previous site inspection results.

The Contractor(s) will update the ET with relevant information on the construction works prior to carrying out the site inspections. The site inspection results will be submitted to the IEC, Project Proponents and the Contractor(s) within 24 hours. Should actions be necessary, the ET will follow up with recommendations on improvements to the environmental protection and pollution control works and will submit these recommendations in a timely manner to the IEC, Project Proponents and the Contractor(s). They will also be presented, along with the remedial actions taken, in the monthly EM&A report. The Contractor(s) will follow the procedures and time frame stipulated in the environmental site inspection for the implementation of mitigation proposal. An action reporting system will be formulated and implemented to report on any remedial measures implemented subsequent to the site inspections.

Ad hoc site inspections will also be carried out by the ET and site audits by the IEC if significant environmental issues are identified. Inspections and audits may also be required subsequent to receipt of an environmental complaint or as part of the investigation work as specified in the Action Plan for environmental monitoring and audit.

11.2 Compliance with Legal & Contractual Requirements

There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong with which the construction activities will comply.

In order that the works are in compliance with the contractual requirements, the works method statements (where relevant to environmental measures) submitted by the Contractor(s) to the Project Proponents for approval should be sent to the ET for review.

The ET will also review the progress and programme of the works to check the regulatory compliance.

The Contractor(s) will regularly copy relevant documents to the ET so that the checking and auditing work can be carried out. The relevant documents should at least include the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws and all valid licences/permits. The site diary will also be available for the ET inspection upon request.

After reviewing the document, the ET will advise the Project Proponents and the Contractor(s) of any non-compliance from the contractual and legislative requirements on environmental protection and pollution control for follow-up actions.

Upon receipt of the advice, the Contractor(s) should undertake immediate action to remedy the situation. The Project Proponents should follow up to ensure that appropriate action will be taken by the Contractor(s) in order to satisfy the environmental protection and pollution control requirements.

11.3 Environmental Complaints

The ET will undertake the following procedures (see *Figure 11.1*) upon receipt of a complaint:

- (1) log complaint and date of receipt into the complaint database and inform the IEC immediately;
- (2) investigate the complaint and discuss with the Contractor(s) and Project Proponents to determine its validity and to assess whether the source of the issue is due to works activities;
- (3) if a complaint is considered valid due to the works, the ET will identify mitigation measures in consultation with the Contractor(s), Project Proponents and IEC;
- (4) if mitigation measures are required, the ET will advise the Contractor(s) accordingly;
- (5) review the Contractor(s)'s response, with IEC and Project Proponents, on the identified mitigation measures and the updated situation;
- (6) undertake additional monitoring and audit to verify the situation if necessary and confirm that any valid reason for complaint does not recur;
- (7) if the complaint is referred by EPD, an interim report will be submitted to EPD on the status of the complaint investigation and follow-up action within the time frame assigned by EPD;
- (8) report the investigation results and the subsequent actions on the source of the complaint for responding to complainant. If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD; and
- (9) record the complaint, investigation, the subsequent actions and the results in the Monthly EM&A Reports.

During the complaint investigation work, the ET, Contractor(s) and Project Proponents should cooperate with the IEC in providing the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor(s) will promptly carry out the mitigation measures. Project Proponents should agree the proposed mitigation measures and the ET and IEC should check that the measures have been carried out by the Contractor(s).

11.4 Log-Book

The ETL will keep a contemporaneous log-book of each and every instance or circumstance or change of circumstances which may affect the EIA and every non-compliance from the recommendations of the EIA Report or the EP. The ETL will notify the IEC within one working day of the occurrence of any such instance or circumstance or change of circumstance. The ETL's log-book

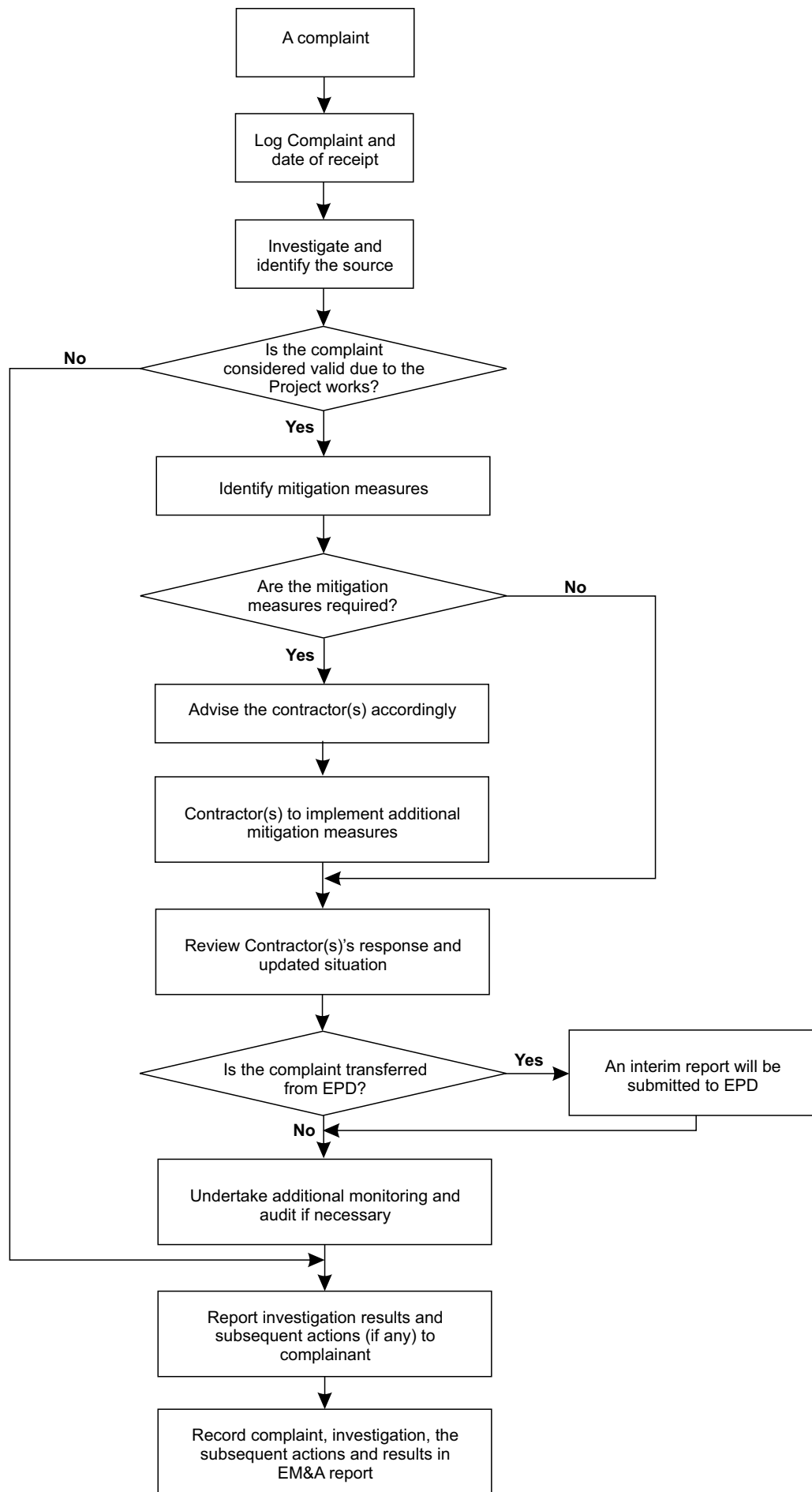


Figure 11.1

Flow Chart for Handling Environmental Complaints

will be kept readily available for inspection by persons assisting in supervision of the implementation of the EIA Report recommendations (such as Project Proponents, IEC and Contractor(s)) and the FEPs or by EPD or his authorised officers.

12. REPORTING

12.1 General

Reports can be provided in an electronic medium upon agreeing the format with Project Proponents and EPD. The monitoring data (baseline and impact) will also be made available through a dedicated internet website that would be agreed with relevant authority.

Types of reports that the ETL will prepare and submit include baseline monitoring report, post-construction water quality monitoring report, post-construction marine mammal monitoring report, monthly EM&A reports, quarterly EM&A summary reports, annual/ final EM&A review report, and water quality monitoring report for the first-year of operation of the LNG Terminal. In accordance with *Annex 21* of the *EIAO-TM*, a copy of the monthly, quarterly summary and annual/ final review EM&A reports will be made available to the Director of Environmental Protection.

12.2 Baseline Monitoring Report

In respect of the construction phase water quality and marine mammal EM&A works for the marine construction works, the ET will prepare and submit a Baseline Monitoring Report at least 2 weeks before commencement of construction of the Project for agreement on the Action/Limit Levels for water quality and marine mammal monitoring. Copies of the Baseline Monitoring Report will be submitted to the following: the Contractor(s), the IEC, the Project Proponents, the EPD and the AFCD as appropriate. The ET will liaise with the relevant parties on the exact number of copies required.

The Baseline Monitoring Report for the construction phase, covering both baseline water quality monitoring and baseline marine mammal monitoring, will include at least the following:

- (1) Up to half a page executive summary.
- (2) Brief project background information.
- (3) Drawings showing locations of the baseline monitoring stations.
- (4) Monitoring results (in both hard and electronic copies) together with the following information:
 - monitoring methodology;
 - name of laboratory and types of equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency and duration; and
 - quality assurance (QA)/quality control (QC) results and detection limits.
- (5) Details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period; and
 - other factors which might affect the results.
- (6) Determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data, the analysis will conclude if there is any significant difference between control and impact stations for the parameters monitored.
- (7) Revisions for inclusion in the EM&A Manual.

- (8) Comments, recommendations and conclusions.

12.3 Post-Construction Water Quality Monitoring Report

The ET will prepare and submit a Post-Construction Water Quality Monitoring Report within six weeks following the completion of the post-construction water quality monitoring for the Project. Copies of the Post-Construction Water Quality Monitoring Report will be submitted to the following: the Contractor(s), the IEC, the Project Proponents, the EPD and the AFCD as appropriate. The ET will liaise with the relevant parties on the exact number of copies required.

The Post-Construction Water Quality Monitoring Report will include at least the following:

- (1) Up to half a page executive summary.
- (2) Brief project background information.
- (3) Drawings showing locations of the monitoring stations.
- (4) Monitoring results (in both hard and electronic copies) together with the following information:
 - monitoring methodology;
 - name of laboratory and types of equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency and duration;
 - environmental quality performance limits (Action and Limit levels);
 - Event and Action Plans;
 - environmental mitigation measures, as recommended in the Project EIA Report;
 - environmental requirements in contract documents;
 - graphical plots of trends of monitored parameters at key stations over the monitoring; and
 - quality assurance (QA)/quality control (QC) results and detection limits.
- (5) Details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period; and
 - other factors which might affect the results.
- (6) Comments, recommendations and conclusions.

12.4 Post-Construction Marine Mammal Monitoring Report

The purpose of post-construction marine mammal monitoring is to review whether the marine mammals would return to the areas upon cessation of the disturbance after the completion of marine-based construction works by comparing the change in distribution of the finless porpoises between the baseline, construction and post-construction monitoring. The ET will prepare and submit a Post-Construction Marine Mammal Monitoring Report within two months following the completion of the post-construction marine mammal monitoring for the Project. Copies of the Post-Construction Marine Mammal Monitoring Report will be submitted to the following: the Contractor(s), the IEC, the Project Proponents, the EPD and the AFCD as appropriate. The ET will liaise with the relevant parties on the exact number of copies required.

The Post-Construction Marine Mammal Monitoring Report will include at least the following:

- (1) Up to half a page executive summary.
- (2) Brief project background information.
- (3) Drawings showing the monitoring locations.
- (4) Monitoring results (in both hard and electronic copies) together with the following information:
 - monitoring methodology;
 - types of equipment used;
 - parameters monitored;
 - monitoring locations;
 - monitoring date, time, frequency and duration;
 - environmental quality performance limits (Action and Limit levels);
 - Event and Action Plan for the construction phase marine mammal monitoring;
 - environmental mitigation measures, as recommended in the Project EIA Report;
 - environmental requirements in contract documents; and
 - graphical plots of trends of monitored parameters over the monitoring.
- (5) Details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period; and
 - other factors which might affect the results.
- (6) Comments, recommendations and conclusions.

12.5 Monthly EM&A Reports

The results and findings of the construction phase EM&A work required in this Manual will be recorded in the Monthly EM&A Reports prepared by the ETL. The EM&A report will be prepared and submitted within 2 weeks of the end of each reporting month, with the first report due the month after construction commences. Each monthly EM&A report will be submitted to the following parties: the Contractor(s), the IEC, the Project Proponents and the EPD, as well as to other relevant departments as required. Before submission of the first EM&A Report, the ET will liaise with the parties on the exact number of copies and format of the reports in both hard copy and electronic medium.

The ETL will review the number and location of monitoring stations and parameters every six months, or on as needed basis, in order to cater for any changes in the surrounding environment and the nature of works in progress.

12.5.1 Contents of First Monthly EM&A Report

- (1) 1-2 pages executive summary, comprising:
 - breaches of Action and Limit levels;
 - complaint log;
 - notifications of any summons and successful prosecutions;

- reporting changes; and
 - forecast of impact predictions.
- (2) Basic project information including a synopsis of the project organisation, programme and management structure, and a drawing of the Project area showing the environmentally sensitive receivers and the locations of monitoring and control stations, programme, management structure and the work undertaken during the month.
- (3) Environmental Status, comprising:
- works undertaken during the month (such as location of works, quantities of waste generated); and
 - drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- (4) A brief summary of EM&A requirements including:
- monitoring parameters;
 - environmental quality performance limits (Action and Limit levels);
 - Event and Action Plans;
 - environmental mitigation measures, as recommended in the Project EIA Report; and
 - environmental requirements in contract documents.
- (5) Advice on the implementation of environmental protection, mitigation and pollution control measures as recommended in the Project EIA Report and summarised in the updated implementation schedule.
- (6) Monitoring results (in both hard and electronic copies) together with the following information:
- monitoring methodology;
 - name of laboratory and equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth); and
 - monitoring date, time, frequency, and duration;
- (7) Graphical plots of trends of monitored parameters for representative monitoring stations annotated against the following:
- major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
- (8) Advice on the solid and liquid waste management.
- (9) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels).
- (10) A review of the reasons for and the implications of non-compliance including a review of pollution sources and working procedures.

- (11) A description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- (12) A summary record of complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints.
- (13) A summary record of notifications of summons, successful prosecutions for breaches of environmental protection/pollution control legislation and actions to rectify such breaches.
- (14) A forecast of the works programme, impact predictions and monitoring schedule for the next one month.
- (15) Comments, recommendations and conclusions for the monitoring period.

12.5.2 Contents of the Subsequent Monthly EM&A Reports

- (1) Title page.
- (2) Executive summary (1-2 pages), including:
 - breaches of Action and Limit levels;
 - complaint log;
 - notifications of any summons and successful prosecutions;
 - reporting changes; and
 - forecast of impact predictions.
- (3) Contents page.
- (4) Environmental status, comprising:
 - drawing showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
 - summary of non-compliance with the environmental quality performance limits; and
 - summary of complaints.
- (5) Environmental issues and actions, comprising:
 - review issues carried forward and any follow-up procedures related to earlier non-compliance (complaints and deficiencies);
 - description of the actions taken in the event of non-compliance and deficiency reporting;
 - recommendations (should be specific and target the appropriate party for action); and
 - implementation status of the mitigation measures and the corresponding effectiveness of the measures.
- (6) Appendices, including:
 - action and limit levels;
 - graphical plots of trends of monitored parameters at key stations over the past reporting month for representative monitoring stations annotated against the following: major activities being carried out on site during the period; weather conditions during the period; and any other factors which might affect the monitoring results;

- monitoring schedule for the present and next reporting period;
- cumulative complaints statistics; and
- details of complaints, outstanding issues and deficiencies.

12.6 Quarterly EM&A Summary Report

The ETL will submit Quarterly EM&A Summary Reports for the construction phase EM&A works only. These reports should contain at least the following information:

- (1) Up to half a page executive summary.
- (2) Basic project information including a synopsis of the Project organisation, programme, contacts of key management, compliance with the FEPs condition (status of submission) and a synopsis of work undertaken during the quarter.
- (3) A brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (Action and Limit levels); and
 - environmental mitigation measures, as recommended in the Project EIA Report.
- (4) Advice on the implementation of environmental protection and pollution control/mitigation measures as recommended in the Project EIA Report and summarised in the updated implementation schedule.
- (5) Drawings showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- (6) Graphical plots of the trends of monitored parameters over the past four months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
 - the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results.
- (7) Advice on the solid and liquid waste management.
- (8) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels).
- (9) An Impact Prediction Review will be prepared to compare project predictions with actual impacts for the purpose of assessing the accuracy of predictions on the EIA study. The review will focus on the comparison between the EIA study predictions with the EM&A monitoring results. If any excessive variation was found, a summary of investigation and follow up procedure taken will be addressed accordingly.
- (10) A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures.
- (11) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance.

- (12) A summarised record of complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken.
- (13) Comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter.
- (14) Project Proponents' contacts for the public to make enquiries.

12.7 Annual/ Final EM&A Review Reports

An annual/ final EM&A report will be prepared by the ET at the end of each construction year during the course of the Project. A final EM&A report will be prepared by the ET at the end of the construction phase of the Project. The annual/ final EM&A reports will contain at least the following information:

- (1) Executive Summary (1-2 pages).
- (2) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- (3) Basic project information including a synopsis of the project organization, contacts for key management staff and a synopsis of work undertaken during the course of the project.
- (4) A brief summary of EM&A requirements including:
 - environmental mitigation measures as recommended in the project EIA Report;
 - environmental impact hypotheses tested;
 - environmental quality performance limits (Action and Limit Levels);
 - monitoring parameters; and
 - Event and Action Plans.
- (5) A summary of the implementation status of environmental protection and pollution control/mitigation measures as recommended in the project EIA Report and summarised in the updated implementation schedule.
- (6) Graphical plots and the statistical analysis of the trends of monitored parameters over the course of the project including the post-project monitoring for monitoring stations annotated against the following:
 - the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results.
- (7) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels).
- (8) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate.
- (9) A description of the actions taken in the event of non-compliance.
- (10) A summary record of complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken.

- (11) A summary record of notifications of summonses and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches investigation, follow-up actions taken and results.
- (12) A comparison of the EM&A data with the EIA predictions with annotations and explanations for any discrepancies, including a review of the validity of EIA predictions and identification of shortcomings in the EIA recommendations.
- (13) A review of the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness, including cost effectiveness.
- (14) A review of the success of the EM&A programme, including a review of the effectiveness and efficiency of the mitigation measures, and recommendations for any improvements in the EM&A programme.
- (15) A clear cut statement on the environmental acceptability of the project with reference to specific impact hypotheses and a conclusion to state the return to ambient and/or the predicted scenario as the EIA findings.

12.8 Water Quality Monitoring Report for the First Year of Operation of the LNG Terminal

A water quality monitoring report will be prepared by the ET every quarter and at the end of the first year of operation for the LNG Terminal to include the results of weekly marine water quality monitoring exercise for the first-year of LNG Terminal Operation. The report will contain at least the following information:

- (1) Executive Summary (1-2 pages).
- (2) Brief project background information.
- (3) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- (4) A brief summary of monitoring requirements including:
 - monitoring methodology;
 - name of laboratory and types of equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency and duration;
 - environmental quality performance limits (Action and Limit Levels);
 - Event and Action Plans; and
 - quality assurance (QA)/quality control (QC) results and detection limits.
- (5) Graphical plots and the statistical analysis of the trends of monitored parameters over the course of the monitoring including the monitoring stations annotated against the following:
 - the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results.

- (6) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels).
- (7) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate.
- (8) A description of the actions taken in the event of non-compliance.
- (9) A summary record of complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken.
- (10) A summary record of notifications of summonses and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches investigation, follow-up actions taken and results.
- (11) A comparison of the EM&A data with the EIA predictions with annotations and explanations for any discrepancies, including a review of the validity of EIA predictions and identification of shortcomings in the EIA recommendations.
- (12) A review of the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness, including cost effectiveness;
- (13) A review of the success of the EM&A programme, including a review of the effectiveness and efficiency of the mitigation measures, and recommendations for any improvements in the EM&A programme;
- (14) A clear cut statement on the environmental acceptability of the Project Operation and a conclusion to state the return to the predicted scenario as the EIA findings; and
- (15) For reporting at the end of the first year of operation, a review of the need to extend the operational monitoring, or not.

12.9 Data Keeping

The site documents such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the EM&A Reports for submission. However, the documents will be kept by the ETL and be ready for inspection upon request. Relevant information will be clearly and systematically recorded in the documents. The monitoring data will also be recorded in magnetic media, and the soft copy will be available upon request. The documents and data will be kept for at least one year after the completion of the EM&A works for the construction and operation phases.

12.10 Interim Notifications of Environmental Quality Limit Exceedances

With reference to Event and Action Plans, when the environmental quality limits are exceeded, the ET will notify the Contractor(s), Project Proponents and EPD as appropriate within 24 hours of the identification of the exceedance. The notification will be followed up with each party on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in **Annex B**.

ANNEX A

IMPLEMENTATION SCHEDULE

TABLE A.1 IMPLEMENTATION SCHEDULE OF RECOMMENDED MITIGATION MEASURES

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
Air Quality								
S4.10.1	S2.1	Impervious sheet will be provided for skip hoist for material transport.	Land sites for GRSSs within BPPS and LPS / During construction, particularly dry season	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>
S4.10.1	S2.1	The area where dusty work takes place should be sprayed with water or a dust suppression chemical immediately prior to, during and immediately after dusty activities as far as practicable.	Land sites for GRSSs within BPPS and LPS / During construction	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>
S4.10.1	S2.1	All dusty materials should be sprayed with water or a dust suppression chemical immediately prior to any loading, unloading or transfer operation.	Land sites for GRSSs within BPPS and LPS / During construction	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>
S4.10.1	S2.1	Dropping heights for excavated materials should be controlled to a practical height to minimise the fugitive dust arising from unloading.	Land sites for GRSSs within BPPS and LPS / During construction	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>

⁽¹⁾ D = Design Phase, C = Construction Phase, O = Operational Phase

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S4.10.1	S2.1	During transportation by truck, materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport.	Land sites for GRSSs within BPPS and LPS / During construction	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>
S4.10.1	S2.1	Wheel washing device should be provided at the exits of the work sites. Immediately before leaving a construction site, every vehicle shall be washed to remove any dusty material from its body and wheels as far as practicable.	Land sites for GRSSs within BPPS and LPS / During construction	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>
S4.10.1	S2.1	Road sections between vehicle-wash areas and vehicular entrance will be paved.	Land sites for GRSSs within BPPS and LPS / During construction	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>
S4.10.1	S2.1	Haul roads will be kept clear of dusty materials and will be sprayed with water so as to maintain the entire road surface wet at all times.	Land sites for GRSSs within BPPS and LPS / During construction	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>
S4.10.1	S2.1	Temporary stockpiles of dusty materials will be either covered entirely by impervious sheets or sprayed with water to maintain the entire surface wet all the time.	Land sites for GRSSs within BPPS and LPS / During construction	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>
S4.10.1	S2.1	Stockpiles of more than 20 bags of cement and dusty construction materials will be covered entirely by impervious sheeting sheltered on top and 3-sides.	Land sites for GRSSs within BPPS and LPS / During construction	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S4.10.1	S2.1	All exposed areas will be kept wet to minimise dust emission.	Land sites for GRSS within BPPS and LPS / During construction	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>
S4.10.1	S2.1	Ultra-low-sulphur diesel (ULSD), defined as diesel fuel containing not more than 0.005% sulphur by weight, will be used for all construction plant on-site.	Land sites for GRSS within BPPS and LPS / During construction/ During operation	Contractor(s) / CAPCO / HK Electric		✓	✓	<i>Environment, Transport and Works Bureau Technical Circular (ETWB-TC(W)) No 19/2005 on Environmental Management on Construction Sites</i>
S4.10.1	S2.1	The engine of the construction equipment during idling will be switched off.	Land sites for GRSS within BPPS and LPS / During construction	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>
S4.10.1	S2.1	Regular maintenance of construction equipment deployed on-site will be conducted to prevent black smoke emission.	Land sites for GRSS within BPPS and LPS / During construction	Contractor(s)		✓		<i>Air Pollution Control (Construction Dust) Regulation</i>
S4.10.1	S2.1	All marine vessels fuelled in Hong Kong are required to operate using marine light diesel with sulphur content lower than 0.05%.	Marine sites for the LNG Terminal, the BPPS Pipeline and the LPS Pipeline / During construction/ During operation	Contractor(s) / Project Proponents		✓	✓	<i>Air Pollution Control (Marine Light Diesel) Regulation</i>

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S4.10.1	S2.1	Non-road mobile machinery (NRMMS), e.g. mobile generator and air compressor, shall comply with the prescribed emission standards and approved with a proper label by EPD.	Land sites for GRSS within BPPS and LPS and marine sites for the LNG Terminal, the BPPS Pipeline and the LPS Pipeline / During construction	Contractor(s)		✓		<i>Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation</i>
S4.10.1	S2.1	To ensure proper implementation of the recommended dust mitigation measures and good construction site practices during the construction phase of the GRSS and the BPPS and the LPS, environmental site audits on monthly basis is recommended throughout the construction period.	Land sites for GRSS within BPPS and LPS / During construction	Contractor(s)/ Environmental Team (ET) & Independent Environmental Checker (IEC)		✓		-
S4.10.2	S2.2	LNGCs shall comply with the fuel restriction requirement under the <i>Air Pollution Control (Ocean Going Vessels) (Fuel at berth) Regulation</i> .	Marine site for the LNG Terminal / During operation	HKLTL			✓	<i>Air Pollution Control (Ocean Going Vessels) (Fuel at berth) Regulation</i>
Hazard to Life								
S5.3.3	S3	All personnel within the BPPS shall comply with CLP safety policy and requirements.	Land site for the GRS within BPPS / During construction / During operation	Contractor(s) / CAPCO		✓	✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S5.3.3	S3	All personnel within the LPS shall comply with HK Electric safety policy and requirements.	Land site for the GRS within LPS / During construction / During operation	Contractor(s) / HK Electric		✓	✓	-
S5.3.3	S3	All operation work procedures shall be complied with the operating plant procedures or guidelines and regulatory requirements.	Land sites for GRSs within BPPS and LPS / During construction / During operation	Contractor(s) / CAPCO / HK Electric		✓	✓	-
S5.3.3	S3	All personnel shall be equipped with appropriate personal protective equipment (PPE) when working at the BPPS and LPS facilities.	Land sites for GRSs within BPPS and LPS / During construction / During operation	Contractor(s) / CAPCO / HK Electric		✓	✓	-
S5.3.3	S3	Safety training and briefings shall be provided to all personnel.	Land sites for GRSs within BPPS and LPS / During construction / During operation	Contractor(s) / CAPCO / HK Electric		✓	✓	-
S5.3.3	S3	Regular site safety inspections/ audits shall be conducted.	Land sites for GRSs within BPPS and LPS / During construction/ During operation	Contractor(s) / CAPCO / HK Electric		✓	✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S5.3.3	S3	Method statements and risk assessments shall be prepared and safety control measures shall be in place before commencement of work.	Land sites for GRSSs within BPPS and LPS / During construction	Contractor(s)		✓		-
S5.3.3	S3	Work permit system, on-site pre-work risk assessment and emergency response procedure shall be in place before commencement of work.	Land sites for GRSSs within BPPS and LPS / During construction	Contractor(s)		✓		-
S5.3.3	S3	All construction workers shall be under close site supervision during the construction phase of the GRSSs.	Land sites for GRSSs within BPPS and LPS / During construction	Contractor(s)		✓		-
S5.4.1	S3	An emergency response plan will be put in place which fully documents the procedures to be followed in the event of an emergency.	Transit of the LNGC and FSRU Vessel under Emergency Situation / During operation	HKLTL			✓	-
S5.3.3	S3	Method statements and risk assessments shall be prepared and safety control measures should be in place before the commencement of construction works.	LNG Terminal / During construction	Contractor(s)		✓		-
S5.3.3	S3	Work permit system, on-site pre-work risk assessment and emergency response procedure shall be in place before commencement of construction works.	LNG Terminal / During construction	Contractor(s)		✓		-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S5.3.3	S3	All construction workers shall be under close site supervision during the construction phase of the LNG Terminal.	LNG Terminal / During construction	Contractor(s)		✓		-
S5.3.3	S3	All personnel within the LNG Terminal shall comply with relevant safety policy and requirements.	LNG Terminal / During operation	HKLTL			✓	-
S5.3.3	S3	All operation work procedures shall be complied with relevant codes and standards (e.g. SIGTTO) and regulatory requirements.	LNG Terminal / During operation	HKLTL			✓	-
S5.3.3	S3	Work permit system and emergency response procedure shall be in place.	LNG Terminal / During operation	HKLTL			✓	-
S5.3.3	S3	Robust and extended process control system, safety control system, fire-fighting system and security system shall be provided.	LNG Terminal / During operation	HKLTL			✓	-
S5.3.3	S3	Sufficient and trained / competent staff shall be provided to operate the LNG Terminal.	LNG Terminal / During operation	HKLTL			✓	-
S5.3.3	S3	Regular safety inspections/audits shall be conducted.	LNG Terminal / During operation	HKLTL			✓	-
Noise								
S6.7	S4	N/A						
Water Quality								

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S7.9.1	S5	A detailed hydrotesting procedure for subsea pipelines will be developed that will detail how the process will be carried out, how it will be carefully controlled and monitored, and how the intake and subsequent discharge of the seawater will be managed. Water quality monitoring for commissioning hydrotest for the subsea pipelines is presented in Section 5.3.5 of the Updated EM&A Manual.	LNG Terminal / During construction	Contractor(s)		✓		TM Standard under the WPCO, WPCO license requirements, WQO
S7.9.1	S5	Adoption of appropriate dredging and jetting rates, plant numbers and silt curtains at the plant and WSRs, where applicable (Table 7.18 of the EIA Report, reprovided as Table A.2 below).	Marine Dredging & Jetting for the BPPS Pipeline and the LPS Pipeline / During construction	Contractor(s)		✓		-
S7.9.1	S5	Grab dredging can be conducted concurrently with one TSHD.	Marine Dredging for the BPPS Pipeline and the LPS Pipeline / During construction	Contractor(s)		✓		-
S7.9.1	S5	One jetting machine will be working on LPS pipeline. No more than two jetting machines will be working on BPPS pipeline.	Marine Jetting for the BPPS Pipeline and the LPS Pipeline / During construction	Contractor(s)		✓		-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S7.9.1	S5	Cofferdam construction and removal at landfalls of BPPS and LPS (where required) should not be conducted concurrently with the nearby pipeline dredging sections (BPPS KP44.9 - 45.0 and LPS KP17.4-18.2). Silt curtain surrounding the works areas for cofferdam construction and removal at pipeline landfalls of the BPPS and the LPS should also be implemented.	Pipeline landfalls for the BPPS Pipeline and the LPS Pipeline / During construction	Contractor(s)		✓		-
S7.9.1/ S7.9.2	S5	The following measures shall be followed for provision of silt curtain: <ul style="list-style-type: none"> The silt curtain shall be formed and installed in such a way that tidal rise and fall are accommodated, with the silt curtains always extending from the surface to the bottom of the water column and held with anchor blocks. Schematic diagrams on silt curtain deployment are provided in Figures 7.4 and 7.5 of the EIA Report. The contractor shall regularly inspect the silt curtains and check that they are moored and marked to avoid danger to marine traffic. Regular inspection on the integrity of the silt curtain should be carried out by the contractor and any damage to the silt curtain shall be repaired by the contractor promptly. Relevant marine works shall only be undertaken when the repair is fixed to the satisfaction of the engineer. 	Marine Dredging & Jetting for the BPPS Pipeline and the LPS Pipeline / During construction Marine Maintenance Dredging (LNG Terminal) / During operation	Contractor(s)		✓	✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S7.9.1 / S7.9.2	S5	All vessels should be well maintained and inspected before use to limit any potential discharges to the marine environment.	Marine Dredging for the BPPS Pipeline and the LPS Pipeline / During construction Marine Maintenance Dredging (LNG Terminal) / During operation	Contractor(s)		✓	✓	-
S7.9.1	S5	All vessels must have a clean ballast system.	Marine Dredging for the BPPS Pipeline and the LPS Pipeline / During construction	Contractor(s)		✓		-
S7.9.1 / S7.9.2	S5	No overflow is permitted from the trailing suction hopper dredger and the Lean Mixture Overboard (LMOB) system will only be in operation at the beginning and end of the dredging cycle when the drag head is being lowered and raised.	Marine Dredging for the BPPS Pipeline and the LPS Pipeline / During construction Marine Maintenance Dredging (LNG Terminal) / During operation	Contractor(s)		✓	✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S7.9.1 / S7.9.2	S5	Dredged marine mud will be disposed of in a gazetted marine disposal area in accordance with the Dumping at Sea Ordinance (DASO) permit conditions.	Marine Dredging for the BPPS Pipeline and the LPS Pipeline / During construction Marine Maintenance Dredging (LNG Terminal) / During operation	Contractor(s)		✓	✓	-
S7.9.1 / S7.9.2	S5	Dredgers will maintain adequate clearance between vessels and the seabed at all states of the tide and reduce operations speed to ensure that excessive turbidity is not generated by turbulence from vessel movement or propeller wash.	Marine Dredging for the BPPS Pipeline and the LPS Pipeline / During construction Marine Maintenance Dredging (LNG Terminal) / During operation	Contractor(s)		✓	✓	-
S7.9.1 / S7.9.2	S5	Marine works shall not cause foam, oil, grease, litter or other objectionable matter to be present in the water within and adjacent to the works site. Wastewater from potentially contaminated area on working vessels should be minimised and collected. These kinds of wastewater should be brought back to port and discharged at appropriate collection and treatment system.	Marine Dredging for the BPPS Pipeline and the LPS Pipeline / During construction / During operation	Contractor(s)		✓	✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S7.9.1 / S7.9.2	S5	No solid waste is allowed to be disposed overboard.	Marine Dredging for the BPPS Pipeline and the LPS Pipeline / During construction / During operation	Contractor(s)		✓	✓	-
S7.9.1	S5	Appropriate infiltration control, such as cofferdam wall, should be adopted to limit groundwater inflow to the excavation works areas in the Project site. Groundwater pumped out from excavation area should be discharged into the storm system via silt removal facilities.	Land sites & drainages for GRSs within BPPS and LPS / During construction	Contractor(s)		✓		-
S7.9.1	S5	Silt removal facilities such as silt traps or sedimentation facilities will be provided to remove silt particles from runoff to meet the requirements of the TM standard under the WPCO. The design of silt removal facilities will be based on the guidelines provided in ProPECC PN 1/94. All drainage facilities and erosion and sediment control structures will be inspected on a regular basis and maintained to confirm proper and efficient operation at all times and particularly during rainstorms. Deposited silt and grit will be removed regularly.	Land sites & drainages for GRSs within BPPS and LPS / During construction	Contractor(s)		✓		<i>ProPECC PN 1/94, TM Standard under the WPCO</i>

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S7.9.1	S5	Earthworks to form the final surfaces will be followed up with surface protection and drainage works to prevent erosion caused by rainstorms.	Land sites & drainages for GRSs within BPPS and LPS / During construction	Contractor(s)		✓		-
S7.9.1	S5	Appropriate surface drainage will be designed and provided where necessary.	Land sites & drainages for GRSs within BPPS and LPS / During construction	Contractor(s)		✓		-
S 7.9.1	S5	The precautions to be taken at any time of year when rainstorms are likely together with the actions to be taken when a rainstorm is imminent or forecasted and actions to be taken during or after rainstorms are summarised in Appendix A2 of ProPECC PN 1/94.	Land sites & drainages for GRSs within BPPS and LPS / During construction	Contractor(s)		✓		ProPECC PN 1/94
S7.9.1	S5	Oil interceptors will be provided in the drainage system where necessary and regularly emptied to prevent the release of oil and grease into the storm water drainage system after accidental spillages.	Land sites & drainages for GRSs within BPPS and LPS / During construction	Contractor(s)		✓		-
S7.9.1	S5	Temporary and permanent drainage pipes and culverts provided to facilitate runoff discharge, if any, will be adequately designed for the controlled release of storm flows.	Land sites & drainages for GRSs within BPPS and LPS / During construction	Contractor(s)		✓		-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S7.9.1	S5	The temporary diverted drainage, if any, will be reinstated to the original condition when the construction work has finished or when the temporary diversion is no longer required.	Land sites & drainages for GRSS within BPPS and LPS / During construction	Contractor(s)		✓		-
S7.9.1	S5	Appropriate numbers of portable toilets shall be provided by a licensed contractor to serve the construction workers over the construction site to prevent direct disposal of sewage into the water environment. No onsite discharge from these chemical toilets would be allowed.	Land sites & drainages for GRSS within BPPS and LPS / During construction	Contractor(s)		✓		-
S 7.9.2	S5	Mitigation measures for maintenance dredging at the LNG Terminal in form of controlled dredging rate (maximum of 5,500m ³ day ⁻¹) as well as silt curtain should be implemented for the control of sediment dispersion and the protection of the nearby WSRs.	Marine Maintenance Dredging (LNG Terminal) / During operation	Contractor(s) / HKLTL			✓	-
S 7.9.2 / S9.11.3	S5 / S7	A project-specific contingency plan (including protocols for avoidance, containment, remediation and reporting accidental fuel spill event) will be prepared and implemented to contain and clean up the spilled or leaked fuels or chemicals at the LNG Terminal, surrounding waters and marine parks.	Fuel spillage for the LNG Terminal / During operation	Contractor(s) / HKLTL			✓	

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S7.12.1	S5.2-S5.5	Marine water quality monitoring at selected WSRs is recommended for marine dredging and jetting works for the pipeline construction.	Designated monitoring stations as defined in EM&A Manual / During marine construction period	Environmental Team (ET)		✓		-
S7.12.1	S5.2-S5.5	To ensure proper implementation of the recommended mitigation measures and good construction site practices during marine-based construction works, environmental site audits on a regular basis is recommended throughout the construction period.	Marine sites for the LNG Terminal, the BPPS Pipeline and the LPS Pipeline / During construction	Contractor(s)/ Environmental Team (ET) & Independent Environmental Checker (IEC)		✓		-
S7.12.2	S5.2-S5.5	Water quality monitoring at the selected nearby WSRs is recommended for first year of operation of the LNG Terminal.	During operation for the LNG Terminal	Environmental Team (ET)/ HKLTL			✓	TM Standard under the WPCO, WPCO license requirements, WQO
S7.12.2	S5.2-S5.5	During maintenance dredging at the LNG Terminal, water quality monitoring at the selected nearby WSRs would be required.	Marine Maintenance Dredging (LNG Terminal) / During operation	Contractor(s) / HKLTL			✓	TM Standard under the WPCO, WPCO license requirements, WQO
Waste Management								
S8.5	S6.2	The contractor(s) will nominate approved personnel to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility of all wastes generated at the site.	All areas / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S8.5	S6.2	<p>Good waste management practices should be implemented:</p> <ul style="list-style-type: none"> • Training of site personnel in proper waste management and chemical handling procedures; • Separation of chemical wastes for special handling and appropriate treatment at the Chemical Waste Treatment Centre; • Encourage collection of aluminium cans and waste paper by individual collectors during construction with separate labelled bins provided to segregate these wastes from other general refuse by the workforce; • Any unused chemicals, and those with remaining functional capacity, be recycled as far as possible; • Prior to disposal of C&D materials, wood, steel and other metals will be separated, to the extent practical for re-use and/or recycling to reduce the quantity of waste to be disposed in a landfill; • Proper storage and site practices to reduce the potential for damage or contamination of construction materials; and • Plan and stock construction materials carefully to reduce amount of waste generated and avoid unnecessary generation of waste. 	All areas / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
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S8.5	Table 6.1	The contractor(s) must provide sufficient waste disposal points. Wastes will be collected and removed from site in a timely manner.	All areas / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	-
S8.5	Table 6.1	The contractor(s) will have appropriate measures to reduce windblown/ floating litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers.	All areas / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	-
S8.5	Table 6.1	The contractor(s) will take and keep records of quantities of wastes generated, recycled and disposed of and the disposal sites.	All areas / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	-
S8.5	Table 6.1	The contractor(s) must segregate and store different types of waste in different containers, skips or stockpiles to enhance reuse and recycling of material and proper disposal of waste.	All areas / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	-
S8.5	S6.2	The contractor(s) will use reusable non-timber formwork to reduce the amount of C&D materials.	All areas / During construction	Contractor(s)		✓		-
S8.5	Table 6.1	The contractor(s) must ensure that all the necessary waste disposal and marine dumping permits or licences are obtained prior to the commencement of the construction works.	During construction	Contractor(s)		✓		-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
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S8.5	S6.2	The contractor will open a billing account with EPD in accordance with the <i>Waste Disposal (Charges for Disposal of Construction Waste) Regulation</i> for the payment of disposal charges.	During construction	Contractor(s)		✓		<i>Cap 354N Waste Disposal (Charges for Disposal of Construction Waste) Regulation</i>
S8.5	S6.2	A trip-ticket system will be established in accordance with <i>DEVB TC(W) No. 6/2010</i> to monitor the reuse of surplus excavated materials off-site and disposal of construction waste and general refuse at transfer facilities/ landfills, and to control fly-tipping.	During construction	Contractor(s)		✓		<i>DEVB TC(W) No. 6/2010, Trip Ticket System for Disposal of Construction & Demolition Materials</i>
S8.5	S6.2	A WMP as stated in the <i>PNAP ADV-19</i> for the amount of waste generated, recycled and disposed of (including the disposal sites) will be established and implemented during the construction phase as part of the Environmental Management Plan (EMP). The Contractor will be required to prepare the EMP and submits it to the Architect/ Engineer under the Contract for approval prior to implementation.	All areas / During construction	Contractor(s)		✓		<i>PNAP ADV-19</i>
S8.5	Table 6.1	The management of dredged marine sediment requirement from <i>PNAP ADV-21</i> will be incorporated in the Contract for the construction and maintenance dredging during the operation of the Project.	Marine works / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	<i>PNAP ADV-21 and Dumping at Sea Ordinance (DASO)</i>

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
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S8.5/ S7.9	S6.2 / S5	Disposal vessels will be fitted with tight bottom seals in order to prevent leakage of material during transport.	Dredged areas / During construction	Contractor(s)/ Project Proponents		✓		<i>Dumping at Sea Ordinance (DASO)</i>
S8.5/ S7.9	S6.2 / S5	Barges will be filled to a level, which ensures that of marine sediment and marine sediment laden water does not spill over during loading or transport to the disposal site and that adequate freeboard is maintained to ensure that the decks are not washed by wave action.	Dredged areas / During construction	Contractor(s)/ Project Proponents		✓		<i>Dumping at Sea Ordinance (DASO)</i>
S8.5/ S7.9	S6.2 / S5	After dredging, any excess materials will be cleaned from decks and exposed fittings before the vessel is moved from the dredging area.	Dredged areas / During construction	Contractor(s)/ Project Proponents		✓		<i>Dumping at Sea Ordinance (DASO)</i>
S8.5/ S7.9	S6.2 / S5	When the dredged material has been unloaded at the disposal areas, any material that has accumulated on the deck or other exposed parts of the vessel will be removed and placed in the hold or a hopper. Under no circumstances will decks be washed clean in a way that permits material to be released overboard.	Dredged areas / During construction	Contractor(s)/ Project Proponents		✓		
S8.5	S6.2	Dredgers will maintain adequate clearance between vessels and the seabed at all states of the tide and reduce operations speed to ensure that excessive turbidity is not generated by turbulence from vessel movement or propeller wash.	Dredged areas / During construction	Contractor(s)/ Project Proponents		✓		

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
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S8.5	Table 6.1	C&D materials will be segregated on-site into public fill and non-inert C&D materials and stored in different containers or skips to facilitate reuse of the public fill and proper disposal of the construction waste. Specific areas of the land and marine-based construction sites will be designated for such segregation and storage if immediate use is not practicable. Prefabrication will be adopted as far as practicable to reduce the construction waste arisings.	During construction	Contractor(s)		✓		-
S8.5	Table 6.1	The contractor(s) will register as a chemical waste producer with the EPD. Chemical waste will be handled in accordance with the <i>Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes</i> .	All areas / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	<i>Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes</i>

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
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S8.5	Table 6.1	Containers used for storage of chemical wastes will: <ul style="list-style-type: none"> Be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed; Have a capacity of less than 450 L unless the specifications have been approved by the EPD; and Display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations. 	All areas / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	<i>Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes</i>
S8.5	Table 6.1	The storage area for chemical wastes will: <ul style="list-style-type: none"> Be clearly labelled and used solely for the storage of chemical waste; Be enclosed on at least 3 sides; Have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest; Have adequate ventilation; Be covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and Be arranged so that incompatible materials are appropriately separated. 	All areas / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	<i>Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes</i>

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S8.5	Table 6.1	<p>Chemical waste will be disposed of:</p> <ul style="list-style-type: none"> Via a licensed waste collector; and To a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Facility which also offers a chemical waste collection service and can supply the necessary storage containers. 	All areas / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	<i>Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes</i>
S8.5	Table 6.1	<p>General refuse (including the floating refuse collected) will be stored in enclosed bins separately from C&D materials and chemical wastes. Floating refuse will be collected on an 'as needed' basis for disposal as general refuse. Workers will be prohibited from throwing rubbish into the sea and adequate bins will be provided on both land and marine-based sites and marine vessels. General refuse will be delivered separately from C&D materials and chemical wastes for offsite disposal on a regular basis to reduce odour, pest and litter impacts. General refuse from the marine vessels will be collected and disposed on shore.</p>	All areas / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
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S8.5	Table 6.1	Recycling bins will be provided at strategic locations within the land and marine-based construction site and marine vessels to facilitate recovery of recyclable materials (including aluminium can, waste paper, glass bottles and plastic bottles) from the Project Site. Materials recovered will be sold for recycling.	All areas / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	-
S8.5	S6.2	To avoid any odour and litter impact, appropriate number of portable toilets will be provided for workers on-site.	All areas / During construction / During operation	Contractor(s)		✓	✓	-
S8.5	S6.2	At the commencement of the construction works and operations, training will be provided to workers on the concepts of site cleanliness and on appropriate waste management procedures, including waste reduction, reuse and recycling. In particular, the training will emphasize no dumping of waste into the sea is allowed, particularly at marine-based work sites and on marine vessels.	All areas / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	-
S8.5	S6.2	Industrial waste arising from maintenance activities will be segregated. Scrap metals and recyclables will be sent for recycling to reduce the overall quantity of waste disposed from these activities.	All areas / During operation	Project Proponents			✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
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S8.7	S6.1	It is recommended that monthly audits of the waste management practices be carried out during the construction phase land-based work sites (at the GRSs at the BPPS and the LPS), and at marine-based work sites (on marine vessels and Jetty) to determine if wastes are being managed in accordance with the recommended good site practices and WMP. The audits will include all aspects of waste management including waste generation, storage, handling, recycling, transportation and disposal, to prevent any dumping of waste into the sea or malpractice of waste disposal.	All areas / During construction	Contractor(s)/ Environmental Team (ET) & Independent Environmental Checker (IEC)		✓		-
Ecology								
S9.11.2	S7	The vessel operators will be required to control and manage all effluent from vessels. These kinds of wastewater shall be brought back to port where possible and discharged at appropriate collection and treatment system to prevent avoidable water quality impact.	Marine works / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	-
S9.11.2	S7	A policy of no dumping of rubbish, food, oil, or chemicals will be strictly enforced. This will also be covered in the contractor briefings.	Marine works / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	-
S9.11.2	S7	Only well-maintained and inspected vessels would be used to limit any potential discharges to the marine environment.	Marine works / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
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S9.11.2	S7	Standard site practices outlined in <i>ProPECC PN 1/94 "Construction Site Drainage"</i> will be followed as far as practicable in order to reduce surface runoff, minimise erosion, and also to retain and reduce any SS prior to discharge.	Marine works / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	<i>ProPECC PN 1/94</i>
S9.11.3	S7	Pipeline dredging/ jetting works between North of Tai O and Fan Lau (BPPS KP21.3 to 15.6) will avoid the peak months of Chinese White Dolphin (CWD) calving (May and June).	Marine works (Dredging/ jetting works between North of Tai O and Fan Lau along the BPPS Pipeline) / During construction	Contractor(s)		✓		-
S9.11.3	S7	Pipeline dredging/ jetting works between South of Soko Islands and the LNG Terminal (BPPS KP8.9 to 0.0) will be restricted to a daily maximum of 12 hours with daylight (0700 – 1900) operations.	Marine works (Dredging/ jetting works between South of Soko Islands and the LNG Terminal along the BPPS Pipeline) / During construction	Contractor(s)		✓		-
S9.11.3	S7	Pipeline dredging/ jetting from LNG Terminal to South of Shek Kwu Chau (LPS KP0.0 to 5.0) will be restricted to a daily maximum of 12 hours with daytime (0700 – 1900) operations.	Marine works (Dredging/ jetting works between from LNG Terminal to South of Shek Kwu Chau along the LPS Pipeline) / During construction	Contractor(s)		✓		-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
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S9.11.3	S7	<p>Use of vibratory/ hydraulic pushing method to vibrate / push the open-ended steel tubular pile for the upper layer of the seabed and only use hydraulic hammer (if needed) to install the remainder of the pile length through the lower layer of the seabed. During underwater percussive piling works:</p> <ul style="list-style-type: none"> Quieter hydraulic hammers should be used instead of the noisier diesel hammers; Use of Noise Reduction System for hydraulic hammering; Acoustic decoupling of noisy equipment on work barges should be undertaken; Using ramp-up piling procedures. This comprises of low energy driving for a period of time prior to commencement of full piling. This will promote avoidance of the area by marine mammals when sounds levels are not injurious. Blow frequency during this ramping up period should replicate the intensity that would be undertaken during full piling (e.g. one blow every two seconds) to provide cues for marine mammals to localize the sound source. Pile blow energy should be ramped up gradually over the 'soft start' period. Activities will be continuous without short-breaks and avoiding sudden random loud sound emissions; Underwater percussive piling should be conducted inside a bubble curtain so as to 	Marine works (Piling at the LNG Terminal) / During construction	Contractor(s)		✓		-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
		<p>ameliorate underwater sound level transmission;</p> <ul style="list-style-type: none"> The percussive pile driving will be conducted during the daytime (0700 – 1900) for a maximum of 12 hours, avoiding generation of underwater sounds at night time; and Underwater percussive piling works for the Jetty construction will avoid the peak season of FP (December to May). 						
S9.11.3	S7	The vessel operators of this Project will be required to use predefined and regular routes (that do not encroach into existing and proposed marine parks), make use of designated fairways to access the works areas, and would avoid traversing sensitive habitats such as existing and proposed marine parks (with the exception of the FSRU Vessel which will need to transit through the proposed SLMP during manoeuvring to the Jetty and after typhoon event due to its safe operational requirement).	Marine works / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	-
S9.11.3	S7	Any anchoring/ anchor spread requirements during Project construction will avoid encroachment into the existing and proposed marine parks, unless otherwise agreed by the Director of Environmental Protection.	Marine works (on existing, planned and potential marine parks) / During construction	Contractor(s)/ Project Proponents		✓		-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S9.11.3	S7	Silt curtain deployment during Project construction and maintenance dredging will avoid encroachment into the existing and proposed marine parks, unless otherwise agreed by the Director of Environmental Protection.	Marine works (on existing, planned and potential marine parks) / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	-
S9.11.3	S7	No stopping over or anchoring activity of vessels related to the Project should be conducted within existing and proposed marine parks, even before, during and after typhoon, unless otherwise agreed by the Director of Environmental Protection.	Marine works (on existing, planned and potential marine parks) / During construction / During operation	Contractor(s)/ Project Proponents		✓	✓	-
S9.11.3	S7	Use of appropriate dredging and jetting rates with the use of silt curtain where needed as recommended in the Water Quality section (Section 7 of the EIA Report) to reduce potential water quality impacts from elevated suspended solids (SS) due to the proposed marine works.	Marine works / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	-
S9.11.3	S7	Silt curtain will be checked and maintained to ensure its effectiveness in mitigating water quality impacts on existing, planned and potential marine parks.	Marine works / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S9.11.3	S7	All vessel operators working on the Project will be given a briefing, alerting them to the locations of the existing, proposed and potential marine parks and the regulations for marine parks, the possible presence of dolphins and porpoises in the marine works areas, and the guidelines for safe vessel operation in the presence of cetaceans. The vessels will avoid using high speed as far as possible. By observing the guidelines, vessels will be operated in an appropriate manner so that marine mammals will not be subject to undue disturbance or harassment.	Marine works / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	-
S9.11.3	S7	All vessels used in this Project will be required to slow down to 10 knots around the Project's marine works areas and areas with high dolphin and porpoise usage, including existing and proposed marine parks. With implementation of this measure, the chance of vessel strike resulting in physical injury or mortality of marine mammals will be extremely unlikely.	Marine works / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S9.11.3	S7	During underwater percussive piling works, a marine mammal exclusion zone within a radius of 500m radius will be implemented during underwater percussive piling works. Qualified observer(s) will scan an exclusion zone of 500m radius around the work area for at least 30 minutes prior to the start of piling. If a marine mammal is observed in the exclusion zone, piling will be delayed until they have left the area. This measure will ensure the area in the vicinity of the underwater percussive piling work is clear of marine mammals prior to the commencement of works and will serve to reduce any disturbance to marine mammals. When a marine mammal is spotted by qualified personnel within the exclusion zone, piling works will cease and will not resume until the observer confirms that the zone has been continuously clear of the marine mammal for a period of 30 minutes. This measure will ensure the area in the vicinity of the piling is clear of the marine mammal during works and will serve to reduce any disturbance to marine mammals.	Marine works / During construction	Contractor(s) / Project Proponents		✓		-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
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S9.11.3	S7	During marine dredging or jetting operations, a marine mammal exclusion zone within a radius of 250m from dredger or jetting machine will be implemented. Qualified observer(s) will scan an exclusion zone of 250m radius around the work area for at least 30 minutes prior to the start of dredging or jetting. If cetaceans or other megafauna are observed in the exclusion zone, dredging or jetting will be delayed until they have left the area. This measure will ensure the area in the vicinity of the dredging or jetting work is clear of marine mammals prior to the commencement of works and will serve to reduce any disturbance to marine mammals. When a marine mammal is spotted by qualified personnel within the exclusion zone, dredging or jetting works will cease and will not resume until the observer confirms that the zone has been continuously clear of the marine mammal for a period of 30 minutes. This measure will ensure the area in the vicinity of the works is clear of the marine mammal during works and will serve to reduce any disturbance to marine mammals. If necessary, for night-time works, exclusion zone monitoring for FP by underwater acoustic means would be explored to supplement the exclusion zone monitoring by trained observers. A site trial will be conducted to demonstrate its practicability/ effectiveness before actual implementation during the night-time works.	Marine works / During construction / During operation	Contractor(s) / Project Proponents		✓	✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
S9.11.3	S7	Implementation of a contingency plan to contain and clean up the spilled or leaked fuels or chemicals at the LNG Terminal, surrounding waters and marine parks.	Marine site for the LNG Terminal / During operation	Contractor(s) / HKLTL			✓	-
S9.15.1	S7	Baseline, impact and post-construction monitoring of marine mammal using vessel-based line transect surveys and passive acoustic monitoring (PAM) will be undertaken to keep track of potential changes in the usage of waters in the vicinity of the Project's works areas by FP. Prior to the commencement of monitoring, methods will be agreed with the AFCD.	Marine site / During construction	Contractor(s) / ET/ Project Proponents		✓		-
Fisheries								
S10.8	S8	The mitigation measures designed to mitigate impacts to water quality to acceptable levels (compliance with assessment criteria) and marine ecological impacts are expected to mitigate impacts to fisheries resources.	During construction and operation	Contractor(s) / Project Proponents / Environmental Team (ET) & Independent Environmental Checker (IEC)		✓	✓	-
S10.8	S8	Impingement and entrainment of fisheries resources will be reduced through appropriate design of the intake screens on the cooling water intake.	During operation for the LNG Terminal	Contractor(s) / HKLTL			✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
					D	C	O	
Visual								
S11.8	S9	Sensitive architectural design of the new facilities. This should take into account material texture, colour, finished to structure and the context of the site to ensure the GRSs at the BPPS and LPS blend into the existing context, cause least disturbance to the existing land. LNG Terminal will be designed for marine safety and operations, in accordance with relevant standards and regulations and sensitive architectural design will be considered where practicable.	All areas / Detailed design / During construction / During operation	Design Contractor / Project Proponents	✓	✓	✓	-
S11.8	S9	Pre-construction and construction period for the GRSs and LNG Terminal should be reduced as far as practical to lower visual impact.	All areas / During construction	Contractor(s)		✓		-
S11.8	S9	Following construction, land areas temporarily affected by the construction works, will be reinstated to their former state.	Land sites for the GRSs within BPPS and LPS / During construction	Contractor(s)		✓		-
S11.8	S9	Light intensity and beam directional angle should be controlled at the GRSs and the LNG Terminal at the design stage to reduce light pollution and glare (e.g. hooded lights, specific directional focus, etc.).	All areas / Detailed design / During operation	Design Contractor / Project Proponents	✓		✓	-

EIA Reference	EM&A Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Location/ duration of recommended measures & timing of completion of recommended measures	Implementation Agent	Implementation Stage ¹			Relevant Legislation & Guidelines
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S11.8	S9	Any plants to be affected by the GRSs at the BPPS and the LPS should be preserved and care taken to ensure the existing health status of the vegetation is maintained or enhanced after construction.	All areas / During construction	Contractor(s)		✓		-
Cultural Heritage								
S12.7	S10	N/A						

TABLE A.2 SUMMARY OF MITIGATION MEASURES FOR PIPELINE CONSTRUCTION WORKS

Work Location	Plants Involved	Allowed Maximum Work Rate	Silt Curtain at Plants	Silt Curtain at WSRs	Other Measures ⁽¹⁾
LPS Pipeline (under FEP-02/558/2018/A)					
Pipeline shore approach at LPS (KP17.4 - 18.2)	1 Grab Dredger	1,600m ³ day ⁻¹ for 24 hours each day	Yes	Not required	
West Lamma Channel (KP14.5 - 17.4)	1 Jetting Machine	1,000m day ⁻¹ for 24 hours each day	Yes	Not required	
South of Shek Kwu Chau to West Lamma Channel (KP5.0 - 14.5)	1 Jetting Machine	7,000m day ⁻¹ for 24 hours each day	Yes	Not required	
Double Berth Jetty to South of Shek Kwu Chau (KP0.1 - 5.0)	1 Jetting Machine	720m day ⁻¹ for 24 hours each day	Yes	Two layers at Eastern Boundary of the Proposed South Lantau Marine Park (KP0.1 - 5.0)	Daily maximum of 12 hours with daylight (0700 – 1900)
Pipeline Riser Sections at Double Berth Jetty (under FEP-02/558/2018/A and FEP-03/558/2018/B)					
Pipeline Riser (KP0.0 - 0.1 for both pipelines)	1 Grab Dredger	8,000m ³ day ⁻¹ for 24 hours each day	Yes	Not required	Daily maximum of 12 hours with daylight (0700 – 1900)
BPPS Pipeline (under FEP-03/558/2018/B)					
Jetty Approach (KP0.1 - 5.0), excluding Subsea Cable Sterile Corridors	1 Jetting Machine (Note 1)	1,000m day ⁻¹ for 24 hours each day	Yes	Not required for grab dredging; Two layers at Southern Boundary of the Proposed South Lantau Marine Park (KP0.1 - 8.9) for jetting	Daily maximum of 12 hours with daylight (0700 – 1900)
Subsea Cable Sterile Corridors (KP1.49 - 2.75 & KP3.55 - 4.43)	2 Grab Dredgers, followed by 1 Jetting Machine	8,000m ³ day ⁻¹ for 24 hours each day for each dredger 720m day ⁻¹ for 24 hours each day jetting machine	Yes		
South of Soko Islands (KP5.0 - 8.9)	1 Jetting Machine (Note 1)	1,000m day ⁻¹ for 24 hours each day	Yes		
Southwest of Soko Islands (KP8.9 - 12.1)	1 Jetting Machine (Note 1)	1,000m day ⁻¹ for 24 hours each day	Yes	Not required	
Adamasta Channel (KP12.1 - 15.6)	1 Jetting Machine (Note 1)	1,000m day ⁻¹ for 24 hours each day	Yes	Not required	
Southwest Lantau (KP15.6 - 21.3)	1 Jetting Machine (Note 1)	1,500 m day ⁻¹ for 24 hours each day	Yes	Not required	Avoid the peak months of Chinese White Dolphin (CWD) calving (May and June)

Work Location	Plants Involved	Allowed Maximum Work Rate	Silt Curtain at Plants	Silt Curtain at WSRs	Other Measures ⁽¹⁾
West of Tai O to West of HKIA (KP21.3 - 31.5)	1 Jetting Machine (Note 1)	1,500m day ⁻¹ for 24 hours each day from KP KP26.2 to 21.3 720m day ⁻¹ for 24 hours each day from KP31.5 to 26.2	Yes	Not required	
Sha Chau to Lung Kwu Chau (KP31.5 - 36.0)	1 Jetting Machine (Note 1)	720m day ⁻¹ for 24 hours each day	Yes	Two layers at Western Boundary of the Sha Chau and Lung Kwu Chau Marine Park (KP31.5 - 36.0)	
Sha Chau to Lung Kwu Chau (KP36.0 - 37.5)	1 Jetting Machine (Note 1)	720m day ⁻¹ for 24 hours each day	Yes	Two layers at Western Boundary of the Sha Chau and Lung Kwu Chau Marine Park (KP36.0 - 37.5)	
Lung Kwu Chau to Urmston Anchorage (KP37.5 - 41.1)	1 Jetting Machine (Note 1)	1,000m day ⁻¹ for 24 hours each day	Yes	Two layers at NW corner of Sha Chau and Lung Kwu Chau Marine Park (KP37.5 - 41.1)	
Urmston Road (KP41.1 - 42.9)	1 Grab Dredger	8,000m ³ day ⁻¹ for 24 hours each day	Yes	Not required	
West of BPPS (KP42.9 - 44.9)	1 Jetting Machine (Note 1)	1,000m day ⁻¹ for 24 hours each day	Yes	Two layers at CR1, CR2 (Note 2)	
Pipeline shore approach at BPPS (KP44.9 - 45.0)	1 Grab Dredger	1,500m ³ day ⁻¹ for 24 hours each day	Yes	Two layers at CR1, CR2 (Note 2)	

Notes:

- (1) No more than two jetting machines will be used for the construction of the subsea gas pipeline of the Project. In addition to existing relevant mitigation measures, the minimum separation distance between the two jetting machines for avoiding cumulative impact is 5km for most of the pipeline sections, except when one jetting machine is working at the subsea cable sterile corridors (i.e. KP1.49 – KP2.75 and KP3.55 – KP4.43). When one jetting machine is working at the subsea cable sterile corridors, no other jetting machine will work concurrently within KP0.0-KP14.25, i.e., between the Jetty and Adamasta Channel.
- (2) CR1 and CR2 denote the coral colonies identified at the artificial seawall at BPPS.

ANNEX B

PROFORMA FOR CONSTRUCTION PHASE EM&A PROGRAMME

Water Quality Monitoring Data Log Sheet

Date: _____

Tide: Mid-ebb / Mid-flood

Monitoring Station	Weather Condition	Sea Condition**	Sampling Time	Depth (m)	Current Velocity (m/s)	Direction	Temperature (°C)		Salinity (ppt)		pH		DO Saturation (%)		Dissolved Oxygen (mg/L)			Turbidity(NTU)			Suspended Solids (mg/L)		
							Value	Average	Value	Average	Value	Average	Value	Average	Value	Average	DA*	Value	Average	DA*	Value	Average	DA*

Remark: * DA: Depth-Averaged
** Calm: Small or no wave; Moderate: Between calm and rough; Rough: White capped or rougher
*** Results of Suspended Solids refer to separate datasheet

IMPLEMENTATION SCHEDULE

Ref: _____

EIA Ref*	EM&A Log Ref	Environmental Protection Measures*	Location/ Timing	Implementation Agent	Implementation Stages**			
					Des	C	O	Dec

* All recommendations and requirements resulted during the Course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project
 ** Des- Design, C-Construction, O-Operation, Dec- Decommissioning

Signed by Project Proponent:

Date: _____

IMPLEMENTATION STATUS PROFORMA

Ref**	Environmental Protection Measures*	Implementation Status

* *All recommendations and requirements resulted during the Course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project*

** *EIA Ref / EM&A Log Ref / Design Document Ref*

Signed by Environmental Team Leader:

Date: _____

Audited by Independent Environmental Checker:

Date: _____

SITE INSPECTION PROFORMA

Ref: _____

Date	Location	Req. Ref.*	Observation / Deficiency	Mitigation Action** (Responsible Agency)	Date*** of Confirmation

* EIA Ref / EM&A Log Ref / Design Document Ref / Environmental Protection Contract Clause
 ** Specific Environmental Mitigation Measures should be stated, such as, equipment, processes, systems, practices or technologies
 *** The required completion date to confirm the specified Environmental Protection Action

This Proforma is an Environmental Protection Instruction for:

Signed by Environmental Team Leader:

Date: _____

Copy to Independent Environmental Checker

Date: _____

REGULATORY COMPLIANCE PROFORMA

Ref: _____

Ref*	Environmental License / Permit*	Control Area / Facility / Location	Effective Date

* *Name of Applicant, Business Corporation, relevant regulation and remark of license / permit conditions*

** *File reference of the licensee / permittee*

Recorded by Environmental Team Leader:

Date: _____

Signed by Independent Environmental Checker :

Date: _____

COMPLAINT LOG

Ref: _____

Log Ref.	Date / Location	Complainant/ Date of Contract	Details of Complaint	Investigation / Mitigation Action	File Closed

Filed by Environmental Team Leader:

Date: _____

DOLPHIN / PORPOISE SIGHTING SHEET

HIGH PRIORITY DATA (Record at Initial Sighting)

Date _____ Time _____ Sighting No. _____
Sighting Distance (metres) _____ Sighting Angle (°) _____
Sighting Angle – Dolphins _____ Sighting Angle – Bow of Boat _____
Sighting Position (Initial) _____
Sighting Position (dolphin) _____ (Trip: _____ km)

LOW PRIORITY DATA (Record During or After Sighting)

Species Humpback Dolphin **Effort** On
 Finless Porpoise Off
 Other

Seen By _____

Group Size Best _____ High _____ Low _____

CWD* Group Composition† UC _____ UJ _____ SJ _____

SS _____ SA _____ UA _____

FP‡ Group Composition Calves _____ Adults _____

Beaufort 0 1 2 3 4 5 6 7+

Boat Assoc. None Pair Shrimp Hang
 Other _____

Photos Yes No

Survey Area _____

Survey Type _____

BEHAVIOUR / COMMENTS

Feeding Socializing Travelling Milling/Resting
 Breaching Spy-hopping Porpoising

Other Behaviour _____

Identified Individual(s) _____

Other Comments _____

* CWD = Chinese White Dolphin

† UC = Unspotted Calf, UJ = Unspotted Juvenile, SJ = Spotted Juvenile, SS = Spotted Sub-Adult, SA = Spotted Adult, UA = Unspotted Adult

‡ Finless Porpoise