

**Contract No. HY/2011/03**

**Hong Kong-Zhuhai-Macao Bridge Hong Kong Link  
Road**

**Section between Scenic Hill and Hong Kong  
Boundary Crossing Facilities**

**Contract Specific**

**Environmental Monitoring and Audit (EM&A) Manual**

**Rev. 6**

12 July 2013

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## 1 Introduction

### 1.1 Background

- 1.1.1 This Contract Specific Environmental Monitoring and Audit (EM&A) Manual is prepared for Contract HY/2011/03 Hong Kong-Zhuhai-Macao Bridge (“HKZMB”) Hong Kong Link Road – Section between Scenic Hill and Hong Kong Boundary Crossing Facilities (“the Contract”) for the Highways Department of HKSAR. The Contract was awarded to China State Construction Engineering (Hong Kong) Limited (“the Contractor”) and BMT Asia Pacific was appointed as the Environmental Team by the Contractor.
- 1.1.2 The Contract is part of the Hong Kong – Zhuhai – Macao Bridge Hong Kong Link Road (“HKLR”) Project and Hong Kong – Zhuhai – Macao Bridge Hong Kong Boundary Crossing Facilities (HKBCF) Project, these projects are considered to be “Designated Projects”, under Schedule 2 of the Environmental Impact Assessment (EIA) Ordinance (Cap 499) and Environmental Impact Assessment (EIA) Reports (Register No. AEIAR-144/2009 and AEIAR-145/2009) were prepared for the Project. The current Environmental Permit (EP) EP-352/2009/A for HKLR and EP-353/2009/E for HKBCF were issued on 31 October 2011 and 16 October 2012, respectively. These documents are available through the EIA Ordinance Register.
- 1.1.3 This Contract Specific EM&A Manual is to fulfill Clause 8.2.3 of the Employer’s Requirements of Contract No. HY/2011/03 to include all contract-related contents from the EM&A Manuals approved under the EIAO for Hong Kong Link Road and HKBCF. The Site Area of the Contract is shown in **Figure 1**.

### 1.2 Purpose of this Manual

- 1.2.1 This Contract Specific EM&A Manual outlines the monitoring and audit programme to be undertaken during the course of the construction works specific to Contract No. HY/2011/03. It aims to provide systematic procedures for monitoring, auditing and minimization of the environmental impacts associated with the construction works. The purpose of this EM&A Manual is:
- to guide the set up of an EM&A programme to ensure compliance with the EIA recommendations;
  - to specify the requirements for monitoring equipment;
  - to propose environmental monitoring points, monitoring frequency etc.;
  - to propose Action/Limit Level; and
  - to propose Event/Action Plan.
- 1.2.2 Hong Kong environmental regulations and the Hong Kong Planning Standards and Guidelines (HKPSG) have served as environmental standards and guidelines in the preparation of this Manual. In addition, this Contract Specific EM&A Manual has been prepared in accordance with the requirements stipulated in Annex 21 of the Technical Memorandum on the EIA Process (TM-EIAO).
- 1.2.3 This Manual contains the following information:
- Responsibilities of the Contractor, the Supervising Officer (SO), Environmental Team (ET), and the Independent Environmental Checker (IEC) with respect to the EM&A requirements;
  - Role of the Environmental Protection Office (ENPO);
  - Project organization for the EM&A works;
  - Programming of construction activities for the Contract;

- The basis for, and description of the broad approach underlying the EM&A programme;
- Requirements with respect to the construction schedule and the necessary EM&A programme to track the varying environmental impacts;
- Details of the methodologies to be adopted, including all laboratories and analytical procedures, and details on quality assurance and quality control programme;
- The rationale on which the environmental monitoring data will be evaluated and interpreted;
- 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 non-compliance with the environmental criteria and complaints; and
- Requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures.

1.2.4 As the HKLR project has been split into two contracts, the environmental monitoring locations as required in the updated EM&A Manual for HKLR (Version 1.0) are not all relevant to the Contract. According to the requirements provided in the contract document, the following environmental monitoring will be undertaken for the Contract and form part of the EM&A Programme:

Environmental Monitoring	Locations
Air Quality	AMS5 and AMS6
Noise	NMS5
Water Quality	IS5, IS(Mf)6, IS7, IS8, IS(Mf)9, IS10, SR3, SR4, SR5, SR10A, SR10B, CS2 and CS(Mf)5
Chinese White Dolphin	Northeast Lantau and Northwest Lantau
Mudflat	Intertidal soft shore habitats in San Tau and Tung Chung Bay
Coral	Pre-construction dive survey for corals along the shore of the HKLR reclamation site.

1.2.5 For the purpose of this manual, the SO shall refer to the Supervising Officer as defined in the Construction Contract, in cases where the SO's powers have been delegated to the Supervising Officer's Representative ("SOR"), in accordance with the Construction Contract. The responsibilities of the SO are the same as those of the Engineer defined in the EM&A Manual for the HKLR. The Environmental Team Leader (ETL), who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the environmental monitoring and audit requirements.

1.2.6 Sections 5 – 16 of this manual have been reference to the numbering system of the Updated EM&A Manual for HKLR (Version 1.0) for ease of reference.

## 2 Project Description

### 2.1 Contract No. HY/2011/03 Hong Kong Link Road

2.1.1 The Works under this Contract comprises the design and construction for the section of HKLR between Scenic Hill and Hong Kong Boundary Crossing Facilities, including the following:-

- New reclamation along the east coast of the Hong Kong International Airport (HKIA), of approximately 23 hectares;
- A tunnel (hereinafter referred to as Tunnel SHT) from Scenic Hill to the new reclamation, of approximately 1 kilometre in length with 3 lanes for eastbound carriageway heading to the HKBCF and 4 lanes for westbound carriageway heading to the HZMB Main Bridge;
- An abutment of the viaduct portion of the HKLR at the west portal of Tunnel SHT and associated roadworks at west portal of Tunnel SHT;
- An at-grade road on the new reclamation along the east coast of the HKIA to connect with the Hong Kong Boundary Crossing Facility ("HKBCF"), of approximately 1.6 km along dual 3-lane carriageway with hard shoulder for each bound;
- Roadlinks between the HKBCF and the HKIA including new roads and modification of existing roads in the HKIA, involving viaducts, at-grade roads and a tunnel (hereinafter referred to as Tunnel HAT);
- A highway operation and maintenance area (hereinafter referred to as HMA) located on the new reclamation at south of Dragonair Headquarters Building, including construction of buildings, connection roads and other associated facilities;
- Associated civil, structural, building, geotechnical, marine, environmental protection, landscaping, drainage and sewerage, tunnel and highway electrical and mechanical works, together with installation of street lightings, traffic aids and sign gantries, water mains and fire hydrants, provision of facilities for installation of traffic control and surveillance system (TCSS), reprovisioning works of affected existing facilities, implementation of transplanting, compensatory planting and protection of existing trees, and implementation of an environmental monitoring and audit (EM&A) programme.

### 2.2 Implementation Programme

2.2.1 **Appendix A** illustrates the tentative construction programme for the Project. All the key construction activities are shown with the tentative dates for commencement and completion.

2.2.2 All necessary mitigation measures have been identified and recommended in the original EM&A Manuals approved under the EIAO for HKLR and HKBCF.

2.2.3 The mitigation measures which are applicable to the works under this Contract were extracted from Environmental Mitigation Implementation Schedule (EMIS) in the original EM&A Manuals and are given in **Appendix B**. It specifies the extent, locations, time frame and responsibilities for the implementation of the environmental mitigation measures identified.

## 2.3 Concurrent Projects During Construction Phase

- 2.3.1 Construction of HKLR commenced in Year 2012 and scheduled to open in Year 2016.
- 2.3.2 The advance works of Tuen Mun Check Lap Kok Link, i.e. reclamation works of the southern landfall of the TMCLKL sub-sea tunnel commenced in late 2011. The southern connection of the TMCLKL was scheduled to complete in 2016 to tally with the commissioning of the HZMB, and to complete the northern connection in 2017.
- 2.3.3 The Main Bridge of the HZMB within the Guangdong water would also be concurrent with the construction of HKBCF and southern landfall of TMCLKL. The tentative commissioning date is also 2015.
- 2.3.4 Another concurrent project during the construction of HKBCF and southern landfall of TMCLKL is the 72 ha reclamation for Lantau Logistics Park. This has been considered as a concurrent project in the EIA.



## 3 Project Organization

### 3.1 Project Organization

- 3.1.1 The proposed project organization and lines of communication with respect to environmental protection works are shown in **Appendix C**.
- 3.1.2 The ETL shall be an independent party from the Contractor and has relevant professional qualifications, and have at least 7 years of experience in conducting EM&A projects subject to approval of the SO and EPD.
- 3.1.3 The responsibilities of respective parties are described in the following sections.

### 3.2 The Contractor

- 3.2.1 The role and responsibility of the Contractor are provided below:
- employ an ET to undertake monitoring, laboratory analysis and reporting of environmental monitoring and audit;
  - provide assistance to ET in carrying out monitoring and auditing;
  - 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; and
  - adhere to the agreed procedures for carrying out complaint investigation.

### 3.3 Environmental Team

- 3.3.1 The ET is to be appointed by the Contractor. The role and responsibilities of the ET are provided below:
- set up all the required environmental monitoring stations;
  - monitor various environmental parameters as required in the EM&A Manual;
  - analyze the environmental monitoring and audit data and review the success of EM&A programme to cost-effectively confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising;
  - carry out site inspection to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and take proactive actions to pre-empt problems;
  - audit and prepare audit reports on the environmental monitoring data and site environmental conditions;
  - report on the environmental monitoring and audit results to the IEC, Contractor, the SO and EPD or its delegated representative;
  - recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans;

- undertake regular on-site audits/inspections and report to the Contractor and the SO of any potential non-compliance; and
- follow up and close out non-compliance actions.

### 3.4 Supervising Officer or Supervision Officer's Representative

3.4.1 The role and responsibilities of the SO or SOR are provided below:

- supervise the Contractor's activities and ensure that the requirements in the EM&A Manual are fully complied with;
- inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans;
- employ an IEC to audit the results of the EM&A works carried out by the ET; and
- comply with the agreed Event Contingency Plan in the event of any exceedance.

### 3.5 Independent Environmental Checker

3.5.1 An IEC will be responsible for the environmental auditing works. The role and responsibilities of the IEC are provided below:

- review the EM&A works performed by the ET (at not less than monthly intervals);
- audit the monitoring activities and results (at not less than monthly intervals);
- report the audit results to the SO and EPD in parallel;
- review the EM&A reports (monthly and quarterly summary reports) submitted by the ET;
- review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;
- check the mitigation measures that have been recommended in the EIA and this Manual, and ensure they are properly implemented in a timely manner, when necessary; and
- report the findings of site inspections and other environmental performance reviews to SO and EPD.

### 3.6 Environmental Protection Office

3.6.1 Notwithstanding the above, given that the TMCLKL, HKBCF and HKLR will be constructed concurrently, an ENPO or equivalent to oversee the cumulative construction projects in North Lantau area will be established by the Project Proponent. The responsibility of the ENPO would be similar to that of the IEC but should also include:

- coordinate the monitoring and auditing works for all the on-going projects in the area in order to identify possible sources/causes of exceedances and recommend suitable remedial actions where appropriate;
- review cumulative impacts including possible sources/causes of exceedance and recommending suitable remedial actions;

- liaise with the mainland project teams for HZMB Main Section to identify and assess any cross-boundary cumulative impacts in order to establish suitable remedial actions where necessary; and
  - coordinate the assessment and response to complaints/enquires from locals, green groups, district councils or the public at large.
- 3.6.2 The exact responsibilities and organisation of the ENPO have been defined by the Project Proponent in accordance with the relevant Environmental Permits.
- 3.6.3 Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibilities, as required under the EM&A programme for the duration of the Project.

## 4 Environmental Submissions

### 4.1 Introduction

- 4.1.1 The Contractor shall prepare relevant environmental submissions (including statutory submissions) as required under the Environmental Permit EP-352/2009/A and EP-353/2009/E, and the approved EM&A Manuals covered by the EP, and obtain approval from SO, IEC, EPD and other relevant authorities to encompass the recommended environmental protection / mitigation measures with respect to their latest construction methodology and programme.
- 4.1.2 Statutory submissions required under EP-352/2009/A include:
- Dolphin Watching Plan;
  - Acoustic Decoupling Measures Plan;
  - Coral Translocation Methodology;
  - Spill Response Plan;
  - Regular Marine Vessels Travel Routes;
  - Emergency Response Plan for Tank Farm;
  - Landscape and Visual Plan;
  - Waste Management Plan; and
  - Emergency Response Plan for Spillage of Oil and Chemicals.
- 4.1.3 As the Contract only involves the construction of roadlinks between the proposed HKBCF and Hong Kong International Airport, relevant statutory submissions required under EP-353/2009/E are:
- Landscape and Visual Plan; and
  - Waste Management Plan.
- 4.1.4 Environmental submissions required under the EM&A Manuals include:
- Environmental Management Plan;
  - Site Drainage Management Plan;
  - Silt Curtain Performance Pilot Test Plan; and
  - Ecological Monitoring Plan.

### 4.2 Environmental Permit Submissions - Plans on Marine Ecological Mitigation Measures

#### Dolphin Watching Plan

- 4.2.1 The Dolphin Watching Plan shall include details on regular inspection of the silt curtains, visual inspection of the waters surrounded by the curtains, and an action plan to cope with any unpredicted incidents such as the case that Chinese White Dolphin (CWD) is found within the water surrounded by the silt curtains.
- 4.2.2 The Dolphin Watching Plan is required under Clause 2.5 of the EP-352/2009/A.

### Acoustic Decoupling Measures Design

- 4.2.3 The Contractor shall prepare the design and implementation of acoustic decoupling measures to be applied during bored piling and reclamation works.
- 4.2.4 The design of acoustic decoupling measures is required under Clause 2.6 of the EP-352/2009/A.

### Coral Translocation Methodology

- 4.2.5 A detailed coral translocation methodology shall be prepared, including pre-translocation survey, identification of receiving sites and post-translocation monitoring.
- 4.2.6 The detailed coral translocation methodology is required under Clause 2.7 of the EP-352/2009A.

### Spill Response Plan

- 4.2.7 A Spill Response Plan detailing the actions to be taken in the event of accidental spillage of oil or other hazardous chemicals from construction activities including vessels operating for the Project, with specific provisions for protecting marine ecology and the Chinese White Dolphin (CWD) shall be prepared.
- 4.2.8 The Spill Response Plan is required under Clause 2.8 of the EP-352/2009A.

### Regular Marine Vessels Travel Routes

- 4.2.9 To minimize the chance of vessel collision and the disturbance to the Chinese White Dolphin (CWD), a plan showing the regular marine travel routes of vessels moving to and from the Project work sites shall be prepared. Any subsequent changes to the regular routes shall be verified by the IEC as conforming to the requirements in the EIA Report.
- 4.2.10 The marine vessels travel routes plan is required under Clause 2.9 of the EP-352/2009A.

## 4.3 Emergency Response Plan for Tank Farm

- 4.3.1 An emergency response plan to minimize death and damages due to accidents at the tank farm shall be prepared. The emergency response plan shall at least detail the emergency response procedures including evacuation, logistics and notification arrangement in the event of fire, fuel spillage and fuel leakage at the tank farm.
- 4.3.2 The emergency response plan is required under Clause 2.10 of the EP-352/2009A.

## 4.4 Landscape and Visual Plan

- 4.4.1 A landscape and visual plan incorporating measures, including aesthetic design on the tunnel portals, at-grade roads and reclamation and visually neutral/recessive colour scheme for construction of offshore structures and night-time lighting control shall be prepared.
- 4.4.2 The landscape and visual plan is required under Clause 2.11 of the EP-352/2009A and Clause 2.9 of the EP-353/2009/E.

#### 4.5 Waste Management Plan

- 4.5.1 The Contractor shall include a Waste Management Plan (WMP) for the construction of the project and submit to the SO, IEC and EPD for approval. Where waste generation is unavoidable, the opportunities for recycling or reusing should be maximized. If wastes cannot be recycled, recommendations for appropriate disposal routes should be provided in the WMP. A method statement for stockpiling and transportation of the excavated materials and other construction wastes should also be included in the WMP and approved before the commencement of construction. All mitigation measures arising from the approved WMP shall be fully implemented.
- 4.5.2 For the purpose of enhancing the management of Construction and Demolition (C&D) materials including rock, and minimising its generation at source, construction would be undertaken in accordance with the Environment, Transport and Works Bureau Technical Circular (Works) No. 33/2002 - Management of Construction and Demolition Material Including Rock, or its latest versions. The management measures stipulated in the Technical Circular should be incorporated into the WMP.
- 4.5.3 The WMP is required under Clause 2.12 of the EP-352/2009/A and Clause 2.10 of the EP-353/2009/E.

#### 4.6 Emergency Response Plan for Spillage of Oil and Chemicals

- 4.6.1 An Emergency Response Plan on how to prevent oil and chemical spillages caused by traffic incidents on the carriageway from entering into the waterbody during operation shall be prepared.
- 4.6.2 The Emergency Response Plan for Spillage of Oil and Chemicals is required under Clause 3.16 of the EP-352/2009A.

#### 4.7 Construction Method Statement

- 4.7.1 In case the Contractor would like to adopt alternative construction methods or implementation schedules, it is required to submit details of methodology and equipment to the SO for approval before the work commences. Any changes in construction method shall be reflected in a revised EMP or the Contractor will be required to demonstrate the manner in which the existing EMP should accommodate the proposed changes. The Contractor may need to apply for a Further Environmental Permit (FEP) from EPD before commencement of any construction activities.

#### 4.8 Environmental Management Plan

- 4.8.1 A systematic Environmental Management Plan (EMP) shall be set up by the Contractor to ensure effective implementation of the mitigation measures, monitoring and remedial requirements presented in the EIA, EM&A and EMIS. The SO and the IEC will audit the implementation status against the EMP and advise the necessary remedial actions required. These remedial actions shall be enforced by the SO through contractual means.
- 4.8.2 The EMP will define in details how the Contractor (together with its sub-contractors) implements the recommended mitigation measures in order to achieve the environmental performance defined in the Hong Kong environmental legislation and the EIA documentation.
- 4.8.3 The review of on-site environmental performance shall be undertaken by SO and IEC through a systematic checklist and audit once the construction commences. The environmental performance review programme comprises a regular assessment on the effectiveness of the EMP. Reference should be made to Environment, Transport and Works Bureau Technical Circular (Works) No. 19/2005 "Environmental Management on Construction Sites" or its latest versions, and any other relevant Technical Circulars.

4.8.4 The EMP is required under Clause 8.8.1 of the Employer's Requirements Part 8.

#### 4.9 Site Drainage Management Plan

4.9.1 A detailed site drainage management plan should cover measures to minimize all potential water quality impact arising from the surface runoffs of all the related constructions.

4.9.2 The detailed site drainage management plan is required under Clause 9.1.2 of the EM&A Manual.

#### 4.10 Silt Curtain Performance Pilot Test Plan

4.10.1 The ET shall be responsible for conducting tests to confirm that their silt curtain systems to be adopted would satisfy the requirements in the EIA Report.

4.10.2 A method statement detailing the pilot test of silt removal efficiency of the floating type silt curtains shall be submitted by the ET Leader to seek approval from the IEC and EPD.

4.10.3 The pilot tests should be carried out during the early stage of construction to confirm whether the silt removal efficiency of the floating type silt curtains can achieve 45% silt removal efficiency for filling activity when deployed, and a combined reduction of 61% when the two layers of floating type silt curtains are used.

4.10.4 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 designed monitoring stations.

#### 4.11 Ecological Monitoring Plan

4.11.1 An ecological monitoring plan for mudflat baseline, impact and post-construction monitoring shall be submitted to AFCD and EPD for approval prior to the baseline monitoring. The mudflat monitoring shall cover the intertidal soft shore habitats in San Tau and Tung Chung Bay where horseshoe crab juveniles and seagrass beds have been sighted.

4.11.2 Baseline monitoring shall be undertaken prior to the commencement of works and quarterly during the construction period. The post-construction monitoring for mudflat shall be undertaken for at least 2 years after the completion of construction.

## 5 Air Quality Monitoring

### 5.1 Air Quality Parameters

- 5.1.1 Monitoring and audit of the Total Suspended Particulates (TSP) levels shall be carried out by the ET to ensure that any deteriorating air quality could be readily detected and timely action taken to rectify the situation.
- 5.1.2 One-hour and 24-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The 24-hour TSP levels shall be measured by following the standard high volume sampling method as set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), **Appendix B**. Upon approval of the IEC, 1-hour TSP levels can be measured by direct reading methods which are capable of producing comparable results as that by the high volume sampling method, to indicate short event impacts.
- 5.1.3 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and any other local atmospheric factors affecting or affected by site conditions, etc., shall be recorded down in detail. A sample data sheet is shown in **Appendix D**.

### 5.2 Monitoring Equipment

- 5.2.1 High volume samplers (HVSs) complying with the following specifications shall be used for carrying out the 1-hour and 24-hour TSP monitoring:
- 0.6 - 1.7 m<sup>3</sup> per minute adjustable flow range;
  - equipped with a timing / control device with +/- 5 minutes accuracy for 24 hours operation;
  - installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
  - capable of providing a minimum exposed area of 406 cm<sup>2</sup>;
  - flow control accuracy: +/- 2.5% deviation over 24-hour sampling period;
  - equipped with a shelter to protect the filter and sampler;
  - incorporated with an electronic mass flow rate controller or other equivalent devices;
  - equipped with a flow recorder for continuous monitoring;
  - provided with a peaked roof inlet;
  - incorporated with a manometer;
  - able to hold and seal the filter paper to the sampler housing at horizontal position;
  - easily changeable filter; and
  - capable of operating continuously for a 24-hour period.
- 5.2.2 The ET is responsible for the provision, installation, operation, maintenance, dismantling of the monitoring equipment. They shall ensure that sufficient number of HVSs with an appropriate calibration kit is available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. The HVSs shall be equipped with an electronic mass flow controller and be calibrated



against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc., shall be clearly labeled.

- 5.2.3 Initial calibration of dust monitoring equipment shall be conducted upon installation and thereafter at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognized primary standard and be calibrated annually. The concern parties such as IEC shall properly document the calibration data for future reference. All the data should be converted into standard temperature and pressure condition.
- 5.2.4 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded in the data sheet as mentioned in **Appendix D**.
- 5.2.5 If the ET proposes to use a direct reading dust meter to measure 1-hour TSP levels, he shall submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable result to the HVS. The instrument should also be calibrated regularly, and the 1-hour sampling shall be determined periodically by the HVS to check the validity and accuracy of the results measured by direct reading method.
- 5.2.6 Wind data monitoring equipment shall also be provided and set up set up for logging wind speed and wind direction near the dust monitoring locations. The equipment installation location shall be proposed by the ET and agreed with the IEC. For installation and operation of wind data monitoring equipment, the following points shall be observed:
- The wind sensors should be installed 10 m above ground so that they are clear of obstructions or turbulence caused by buildings.
  - The wind data should be captured by a data logger. The data shall be downloaded for analysis at least once a month.
  - The wind data monitoring equipment should be re-calibrated at least once every six months.
  - Wind direction should be divided into 16 sectors of 22.5 degrees each.
- 5.2.7 In exceptional situations, the ET may propose alternative methods to obtain representative wind data upon approval from the SO and agreement from the IEC.

### 5.3 Laboratory Measurement / Analysis

- 5.3.1 A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory should be HOKLAS accredited.
- 5.3.2 If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the SO and the measurement procedures shall be witnessed by the IEC. Any measurement performed by the laboratory shall be demonstrated to the satisfaction of the SO and IEC. IEC shall regularly audit to the measurement performed by the laboratory to ensure the accuracy of measurement results. The ET Leader shall provide the SO with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.

- 5.3.3 Filter paper of size 8" x 10" shall be labelled before sampling. It shall be a clean filter paper with no pinholes, and shall be conditioned in a humidity-controlled chamber for over 24-hours and be pre-weighed before use for the sampling.
- 5.3.4 After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper shall then be returned to the laboratory for reconditioning in the humidity-controlled chamber followed by accurate weighing by an electronic balance with readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.
- 5.3.5 All the collected samples shall be kept in a good condition for 6 months before disposal.

## 5.4 Monitoring Locations

- 5.4.1 **Figure 2** shows the locations of the proposed dust monitoring station for the Contract. The status and locations of dust sensitive receivers may change after issuing this Manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from SO and agreement from the IEC.

**Table 5.1 Construction Dust Monitoring Locations**

ID	Location Description
AMS 5	Ma Wan Chung Village (Tung Chung)
AMS 6	Dragonair / CNAC (Group) Building (HKIA)

- 5.4.2 When alternative monitoring locations are proposed, the proposed site should, as far as practicable:
- be at the site boundary or such locations close to the major dust emission source;
  - be close to the sensitive receptors; and
  - take into account the prevailing meteorological conditions.
- 5.4.3 The ET shall agree with the SO in consultation with the IEC on the position of the HVS for the installation of the monitoring equipment. When positioning the samplers, the following points shall be noted:
- a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
  - no two samplers should be placed less than 2 meters apart;
  - the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
  - a minimum of 2 meters of separation from walls, parapets and penthouses is required for rooftop samplers;
  - a minimum of 2 meters separation from any supporting structure, measured horizontally is required;
  - no furnace or incinerator flue is nearby;
  - airflow around the sampler is unrestricted;
  - the sampler is more than 20 meters from the dripline;
  - any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;

- j) permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- k) a secured supply of electricity is needed to operate the samplers.

5.4.4 The ENPO may, depending on site conditions and monitoring results, decide whether additional monitoring locations shall be included or any monitoring locations could be removed/ relocated during any stage of the construction phase.

## 5.5 Baseline Monitoring for Fugitive Dust

- 5.5.1 Baseline monitoring shall be carried out at all of the designated monitoring locations (see **Table 5.1**) for at least 14 consecutive days prior to the commissioning of major construction works to obtain daily 24-hour TSP samples. The selected baseline monitoring stations should reflect baseline conditions at the impact stations. One-hour sampling should also be done at least 3 times per day while the highest dust impact is expected.
- 5.5.2 During the baseline monitoring, there should not be any major construction or dust generation activities in the vicinity of the monitoring stations. Before commencing baseline monitoring, the ET shall inform the IEC of the baseline monitoring programme such that, if required, the SO can conduct on-site audit to ensure accuracy of the baseline monitoring results.
- 5.5.3 In case the baseline monitoring cannot be carried out at the designated monitoring locations, the ET Leader shall carry out the monitoring at alternative locations that can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall be approved by the SO and agreed with the IEC.
- 5.5.4 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with the IEC and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to SO for approval.
- 5.5.5 Ambient conditions may vary seasonally and shall be reviewed once every three months. When the ambient conditions have changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be at times when the Contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, should be revised. The revised baseline levels and air quality criteria should be agreed with the IEC and EPD.

## 5.6 Impact Monitoring for Fugitive Dust

- 5.6.1 The ET shall carry out impact monitoring during the entire construction period. For regular impact monitoring, the sampling frequency of at least once in every 6 days, shall be strictly observed at all the monitoring stations for 24-hour TSP monitoring. For 1-hour TSP monitoring, the sampling frequency of at least 3 times in every 6 days should be undertaken when the highest dust impact occurs. Before commencing impact monitoring, the ET shall inform the IEC of the impact monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the monitoring results.
- 5.6.2 The specific time to start and stop the 24-hour TSP monitoring shall be clearly defined for each location and be strictly followed by the ET.
- 5.6.3 In case of non-compliance with the air quality criteria, more frequent monitoring, as specified in the Action Plan in the following section, shall be conducted within the specified timeframe after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified, and agreed with the SO and the IEC.

## 5.7 Action and Limit Levels

5.7.1 The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET shall compare the impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. **Table 5.2** shows the air quality criteria, namely Action and Limit levels to be used.

**Table 5.2 Action and Limit Levels for Air Quality**

Parameter	Action Level	Limit Level
24-hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 200 \mu\text{g}/\text{m}^3$ , Action level = (baseline level * 1.3 + Limit level)/2; For baseline level $\leq 200 \mu\text{g}/\text{m}^3$ , Action level = Limit Level	260 $\mu\text{g}/\text{m}^3$
1-hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 384 \mu\text{g}/\text{m}^3$ , Action level = (baseline level * 1.3 + Limit level)/2; For baseline level $\leq 384 \mu\text{g}/\text{m}^3$ , Action level = Limit Level	500 $\mu\text{g}/\text{m}^3$

## 5.8 Event and Action Plan

5.8.1 Should non-compliance of the air quality criteria occur, actions in accordance with the Action Plan in **Table 5.3** shall be carried out.

**Table 5.3 Event and Action Plan for Air Quality**

Event	Action			
	ET	IEC	SO	Contractor
Exceedance of Action Level for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform IEC and SO; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method.	1. Notify Contractor.	1. Rectify any unacceptable practice; 2. Amend working methods if appropriate.

Event	Action			
	ET	IEC	SO	Contractor
Exceedance of Action Level for two or more consecutive samples	<ol style="list-style-type: none"> <li>1. Identify source;</li> <li>2. Inform IEC and SO;</li> <li>3. Advise the SO on the effectiveness of the proposed remedial measures;</li> <li>4. Repeat measurements to confirm findings;</li> <li>5. Increase monitoring frequency to daily;</li> <li>6. Discuss with IEC and Contractor on remedial actions required;</li> <li>7. If exceedance continues, arrange meeting with IEC and SO;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss with ET and Contractor on possible remedial measures;</li> <li>4. Advise the ET on the effectiveness of the proposed remedial measures;</li> <li>5. Supervise Implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit proposals for remedial to SO within 3 working days of notification;</li> <li>2. Implement the agreed proposals;</li> <li>3. Amend proposal if appropriate.</li> </ol>
Exceedance of Limit Level for one sample	<ol style="list-style-type: none"> <li>1. Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>2. Inform SO, Contractor and EPD;</li> <li>3. Repeat measurement to confirm finding;</li> <li>4. Increase monitoring frequency to daily;</li> <li>5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and SO informed of the results.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss with ET and Contractor on possible remedial measures;</li> <li>4. Advise the SO on the effectiveness of the proposed remedial measures;</li> <li>5. Supervise implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Amend proposal if appropriate.</li> </ol>

Event	Action			
	ET	IEC	SO	Contractor
Exceedance of Limit Level for two or more consecutive samples	1. Notify IEC, SO, Contractor and EPD; 2. Identify source; 3. Repeat measurement to confirm findings; 4. Increase monitoring frequency to daily; 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 6. Arrange meeting with IEC and SO to discuss the remedial actions to be taken; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and SO informed of the results; 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst SO, ET, and Contractor on the potential remedial actions; 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SO accordingly; 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures properly implemented; 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to IEC within 3 working days of notification; 3. Implement the agreed proposals; 4. Resubmit proposals if problem still not under control; 5. Stop the relevant portion of works as determined by the SO until the exceedance is abated.

## 5.9 Mitigation Measures

- 5.9.1 The EIA Report has recommended dust control measures including 8 times of watering per day. Good site practices such as road surface paving, dust enclosures, wheels wash facilities would be implemented to reduce the generation of dust.
- 5.9.2 All the proposed mitigation measures are summarised in the Environmental Mitigation Implementation Schedule (EMIS) in **Appendix B**.

## 6 Noise Monitoring

### 6.1 Noise Parameter

- 6.1.1 Construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level ( $L_{eq}$ ).  $L_{eq, 30 \text{ min}}$  shall be used as the monitoring parameter for the time period between 07:00 and 19:00 hours on normal weekdays. For all other time periods,  $L_{eq, 5 \text{ min}}$  shall be employed for comparison with the Noise Control Ordinance (NCO) criteria.
- 6.1.2 As supplementary information for data auditing, statistical results such as  $L_{10}$  and  $L_{90}$  shall also be obtained for reference.

### 6.2 Monitoring Equipment

- 6.2.1 As referred to in the Technical Memorandum (TM) issued under the NCO, sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement, the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agrees to within 1.0 dB.
- 6.2.2 Noise measurements should be made in accordance with standard acoustical principles and practices in relation to weather conditions.
- 6.2.3 The ET is responsible for the provision, installation, operation, maintenance, dismantling of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

### 6.3 Monitoring Locations

- 6.3.1 The location of the proposed noise monitoring station for the Contract is presented in **Table 6.1** and shown in **Figure 2**.

**Table 6.1 Airborne Construction Noise Monitoring Locations**

ID	Location Description
NMS 5	Ma Wan Chung Village (Ma Wan Chung Resident Association) (Tung Chung)

- 6.3.2 The ET shall select the monitoring location from the above table based on the locations of the construction activities and seek approval from ER and agreement from the IEC and EPD to the proposal. The monitoring location should be chosen based on the following criteria:
- at locations close to the major site activities which are likely to have noise impacts;
  - close to the most affected existing noise sensitive receivers; and
  - for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.
- 6.3.3 The monitoring station shall normally be at a point 1 m from the exterior of the sensitive receiver building facade and be at a position 1.2 m above the ground. If there is problem with access to the



normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3 dB(A) shall be made to the free field measurements. The ET shall agree with the IEC on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

- 6.3.4 The ENPO may, depending on site conditions and monitoring results, decide whether additional monitoring locations shall be included or any monitoring locations could be removed/ relocated during any stage of the construction phase.

#### 6.4 Baseline Monitoring for Construction Noise

- 6.4.1 The ET shall carry out baseline monitoring prior to the commencement of the construction works. There shall not be any construction activities in the vicinity of the stations during the baseline monitoring. Continuous baseline noise monitoring for the A-weighted levels  $L_{eq}$ ,  $L_{10}$  and  $L_{90}$  shall be carried out daily for a period of at least two weeks in a sample period of 5 minutes or 30 minutes between 07:00 and 19:00, and 5 minutes between 19:00 and 07:00. A schedule on the baseline monitoring shall be submitted to the SO and IEC for approval before the monitoring starts.
- 6.4.2 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with the IEC and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to the SO for approval.

#### 6.5 Impact Monitoring for Construction Noise

- 6.5.1 During normal construction working hour (07:00-19:00 Monday to Saturday), monitoring of  $L_{eq, 30\text{ minutes}}$  noise levels (as six consecutive  $L_{eq, 5\text{ minutes}}$  readings) shall be carried out at the agreed monitoring locations once every week in accordance with the methodology in the TM.
- 6.5.2 If a school exists near the construction activity, noise monitoring shall be carried out at the monitoring stations for the schools during the school examination periods. The ET Leader shall liaise with the school's personnel and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract.
- 6.5.3 In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Action Plan, shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.
- 6.5.4 A schedule on the compliance monitoring shall be submitted to the SO and IEC for approval before the monitoring starts.

#### 6.6 Event and Action Plan for Construction Noise

- 6.6.1 The Action and Limit levels for construction noise are defined in **Table 6.2**. Should non-compliance of the criteria occur, action in accordance with the Event and Action Plan shall be carried out.

**Table 6.2 Action and Limit Levels for Construction Noise**

Parameter	Action Level	Limit Level
07:00 – 19:00 hours on normal weekdays	When one documented complaint is received	75 dB(A)

Note : If works are to be carried out during restricted hours, the conditions stipulated in the construction noise permit issued by the Noise Control Authority have to be followed.



**Table 6.3 Event and Action Plan for Construction Noise**

Event	Action			
	ET	IEC	SO	Contractor
Exceedance of Action Level	<ol style="list-style-type: none"> <li>1. Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>2. Notify IEC and Contractor;</li> <li>3. Report the results of investigation to the IEC, SO and Contractor;</li> <li>4. Discuss with the Contractor and formulate remedial measures;</li> <li>5. Increase monitoring frequency to check mitigation effectiveness.</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the analysed results submitted by the ET;</li> <li>2. Review the proposed remedial measures by the Contractor and advise the SO accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem;</li> <li>4. Ensure remedial measures are properly implemented</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to IEC;</li> <li>2. Implement noise mitigation proposals.</li> </ol>
Exceedance of Limit Level	<ol style="list-style-type: none"> <li>1. Identify source;</li> <li>2. Inform IEC, SO, EPD and Contractor;</li> <li>3. Repeat measurements to confirm findings;</li> <li>4. Increase monitoring frequency;</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>6. Inform IEC, SO and EPD the causes and actions taken for the exceedances;</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and SO informed of the results;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst SO, ET, and Contractor on the potential remedial actions;</li> <li>2. Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the SO accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem;</li> <li>4. Ensure remedial measures properly implemented;</li> <li>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Resubmit proposals if problem still not under control;</li> <li>5. Stop the relevant portion of works as determined by the SO until the exceedance is abated.</li> </ol>

## 6.7 Mitigation Measures

- 6.7.1 The EIA Report has recommended construction noise control measures including the use of quiet plant and temporary noise barriers. All the proposed mitigation measures are summarised in the EMIS in **Appendix B**.
- 6.7.2 The ventilation building for tunnel underneath Scenic Hill shall be installed with sufficient sound attenuators to control its sound power level emitting to the environment. Other mitigation measures are not required during the operation phase.

## 7 Sediment Quality

### 7.1 Summary

- 7.1.1 The sediment quality data has been reviewed and the findings of the site investigation for sediment quality in relation to the current study area for HKBCF and HKLR is summarised in the EIA Report, there is no requirement on environmental monitoring and audit for sediment quality.

## 8 Waste Management

### 8.1 General

- 8.1.1 The quantity and timing for the generation of waste during the construction phase have been estimated. Measures including the opportunity for on-site sorting, reusing excavated materials for reclamation etc. are devised in the construction methodology to minimise the surplus materials to be disposed off-site. Proper disposal of chemical waste should be via a licensed waste collector.
- 8.1.2 All the proposed mitigation measures are stipulated in the EIA Report and summarized in the EMIS in **Appendix B**.
- 8.1.3 The types and quantities of waste that would be generated during the operational phase have been assessed. It is anticipated there would not be any insurmountable impacts during the operation phase. A trip-ticket system should be operated to monitor all movements of chemical wastes which will be collected by a licensed collector to a licensed facility for final treatment and disposal.
- 8.1.4 Recommendations have been made to ensure proper treatment and proper disposal of these wastes in the EIA Report and all the proposed mitigation measures are stipulated in the EIA Report are summarised in the EMIS in **Appendix B**.
- 8.1.5 EM&A requirements are required for waste management during the construction phase only and the effective management of waste arising during the construction phase will be monitored through the site audit programme. The aims of the waste audit are:
- to ensure the waste arising from the works are handled, stored, collected, transferred and disposed of in an environmentally acceptable manner; and
  - to encourage the reuse and recycling of material.

### 8.2 Waste EM&A Requirements

- 8.2.1 The Contractor shall be required to pay attention to the environmental standard and guidelines and carry out appropriate waste management and obtain the relevant licence/permits for waste disposal. The ET shall ensure that the Contractor has obtained from the appropriate authorities the necessary waste disposal permits or licences including:
- Chemical Waste Permits/licenses under the Waste Disposal Ordinance (Cap 354);
  - Public Dumping Licence under the Land (Miscellaneous Provisions) Ordinance (Cap 28);
  - Marine Dumping Permit under the Dumping at Sea Ordinance (Cap 466); and
  - Effluent Discharge Licence under the Water Pollution Control Ordinance.
- 8.2.2 The Contractor shall refer to the relevant booklets issued by the DEP when applying for the licence/permit and the ET shall refer to these booklets for auditing purposes.
- 8.2.3 During the site inspections and the document review procedures, the ET shall pay special attention to the issues relating to waste management and check whether the Contractor has followed the relevant contract specifications and the procedures specified under the laws of Hong Kong. In addition to the site inspections, the ET shall review the documentation procedures prepared by the Waste Coordinator once a week to ensure proper records are being maintained and procedures undertaken in accordance with the Waste Management Plan.

8.2.4 The Contractor's waste management practices should be audited with reference to the checklist detailed in **Table 8.1** below:

**Table 8.1 Waste Management Checklist**

Activities	Timing	Monitoring Frequency	If non-compliance, Action Required
All necessary waste disposal permits or licences have been obtained.	Before the commencement of demolition works	Once	Apply for the necessary permits/licences prior to disposal of the waste. The ET shall ensure that corrective action has been taken.
Only licensed waste haulier are used for waste collection.	Throughout the works	Weekly	The ET shall inform the SO and IEC of the non-compliance. The SO shall instruct the Contractor to use a licensed waste haulier. The Contractor shall temporarily suspend waste collection of that particular waste until a licensed waste haulier is used. Corrective action shall be undertaken within 48 hours.
Records of quantities of wastes generated, recycled and disposed are properly kept. For demolition material/waste, the number of loads for each day shall be recorded (quantity of waste can then be estimated based on average truck load. Should landfill charging be implemented, the receipts of the charge could be used for estimating the quantity).	Throughout the works	Weekly	The Contractor shall estimate the missing data based on previous records and the activities carried out. The ET shall audit the results and forward to the SO and IEC for approval.
Wastes are removed from site in a timely manner. General refuse is collected on a daily basis.	Throughout the works	Weekly	The ET shall inform the SO and IEC of the non-compliance. The SO shall instruct the Contractor to remove waste accordingly.
Waste storage areas are properly cleaned and do not cause windblown litter and dust nuisance.	Throughout the works	Weekly	The ET shall inform the SO and IEC of the non-compliance. The SO shall instruct the Contractor to clean the storage area and/or cover the waste.
Different types of waste are segregated in different containers or skip to enhance recycling of material and proper disposal of waste.	Throughout the works	Weekly	The ET shall inform the SO and IEC of the non-compliance. The SO shall instruct the Contractor to provide separate skips/ containers. The Contractor shall ensure the workers place the waste in the appropriate containers.
Chemical wastes are stored, handled and disposed of in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes, published by the EPD.	Throughout the works	Weekly	The ET shall inform the SO and IEC of the non-compliance. The SO shall instruct the Contractor to rectify the problems immediately. Warning shall be given to the Contractor if corrective actions are not taken within 24 hrs and the Waste Control Group of the EPD shall be identified.

Activities	Timing	Monitoring Frequency	If non-compliance, Action Required
Demolition material/waste in dump trucks are properly covered before leaving the site.	Throughout the works	Weekly	The ET shall inform the SO and IEC of the non-compliance. The SO shall instruct the Contractor to comply. The Contractor shall prevent trucks shall leaving the site until the waste are properly covered.
Wastes are disposal of at licensed sites.	Throughout the works	Weekly	The ET shall inform the SO and IEC of the non-compliance. The SO shall warn the Contractor and instruct the Contractor to ensure the wastes are disposed of at the licensed sites. Should it involve chemical waste, the Waste Control Group of EPD shall be notified.

Note: ET – Environmental Team, IEC – Independent Environmental Checker, SO – Supervising Officer's Representative

## 9 Water Quality Monitoring

### 9.1 Water Quality Parameters

9.1.1 The reclamation layout of HKLR is presented in **Appendix E**. The EIA Report has assessed the water quality impacts caused by the construction and operation stages. Mitigation measures have been recommended in the EIA to ensure compliance with the relevant legislative requirements. These mitigation measures are summarised below.

- Not used as it is related to the north of the TM-CLKL southern landfall / HKBCF island.
- The decks of barges should be clean and tidy to avoid any filling materials to be washed into the sea.
- Overloading of barge is not allowed and sufficient freeboard should be maintained to ensure no spill over of the filling materials during lifting and transport.
- The moving speed of construction vessels in the filling area should be reduced to prevent disturbance to the seabed generating sediment plumes.
- During the initial months of filling work for HKLR, the silt-removal efficiency of the silt-curtains shall be verified by examining the results of water quality monitoring points. The water quality monitoring points to be selected for the above shall be those close to the locations of the initial period offilling work. Details in this pilot study shall be determined by the ENPO and agreed by EPD before the commencement of monitoring, taking account of the Contractor's proposed actual locations of his initial period of filling work.
- **Appendix E** illustrates different stages of the arrangement of silt-curtains and shows the typical seawall sections. The hanging-type silt-curtain should allow access of vessels to enter into or exit from the reclamation area. The vessel access opening would be formed by two piece of silt-curtain with overlapping length of 150m minimum and a separation distance of about 50m. The indicative position and details of the above openings for HKLR are also shown in **Appendix E**.
- The hanging-type silt-curtains should be maintained in good condition to ensure the sediment plume generated from filling be confined effectively within the site boundary.

9.1.2 Prior to the commencement of the construction work, a detailed site drainage management plan should be submitted to EPD. The plan should cover measures to minimize all potential water quality impact arising from the surface runoffs of all the related constructions.

9.1.3 The guidelines outlined in the Practice Note for Professional Persons (ProPECC), Construction Site Drainage (PN 1/94) should be adopted to control construction site runoff. Mitigation measures to minimise water quality impacts from construction site runoff and wastewater and sewage generated from construction activities are:

- Provision of site drainage systems over the entire construction site with sediment control facilities. Regular inspection and maintenance of the site drainage systems are required to ensure proper and efficient operation at all times. Sedimentation tanks or package treatment systems are required to treat the large amount of sediment-laden wastewater generated from foundation construction work, wheel washing, site runoff. Any construction activities that generate wastewater with high concentrations of SS should also be collected to these facilities for proper treatment prior to disposal.

Treated wastewater can be reused for vehicle washing, dust suppression and general cleaning. Bentonite slurry used in bore-pile construction should be reconditioned and reused to minimise the disposal volume of the used slurry.

- The construction programme should be properly planned to avoid soil excavation in rainy seasons. Exposed stockpiles of excavated soils or construction materials should be covered with tarpaulin or impervious sheets to avoid release of pollutants into the drainage channels.
- Sewage generated from site toilets and canteen should be collected using a temporary storage system. Chemical toilets should be provided at different locations for use by the workers on site. Licensed waste collectors should be employed for collection and disposal of the sewage. The drainage system for collection of wastewater generated from canteen, if any, should be equipped with grease trap capable of providing at least 20 minutes retention during peak flow.
- Wheel washing facilities should be installed at all site entrances/exits.
- An emergency plan should be developed by the contractors to deal with accidental spillage of chemicals.

9.1.4 Upon completion of the HKLR / HKBCF development, stormwater drainage systems would be completed to collect stormwater generated from the whole area including new roads. Sewage generated from the HKBCF development would be treated on site to fulfill effluent limit for discharge. Additional mitigation measures would not be required.

9.1.5 As identified in the EIA Report, key water quality issues during construction phase will be filling works for the reclamation. Marine water quality monitoring shall be carried out during the construction phase to ensure that any unacceptable increase in suspended solids / turbidity and decrease in dissolved oxygen due to filling activity could be readily detected and timely action be taken to rectify the situation.

9.1.6 Dissolved oxygen (DO), turbidity (NTU) and suspended solids (SS) and other general in situ parameters shall be monitored at designated marine water quality monitoring stations during the whole construction phase. DO and turbidity should be measured in-situ whereas SS should be determined by an accredited laboratory.

9.1.7 Other relevant data shall also be recorded, including monitoring location / position, time, water depth, pH value, salinity, temperature, tidal stages, weather conditions and any special phenomena or work underway at the construction site.

9.1.8 According to the EIA report, there is low concentration for PAH, PCB, TBT, and chlorinated pesticides. Monitoring of these chemicals would not be required during the construction stage.

9.1.9 The proposed water quality monitoring schedule shall be submitted to EPD at least 2 weeks before the first day of the monitoring month. EPD shall also be notified immediately for any changes in schedule by fax.

## 9.2 Monitoring Equipment

### Dissolved Oxygen and Temperature Measuring Equipment

9.2.1 The instrument should be a portable and weatherproof dissolved oxygen (DO) measuring instrument complete with cable and sensor, and use a DC power source. The equipment should be capable of measuring:



- a DO level in the range of 0 - 20 mg/ L and 0 - 200% saturation; and
- a temperature of 0 - 45 degree Celsius.

9.2.2 It should have a membrane electrode with automatic temperature compensation complete with a cable.

9.2.3 Should salinity compensation not be built-in to the DO equipment, in-situ salinity should be measured to calibrate the DO equipment prior to each DO measurement.

#### **Turbidity Measurement Instrument**

9.2.4 The instrument should be a portable and weatherproof turbidity measuring instrument using a DC power source. It should have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU (for example, Hach model 2100P or an approved similar instrument).

#### **Sampler**

9.2.5 A water sampler is required. It should comprise a transparent PVC cylinder, with a capacity of not less than 2 litres, which can be effectively sealed with latex cups at both ends. The sampler should 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 (for example, Kahlsico Water Sampler or an approved similar instrument).

#### **Water Depth Detector**

9.2.6 A portable, battery-operated echo sounder should be used for the determination of water depth at each designated monitoring station. This unit can either be hand held or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

#### **Salinity**

9.2.7 A portable salinometer capable of measuring salinity in the range of 0 - 40 parts per thousand (ppt) should be provided for measuring salinity of the water at each monitoring location.

#### **pH Measuring Equipment**

9.2.8 A portable pH meter capable of measuring a range between 0.0 and 14.0 shall be provided to measure pH under the specified conditions (e.g., Orion Model 250A or an approved similar instrument).

#### **Sample Containers and Storage**

9.2.9 Water samples for SS should be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4°C without being frozen) and kept in dark during both on-site temporary storage and shipment to the testing laboratory. The samples shall be delivered to the laboratory within 24 hours of collection and be analysed as soon as possible after collection.

#### **Monitoring Position Equipment**

9.2.10 A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication and Radio Technical Commission for maritime (RTCM) Type 16 error message 'screen pop-up' facilities (for real-time auto-display of error messages and DGPS corrections from the Hong Kong Hydrographic Office), or other equipment instrument of similar accuracy, should be provided and used

during marine water monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

### **Calibration of In-Situ Instruments**

- 9.2.11 The pH meter, DO meter and turbidimeter shall be checked and calibrated before use. DO meter and turbidimeter shall be certified by a laboratory accredited under HOKLAS or any other international accreditation scheme, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes should be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter shall be carried out before measurement at each monitoring location.

### **Back-up Equipment and Vessels**

- 9.2.12 Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when some equipment is under maintenance, calibration, etc. For the on-site calibration of field equipment, the BS1427:1993, "Guide to Field and on-site test methods for the analysis of waters" shall be observed.
- 9.2.13 The Water Quality Monitoring will involve a large number of monitoring stations and measurements should be conducted within the prescribed tidal conditions (within  $\pm 1.75$  hour of the predicted mid-ebb or mid-flood tides) in order to ensure the measurement/samples are representative. A multi-probe monitoring equipment set integrated with water sampler(s) is highly recommended to improve the monitoring efficiency. It is, also, likely that more than one field survey vessels will be required simultaneously to ensure the monitoring are conducted within the acceptable monitoring windows. The ET shall also consider the use of unattended automatic sampling/monitoring devices at fixed stations where monitoring are required throughout the construction period. The use of such unattended automatic devices, however, shall be subject to the approval of the SO, IEC and EPD.

### 9.3 Laboratory Measurement / Analysis

9.3.1 Duplicate samples from each independent sampling event are required for all suspended solids measurements, which shall be carried in a HOKLAS or other international accredited laboratory. Sufficient water samples shall be collected at the monitoring stations for carrying out the laboratory measurement and analysis. The laboratory determination work shall start within 24 hours after collection of the water samples. The analysis for SS is summarized in **Table 9.1**.

**Table 9.1 Laboratory Analysis for Suspended Solids (SS)**

Parameters	Instrumentation	Analytical Method	Detection Limit
Suspended Solid (SS)	Weighting	APHA 2540-D	0.5 mg/L

9.3.2 If a site laboratory is set up or a non-HOKLAS and non-international accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment, analytical procedures, and quality control shall be approved by EPD. All the analysis shall be witnessed by the SO. The ET Leader shall provide the SO with one copy of the relevant chapters of the "APHA Standard Methods for the Examination of Water and Wastewater" 19th edition and any other relevant document for his reference.

### 9.4 Monitoring Locations

9.4.1 The water quality monitoring stations, control stations and locations for during the construction and operation phase of HKLR are shown in **Figure 2**. These stations and locations are considered representative for the contract. The selection of these stations is referenced to Clause 8.2.4A of the Employer's Requirements of Contract No. HY/2011/03 and is based on the following criteria:

- (i) Impact stations (IS) within 250m – 500m envelope of the construction works (4 stations)
- (ii) Sensitive receiver stations (SR) near to key sensitive receivers (5 stations)
- (iii) Control / far field station (CS) at representative locations with less influence by the Project (1 station). Control stations should be located, as far as practicable, both upstream and downstream of the works area. The locations CS(Mf) also serve as the control stations for Mf deposition sites (1 station).
- (iv) Impact stations (IS(Mf)) around the on-site Mf deposition sites during the on-site disposal of Mf material (2 stations).

9.4.2 The co-ordinates of the proposed 13 monitoring stations during the construction phase are listed in **Table 9.2**. As shown in **Figure 2**, the proposed locations for the sensitive receiver monitoring stations represent the typical sensitive receivers around the project works.

**Table 9.2 Water Quality Monitoring Stations (Construction and Post Construction Phases)**

Station	Description	East	North	Parameters to be Measured
IS5	Impact Station (Close to HKLR construction site)	811579	817106	DO, Turbidity, SS
IS(Mf)6	Impact Station (Close to HKLR construction site)	812101	817873	DO, Turbidity, SS
IS7	Impact Station (Close to HKBCF construction site)	812244	818777	DO, Turbidity, SS
IS8	Impact Station (Close to HKBCF construction site)	814251	818412	DO, Turbidity, SS
IS(Mf)9	Impact Station (Close to HKBCF construction site)	813273	818850	DO, Turbidity, SS

Station	Description	East	North	Parameters to be Measured
IS10	Impact Station (Close to HKBCF construction site)	812577	820670	DO, Turbidity, SS
SR3	Sensitive receivers (San Tau SSSI)	810525	816456	DO, Turbidity, SS
SR4	Sensitive receivers (Tai Ho Inlet)	814760	817867	DO, Turbidity, SS
SR5	Sensitive receivers (Artificial Reef in NE Airport)	811489	820455	DO, Turbidity, SS
SR10A	Sensitive receivers (Ma Wan FCZ)	823741	823495	DO, Turbidity, SS
SR10B	Sensitive receivers (Ma Wan FCZ)	823686	823213	DO, Turbidity, SS
CS2	Control Station	805849	818780	DO, Turbidity, SS
CS(Mf)5	Control Station	817990	821129	DO, Turbidity, SS

- 9.4.3 Control stations (CS2, CS(Mf)5) are necessary to compare the water quality from potentially impacted sites with the ambient water quality. Control stations shall be located within the same body of water as the impact monitoring stations but should be outside the area of influence of the works and, as far as practicable, not affected by any other works.
- 9.4.4 In-situ monitoring (DO concentration and saturation, temperature, turbidity, pH, salinity) and water sample for SS shall be taken at 3 water depths, namely, 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth is less than 6 m, in which case the mid-depth station may be omitted. Should the water depth be less than 3 m, only the mid-depth station will be monitored. The status and locations of water sensitive receivers and the marine activities may change after issuing this Manual. If such cases exist, the ET Leader shall propose with justification for changes to monitoring locations or other requirements of the EM&A programme, and seek approval from the IEC and EPD.
- 9.4.5 The ENPO may, depending on site conditions and monitoring results, decides whether additional monitoring locations shall be included or any monitoring locations could be removed / relocated during any stage of the construction phase after getting approval from EPD.

## 9.5 Baseline Monitoring for Water Quality

- 9.5.1 Baseline conditions for marine water quality shall be established and agreed with EPD prior to the commencement of works. The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of the works and to demonstrate the suitability of the proposed impact and control monitoring stations. The baseline conditions shall normally be established by measuring the DO, temperature, turbidity, pH, salinity and SS at all designated locations. The measurements shall be taken at all designated monitoring stations in **Table 9.2** above including control stations, 3 days per week, at mid-flood (within  $\pm 1.75$  hour of the predicted time) and mid-ebb (within  $\pm 1.75$  hour of the predicted time) tides, for at least 4 weeks prior to the commencement of marine works. Replicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database.
- 9.5.2 Baseline monitoring programme may overlap with other reclamation activities. The monitoring exercise should be scheduled as far as possible to avoid concurrent filling activity around the monitoring stations such that representative ambient data could be sampled.
- 9.5.3 Other relevant data shall also be recorded, such as monitoring location / position, time, water depth, tidal stages, weather conditions and any special phenomena underway near the monitoring station. There shall not be any marine construction activities in the vicinity of the stations during the baseline monitoring.

- 9.5.4 As this project will last for a few years, the ET Leader should seek approval from the IEC and EPD on an appropriate set of data to be used with the baseline data collected by this study to establish two set of AL levels respectively for the wet and dry season.
- 9.5.5 Baseline monitoring schedule shall be faxed to EPD 2 weeks prior to the commencement of baseline monitoring. The interval between two sets of monitoring shall not be less than 36 hours.
- 9.5.6 Prior to the commencement of the Contract, the Highways Department has employed environmental specialists under Agreement No. CE 35/2011 (EP) to carry out the baseline environmental monitoring in water quality. Data of the baseline water quality monitoring will be referenced to as appropriate. If baseline monitoring is considered necessary to be carried out, it shall be carried out in accordance with the following requirements.

## 9.6 Efficiency of Silt Curtain

- 9.6.1 The ET shall be responsible for conducting tests to confirm that their silt curtain systems to be adopted would satisfy the requirements in the EIA Report.
- 9.6.2 A method statement shall be submitted by the ET Leader to seek approval from the IEC and EPD.
- 9.6.3 During the initial period of filling work for HKBCF and HKLR, the silt-removal efficiency of the silt-curtains shall be verified by examining the results of water quality monitoring points. The water quality monitoring points to be selected for the above shall be those close to the locations of the initial period of filling work. The details for the pilot study shall be determined by the ENPO and agreed by EPD, taking account of the Contractor's proposed actual locations of his initial period of filling work.
- 9.6.4 Pilot tests should be carried out during the early stage of construction to confirm whether the silt removal efficiency of the floating type silt curtains can achieve 45% silt removal efficiency for filling activity when deployed, and a combined reduction of 61% when the two layers of floating type silt curtains are used.
- 9.6.5 The pilot test shall include basic measurements such as turbidity and suspended solids as well as current speed and direction. A method statement shall be submitted by the ET Leader to seek approval from the IEC and EPD.
- 9.6.6 Not used as there are no cage type silt curtains for the Contract.
- 9.6.7 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 designed monitoring stations.

## 9.7 Impact Monitoring for Water Quality

### Reclamation

- 9.7.1 Reclamation would require filling activity during the construction. During this period, silt curtains would be installed enclosing the whole project site to control sediment loss. **Appendix E** shows the arrangement of the silt curtains. During the construction period, monitoring shall be undertaken 3 days per week, at mid-flood (within  $\pm 1.75$  hour of the predicted time) and mid-ebb (within  $\pm 1.75$  hour of the predicted time) tides, with sampling / measurement at the designated monitoring stations. Replicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database. The interval between two sets of monitoring shall not be less than 36 hours except where there are exceedances of Action and / or Limit levels, in which case the monitoring frequency will be increased. Two consecutive measures of DO concentration, DO saturation, pH, salinity, temperature, turbidity and water samples for SS will be taken in situ at 1 m below the surface,

mid-depth and 1 m above the seabed at each location. If the water depth is less than 6 m, the mid-depth measurement may be omitted subject to the approval of the SO. If the depth is less than 3 m, only the mid-depth measurements need to be taken subject to the approval of the SO. The monitoring probes shall be retrieved out of water after the first measurement and then redeployed for the second measurement. Where the difference in value between the first and second readings of DO or turbidity parameters is more than 25% of the value of the first reading, the reading shall be discarded and further readings shall be taken.

- 9.7.2 If the impact monitoring results indicate that filling work has caused adverse impacts on water quality at the monitoring stations, appropriate actions (including the lowering of production rates for filling) should be taken and additional mitigation measures should be implemented as necessary. Water quality monitoring frequency has to be increased to once per day when filling is undertaken. 24-hour monitoring of turbidity should be implemented as and when necessary. The monitoring results should be made available within a reasonable short period to be agreed with the EPD, SO and IEC.

#### **Relocation of Mf Sediment with Reclamation Area**

- 9.7.3 Not used.

- 9.7.4 Not used.

#### **Water Quality Monitoring along the Water Boundary of Hong Kong and Mainland**

- 9.7.5 Not used because the stations for sensitivity test are far away far from the Contract.

### **9.8 Post-construction Monitoring**

- 9.8.1 Upon completion of all marine-based construction activities, a post-project monitoring exercise on water quality shall be carried out for 4 weeks in the same manner as the baseline monitoring. Replicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database. The measurement parameters for post-construction monitoring shall include DO, temperature, turbidity, pH, salinity, and SS. The measurement shall be taken at all designated monitoring stations including control stations, 3 days per week, at mid-flood (within  $\pm 1.75$  hour of the predicted time) and mid-ebb (within  $\pm 1.75$  hour of the predicted time) tides, for at least 4 weeks. Since the southern and northern landfalls of TM-CLKL are distant from each other and based on the tentatively programme available during the EIA stage the two landfall has a different construction time frame, the Post-construction monitoring for each landfalls may conducted separately. The ET should review the actual implantation programme and recommend if a separate post-construction monitoring for each landfall is required.

### **9.9 Impact Operational Phase Monitoring**

- 9.9.1 The marine water quality monitoring shall be performed monthly during the first year of Project operation at all designated monitoring stations including control stations. Each monthly monitoring event shall consist of one monitoring and sampling event during both mid-ebb (within  $\pm 1.75$  hour of the predicted time) and mid-flood (within  $\pm 1.75$  hour of the predicted time) tides of the same monitoring day. The operation phase monitoring shall be ceased after the first year of operation of the Project subject to the first year review. No marine construction activities should be conducted in the vicinity of the stations during the Operational Phase monitoring period.
- 9.9.2 Sampling shall be taken at three water depths, namely, 1m below water surface, mid-depth and 1m above sea bed, except where the water depth is less than 6m, in which case the mid-depth station may be omitted. If the water depth be less than 3m, only the mid-depth station will be monitored. In-situ



measurements at DO, turbidity, SS, pH, salinity and temperature shall be taken at all the monitoring stations SR2, SR3, CS2 and CS(Mf)5. (refer to **Table 9.2b**). A full set of in duplicated situ measurement and water samples shall be collected during each of the mid-ebb (within  $\pm 1.75$  hour of the predicted time) and mid-flood (within  $\pm 1.75$  hour of the predicted time) tides.

**Table 9.2b Water Quality Monitoring Stations (Operation Phases)**

Station	Description	East	North	Parameters to be measured
SR2	Sensitive receivers (Sha Lo Wan )	807856	816953	DO, Turbidity, SS, pH, salinity, temperature
SR3	Sensitive receivers (San Tau SSSI)	810525	816456	DO, Turbidity, SS, pH, salinity, temperature
CS2	Control Station	805849	818780	DO, Turbidity, SS, pH, salinity, temperature
CS(Mf)5	Control Station	817990	821129	DO, Turbidity, SS, pH, salinity, temperature

## 9.10 Event and Action Plan

9.10.1 The Action and Limit levels for water quality are defined in **Table 9.3**. Should non-compliance of the criteria occur, action in accordance with the Action Plan in **Table 9.3** shall be carried out.

9.10.2 Not used.

**Table 9.3 Action and Limit Levels for Water Quality**

Parameters	Action	Limit
DO in mg/L (Surface, Middle & Bottom)	<u>Surface and Middle</u> 5 percentile of baseline data for surface and middle layer <u>Bottom</u> 5 percentile of baseline data for bottom layer	<u>Surface and Middle</u> 4 mgL <sup>-1</sup> except 5mg/l for FCZ or 1 percentile of baseline data for surface and middle layer <u>Bottom</u> 2 mgL <sup>-1</sup> or 1 percentile of baseline data for bottom layer
SS in mg/L (depth-averaged) at all monitoring stations and control stations	95 percentile of baseline data and 120% of upstream control station's SS at the same tide of the same day	99 percentile of baseline data and 130% of upstream control station's SS at the same tide of the same day and 10 mg/L for WSD seawater intakes
Turbidity in NTU	95 percentile of baseline data and 120% of upstream control station's Turbidity at the same tide of the same day	99 percentile of baseline data and 130% of upstream control station's Turbidity at the same tide of the same day

Notes:

- "depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
- For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- For turbidity, SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
- All the figures given in the table are used for reference only and the EPD may amend the figures whenever it is considered as necessary.

**Table 9.4 Event and Action Plan for Water Quality**

Event	Action			
	ET Leader	IEC	SO	Contractor
Action level being exceeded by one sampling day	1. Repeat in situ measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor and SO; 4. Check monitoring data, all plant, equipment and Contractor's working methods.	1. Check monitoring data submitted by ET and Contractor's working methods.	1. Confirm receipt of notification of non-compliance in writing; 2. Notify Contractor.	1. Inform the SO and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Amend working methods if appropriate.
Action level being exceeded by two or more consecutive sampling days	1. Repeat measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor, SO and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, SO and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Action level;	1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the proposed mitigation measures submitted by Contractor and advise the SO accordingly; 4. Supervise the implementation of mitigation measures.	1. Discuss with IEC on the proposed mitigation measures; 2. Ensure mitigation measures are properly implemented; 3. Assess the effectiveness of the implemented mitigation measures.	1. Inform the Engineer and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 4. Submit proposal of additional mitigation measures to SO within 3 working days of notification and discuss with ET, IEC and SO; 5. Implement the agreed mitigation measures.
Limit level being exceeded by one sampling day	1. Repeat measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor, SO and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, SO and Contractor;	1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the proposed mitigation measures submitted by Contractor and advise the SO accordingly.	1. Confirm receipt of notification of failure in writing; 2. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 3. Request Contractor to review the working methods.	1. Inform the SO and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 4. Submit proposal of mitigation measures to SO within 3 working days of notification and discuss with ET, IEC and SO.



Event	Action			
	ET Leader	IEC	SO	Contractor
Limit level being exceeded by two or more consecutive sampling days	1. Repeat measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor, SO and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, SO and Contractor; 6. Ensure mitigation measures are implemented.	1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the Contractor's mitigation measures whenever necessary to assure their effectiveness and advise the SO accordingly; 4. Supervise the implementation of mitigation measures.	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Ensure mitigation measures are properly implemented; 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level.	1. Take immediate action to avoid further exceedance; 2. Submit proposal of mitigation measures to SO within 3 working days of notification and discuss with ET, IEC and SO; 3. Implement the agreed mitigation measures; 4. Resubmit proposals of mitigation measures if problem still not under control; 5. As directed by the Engineer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.

## 9.11 Mitigation Measures

9.11.1 The EIA Report has recommended construction and operational phase mitigation measures. All the prepared mitigation measures are summarized in the EMIS in **Appendix B**.

## 10 Ecology

### 10.1 Introduction

10.1.1 The EIA Report has assessed the ecological impacts caused by the construction and operation phases. Mitigation measures have been recommended in the EIA to ensure compliance with the relevant legislative requirements. The mitigation measures and ecological monitoring surveys are stated in this Manual in the sections below. A detailed ecological monitoring plan with specification and detailed methodology will be prepared prior to the baseline monitoring, and submitted to AFCD and EPD for approval.

### 10.2 Ecological Mitigation Measures and Implementations

#### Marine Water Quality

- 10.2.1 Low disturbance construction method - Any significant changes in water quality or turbidity should be avoided. This could be mitigated through construction methods.
- 10.2.2 Not used as there is no dredging activity.
- 10.2.3 Not used as there is no filling activity for construction of piers.
- 10.2.4 Good Site Practices – The integrity and effectiveness of all silt curtains should be regularly inspected. Effluent monitoring should be incorporated to make sure that the discharged effluent from construction sites meets the relevant effluent discharge guidelines.
- 10.2.5 Strict enforcement on No-dumping – To avoid degrading the Chinese White Dolphin habitat, restrictions prohibiting dumping of rubbish, food, oil, or chemicals will be strictly enforced.
- 10.2.6 Site runoff control - For works on land, standard site runoff control measures will be established and strictly enforced to ensure that discharge of contaminated or silt-laden runoff into North Lantau waters is minimised.
- 10.2.7 Spill response plan – In the event of vessels operating in the works areas transporting oil or other hazardous chemicals, an oil-spill response plan, with specific provisions for protecting marine ecology and dolphins, will be formulated.
- 10.2.8 Note used as this section is for HKBCF Reclamation.

#### Terrestrial Disturbance

- 10.2.9 The impact from this minor and short-term source can be reduced by good site practice, including strictly following the permitted works hours, using quieter machines where practicable, and avoiding excessive lightings during night time.

#### Sedimentation from Land-based Works Areas

- 10.2.10 Although the extent of earthwork will not affect habitats of Romer's Tree Frog, good site practices (e.g., watering to reduce dust generation, prevention of siltation of freshwater habitats) are still recommended to be implemented. Site runoff should be desilted, to reduce the potential for suspended sediments, organics and other contaminants to enter streams and standing freshwater (which are potential breeding habitats of Romer's Tree Frog). Caution must be taken to avoid runoff entering the area in which Romer's Tree Frog has been recorded.

## Marine Noise and Disturbance

### 1) Bored piling

- 10.2.11 Not used as there is no bored piling work.
- 10.2.12 Not used as there is no bored piling work.
- 10.2.13 Not used as there is no bored piling work.

### 2) Sheet piling

- 10.2.14 Note used as there is no sheet piling work.
- 10.2.15 Note used as there is no sheet piling work.

### 3) Reclamation and Works Vessels

- 10.2.16 Dolphin Exclusion Zone - dolphin exclusion zone of 250m radius should be implemented in the HKLR reclamation sites during the installation of the perimeter silt curtains and any re-deployment of the perimeter silt curtains. Works will be suspended when any Chinese White Dolphin (CWD) is found within the exclusion zone.
- 10.2.17 Dolphin Watching Plan - A dolphin watching plan for works areas will also be included in the EM&A programme. For reclamation sites, once the perimeter silt curtains are installed or re-deployed, the filling work would be conducted inside the silt curtains and a dolphin exclusion zone is not needed. Instead a dolphin watching plan will be performed. The plan would include regular inspection of the silt curtains, scanning of the waters surrounded by the curtains, and an action plan should be devised to cope with any unpredicted incidents such as in case dolphins are found within the waters surrounded by the silt curtains. Similarly, at marine pier sites the concreting work could be conducted inside the bored pile casing after its installation. A dolphin watching plan will replace the dolphin exclusion zone after the casing is installed.
- 10.2.18 Acoustic decoupling of compressors and other equipment – Air compressors and other noisy equipment that must be mounted on construction vessels will be acoustically-decoupled to the greatest extent feasible, for instance by using rubber air-filled tires.

## Marine Traffic

- 10.2.19 Vessel speed limit control – It is known that fast-moving vessels are a threat to dolphins and porpoises, a speed limit of 10 knots will be strictly enforced within the work areas. This speed limit for vessels within the boundaries of the Sha Chau/Lung Kwu Chau Marine Park appears to be effective in protecting the dolphins from vessel collisions.
- 10.2.20 Skipper training – Captains of construction vessels working in the West Lantau waters and near the Brothers Islands should undergo training to learn about local dolphins and porpoises. They should be trained to be aware of the protocol for “dolphin friendly” vessel operation (reference made to Code of Conduct for Dolphin Watching Activities available from AFCD).
- 10.2.21 Predefined and regular routes for working vessels – Captains of all working vessels should be required to use regular travel routes, in order to minimize the chance of vessel collision. And the routes would not go through the dolphin hotspot in Brothers Islands.

## Road Surface Runoff

10.2.22 Silt-grease traps should be deployed to prevent a direct input of road surface runoff to the marine waters.

### Chemical spillage

10.2.23 A Maritime Oil Spill Response Plan (MOSRP) has been developed by Marine Department to deal with oil spill and their potential hazard to the Hong Kong waters. The main objective of the MOSRP is to ensure a timely and effective response to oil spillages and/or their potential treats in the Hong Kong waters.

10.2.24 Similar to the Shenzhen Western Corridor project, a Spill Response Plan will be formulated to deal with the accidental event of the serious spillage of oil or other hazardous chemicals and it should be at least 1 month before the commencement of the construction of the Project. A Spill Response Plan in this regard will be primarily for safety issues and water quality, but could also help to safeguard the dolphin population. It will detail the actions to be taken in the event of accidental spillage of oil or other hazardous chemicals from construction activities including vessels operating of for the Project, with specific provisions for protecting marine ecology and the Chinese White Dolphins. Following the example of Shenzhen Western Corridor, it will be specified in the contingency plan that AFCD must be alerted by the Hong Kong Police Force or Fire Service Department in case an accident of spillage of chemical or oil is reported.

### Precautionary/ Enhancement Measures

10.2.25 As a precautionary measure, pre-construction dive survey for corals will be conducted along the shore of the HKLR reclamation site (see **Figure 3**), prior to marine construction works in this location, to identify any coral colonies suitable for translocation, taking into account the conservation value, the health status and the translocation feasibility. The pre-construction dive survey for area near Sha Lo Wan Headland and at pier site nearest to the intertidal zone is not required for the Contract as these sites would not be affected by the Contract. A detailed translocation plan will be prepared if corals (including hard corals, soft corals and octocorals) of conservation importance, in good conditions, and feasible for translocation are identified during the survey.

10.2.26 Not used as no artificial reefs will be affected by the contract.

10.2.27 Not used as no artificial reefs will be affected by the contract.

## 10.3 Monitoring and Audit for Ecology

10.3.1 An ecological monitoring and audit programme would be needed for the Project HKLR developments. The monitoring programme will include monitoring of physical parameters such as air, noise and water quality, and ecological aspects such as CWD and mudflats. The ecological monitoring and audit programme will monitor potential impacts through construction and operation activities, and will verify the assessments which were made in the EIA report. The monitoring includes the following tasks:

10.3.2 Dolphin monitoring - A dolphin monitoring programme at North Lantau and West Lantau waters, in particular the dolphin sighting hotspots (e.g. Brothers Islands) and areas where juveniles have been sighted (e.g. West Lantau waters), should be set up to verify the predictions of impacts and to ensure that there are no unforeseen impacts on the dolphin population during construction phase. The monitoring period should cover the pre-construction phase (baseline conditions), the entire period of construction phase (tentatively 2010 - 2016), and at least one year after the completion of construction works.

10.3.3 Not used as there is no bored piling work for the Contract.

10.3.4 Not used as there is no bored piling work for the Contract.

10.3.5 Not used as there is no bored piling work for the Contract.

- 10.3.6 Mudflat monitoring - A monitoring programme on the intertidal soft shore habitats on north Lantau coastlines, in San Tau and Tung Chung Bay where horseshoe crab juveniles and seagrass beds have been sighted, should be set up to verify the predictions of impacts. The monitoring period should cover the pre-construction phase (baseline conditions), the entire period of construction phase, and after the completion of construction works. The monitoring should cover the water quality, sedimentation rate, horseshoe crab population, seagrass beds, and soft shore intertidal communities. The survey methodology should make reference to previous intertidal soft shore surveys/monitoring (e.g. the seagrass bed monitoring in Shenzhen Western Corridor, and the territory-wide horseshoe crab study by Shin et al. 2007. Conservation of Horseshoe Crabs in Hong Kong -Final Report (ECF Project 12/2003)).
- 10.3.7 Each of the above ecological monitoring surveys shall be undertaken by suitably qualified specialist(s), (i.e. dolphin specialist, bio-acoustician and intertidal ecologist), who shall have sufficient (at least 5-10 years) relevant post-graduate experience and publication in the respective aspects. Approval on the specialist(s) responsible for each ecological monitoring survey shall be sought from AFCD and EPD.

#### 10.4 Monitoring Location

- 10.4.1 Dolphin monitoring - the dolphin monitoring should adopt line-transect vessel survey method, and cover the line-transect survey areas as in AFCD annual marine mammal monitoring programme for Northeast Lantau survey area; and Northwest Lantau survey area (**Figure 4**).
- 10.4.2 Not used as there is no bored piling work for the Contract.
- 10.4.3 Not used as there is no bored piling work for the Contract.
- 10.4.4 Mudflat monitoring - the monitoring will be conducted on the intertidal soft shore habitats in San Tau and Tung Chung Bay where horseshoe crab juveniles and seagrass beds have been sighted (**Figure 2**).
- 10.4.5 Pre-construction dive survey for corals - the survey will be conducted for about 2 to 3 weeks along the shore of the HKLR reclamation site (see **Figure 3**).

#### 10.5 Baseline Monitoring for Ecology

- 10.5.1 Baseline for dolphin monitoring shall be established by two surveys per month in each survey area stated in Section 10.4.1 for a period of three months prior to the commencement of works and agreed with AFCD. The purpose of the baseline monitoring is to establish pre-construction conditions prior to the commencement of the works and to demonstrate the suitability of the proposed monitoring method.
- 10.5.2 Not used as there are no construction works in the waters to the west of Airport for the Contract.
- 10.5.3 Not used as there is no construction of bridge for the Contract.
- 10.5.4 Baseline for mudflat ecology shall be established prior to the commencement of works and agreed with AFCD.
- 10.5.5 As this project will last for a few years, the ET Leader should seek approval from the IEC, AFCD and EPD on an appropriate methodology and parameters to be recorded. A detailed ecological monitoring plan with specification and detailed methodology will be prepared prior to the baseline monitoring, and submitted to AFCD and EPD for approval.

#### 10.6 Impact Monitoring for Ecology

- 10.6.1 Dolphin monitoring will be conducted twice a month in each survey area stated in Section 10.4.1 throughout the entire construction period.
- 10.6.2 Not used as there is no bored piling work for the Contract.
- 10.6.3 Not used as there is no bored piling work for the Contract.
- 10.6.4 If the impact monitoring results indicate that the density or the distribution pattern of CWD has changed, the ET should inform AFCD and investigate the possible causes of the change. Appropriate actions should be recommended and additional mitigation measures should be implemented as necessary. The monitoring results should be made available within a reasonable short period to be agreed with the EPD, ER and IEC.
- 10.6.5 Mudflat monitoring will be conducted quarterly during the construction period. If the impact monitoring results indicate that the density or the distribution pattern of intertidal fauna and seagrasses has changed, the ET should inform AFCD and investigate the possible causes of the change. Appropriate actions should be recommended and additional mitigation measures should be implemented as necessary. The monitoring results should be made available within a reasonable short period to be agreed with the EPD, ER and IEC.

## 10.7 Post-construction Monitoring for Ecology

- 10.7.1 The dolphin monitoring and mudflat ecological monitoring will be conducted in the post-construction phase at least for 2 year after completion of construction.

## 10.8 Event and Action Plan

- 10.8.1 The Action and Limit levels for dolphin monitoring are shown in **Table 10.1**. The revised Event and Action Plan for dolphin monitoring as shown in **Table 10.2** was approved by EPD in May 2013.

**Table 10.1 AL and LL for Dolphin Impact Monitoring**

	North Lantau Social Cluster	
	NEL	NWL
Action Level	STG < 4.2 & ANI < 15.5	STG < 6.9 & ANI < 31.3
Limit Level	(STG < 2.4 & ANI < 8.9) and (STG < 3.9 & ANI < 17.9)	

Remarks:

1. STG means quarterly encounter rate of number of dolphin sightings.
2. ANI means quarterly encounter rate of total number of dolphins.
3. For North Lantau Social Cluster, AL will be trigger if either NEL **or** NWL fall below the criteria; LL will be triggered if both NEL **and** NWL fall below the criteria.



**Table 10.2 Event and Action Plan for Dolphin Monitoring**

Event	ET Leader	IEC	SO	Contractor
Action Level	<ol style="list-style-type: none"> <li>Repeat statistical data analysis to confirm findings;</li> <li>Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&amp;A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences;</li> <li>Identify source(s) of impact;</li> <li>Inform the IEC, SO and Contractor;</li> <li>Check monitoring data.</li> <li>Review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.</li> </ol>	<ol style="list-style-type: none"> <li>Check monitoring data submitted by ET and Contractor;</li> <li>Discuss monitoring results and findings with the ET and the Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>Discuss monitoring with the IEC and any other measures proposed by the ET;</li> <li>If SO is satisfied with the proposal of any other measures, SO to signify the agreement in writing on the measures to be implemented.</li> </ol>	<ol style="list-style-type: none"> <li>Inform the SO and confirm notification of the non-compliance in writing;</li> <li>Discuss with the ET and the IEC and propose measures to the IEC and the ER/SOR;</li> <li>Implement the agreed measures.</li> </ol>
Limit Level	<ol style="list-style-type: none"> <li>Repeat statistical data analysis to confirm findings;</li> <li>Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&amp;A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences;</li> <li>Identify source(s) of impact;</li> <li>Inform the IEC, SO and Contractor of findings;</li> <li>Check monitoring data;</li> <li>Repeat review to ensure all the dolphin</li> </ol>	<ol style="list-style-type: none"> <li>Check monitoring data submitted by ET and Contractor;</li> <li>Discuss monitoring results and findings with the ET and the Contractor;</li> <li>Attend the meeting to discuss with ET, SO and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures;</li> <li>Review proposals for additional monitoring and any other mitigation measures submitted by ET and Contractor and advise SO of the results and findings accordingly;</li> <li>Supervise / Audit the implementation of</li> </ol>	<ol style="list-style-type: none"> <li>Attend the meeting to discuss with ET, IEC and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures;</li> <li>If SO is satisfied with the proposals for additional dolphin monitoring and/or any other mitigation measures submitted by ET and Contractor and verified by IEC, SO to signify the agreement in writing on such proposals and any other mitigation measures;</li> <li>Supervise the implementation of additional monitoring and/or any other</li> </ol>	<ol style="list-style-type: none"> <li>Inform the SO and confirm notification of the non-compliance in writing;</li> <li>Attend the meeting to discuss with ET, IEC and SO the necessity of additional dolphin monitoring and any other potential mitigation measures;</li> <li>Jointly submit with ET to IEC a proposal of additional dolphin monitoring and/or any other mitigation measures when necessary;</li> <li>Implement the agreed additional dolphin monitoring and/or any other mitigation measures.</li> </ol>

Event	ET Leader	IEC	SO	Contractor
	<p>protective measures are fully and properly implemented and advise on additional measures if necessary;</p> <p>7. If ET proves that the source of impact is caused by any of the construction activity by the works contract, ET to arrange a meeting to discuss with IEC, SO and Contractor the necessity of additional dolphin monitoring and/or any other potential mitigation measures (e.g., consider to modify the perimeter silt curtain or consider to control/temporarily stop relevant construction activity etc.) and submit to IEC a proposal of additional dolphin monitoring and/or mitigation measures where necessary.</p>	<p>additional monitoring and/or any other mitigation measures and advise SO the results and findings accordingly.</p>	<p>mitigation measures.</p>	

Notes:

ET – Environmental Team

IEC – Independent Environmental Checker

SO – Supervising Officer

\* Action to be instigated within 1 month of an event



## 11 Fisheries

### 11.1 Summary

- 11.1.1 The EIA report identified and assessed the potential impacts related to fisheries and marine culture.
- 11.1.2 The water quality monitoring and audit requirements are included in **Section 9 Water Quality**.
- 11.1.3 As mentioned in the EIA report, no further monitoring and audit for fisheries are required.

## 12 Cultural Heritage

### 12.1 Summary

- 12.1.1 Mitigation measures are not required for built heritage and terrestrial archaeology. As a precautionary measures however, periodic monitoring of construction works should be conducted to ensure the avoidance of any impacts on Sha Lo Wan (West) Archaeological Site. Access to Sha Lo Wan (West) Archaeological site for works areas and storage of construction equipment is not allowed.

## 13 Hazard to Life

### 13.1 Summary

- 13.1.1 The EIA report identified that the risks lie well within the acceptable criteria of Annex 4 of the Technical Memorandum and no additional mitigation members are considered necessary or justified. No monitoring and audit is therefore required.

## 14 Landscape and Visual

### 14.1 Introduction

- 14.1.1 The EIA has recommended landscape and visual mitigation measures (refer to Section 14 of EIA Report) to be undertaken during both the construction and operation phases of the project. This section outlines the monitoring and audit of these measures.

### 14.2 Monitoring Details

- 14.2.1 The design, implementation and maintenance of landscape mitigation measures should be checked to ensure that any potential conflicts between the proposed landscape measures and any other works of the project would be resolved as early as practical without affecting the implementation of the mitigation measures.

**Table 14.1 Monitoring Programme**

Stage	Monitoring Task	Monitoring Report	Form of Approval	Frequency
Detailed Design	Checking of design works against the recommendations of the landscape and visual impact assessments within the EIA should be undertaken during detailed design phase, to ensure that they fulfil the intention of the mitigation measures. Any changes to the design, including design changes on site should also be checked.	Not Required	Not Required	At the end of the Detailed Design Phase
Construction	Checking of the contractor's operations during the construction period.	Report on Contractor's compliance, by ET*	Counter-signature of report by IEC	Bi-weekly
Establishment Period	Checking of the plant works during the 12-month Establishment Period after completion of the construction works.	Report on Contractor's compliance, by ET	Counter-signature of report by IEC	Every 2 months
Long Term Management (10 year)	Monitoring of the long-term management of the planting works in the period up to 10 years after completion of construction works.	Report on compliance by ER or Maintenance Agency as appropriate	Counter-signature of report by Management Agency	Annually

Notes:

Environmental Team (ET) – employed by the Contractor; Environmental Permit (EP).

#### Detailed Design Phase

- 14.2.2 The mitigation measures, which are proposed in the EIA to mitigate the landscape and visual impacts, should be embodied into the detailed engineering design, landscape design drawings and contract documents. The Detailed Design should be checked to ensure that the measures are fully incorporated. Potential conflicts with civil engineering, geotechnical, structural, lighting, signage, drainage and underground utilities should be resolved as early as practical.
- 14.2.3 The following mitigation measures are proposed to avoid and reduce the identified impacts.

- Minimize the footprint of project and that the quantity of landscape character units and landscape resources affected;
- Minimize temporary works areas for construction works;
- Undertaking good site practices by applying hydroseeding on temporary stockpiles and reclamation areas;
- Conservation of topsoil for reuse;
- Waste limitation by recycling of felled trees into woodchip mulch for use in landscaped areas.

14.2.4 The following design measures will be developed during detailed design stage to remedy and compensate unavoidable impacts:

- Roadside planting and planting along the edge of the reclamation is proposed;
- Transplanting of mature trees in good health and amenity value where appropriate and reinstatement of areas disturbed during construction by compensatory hydro-seeding and planting;
- Protection measures for the trees to be retained during construction activities;
- Optimizing the sizes and spacing of the bridge columns;
- Fine-tuning the location of the bridge columns to avoid visually-sensitive locations;
- Aesthetic design of the bridge form and its structural elements for HKLR, e.g. parapet, soffit, columns, lightings and so on;
- Considering the decorative urban design elements for HKLR, e.g. decorative road lightings;
- Maximizing new tree, shrub and other vegetation planting to compensate tree felled and vegetation removed;
- Providing planting area around peripheral of HKLR for tree planting screening effect;
- Providing salt-tolerant native trees along the planter strip at affected seawall and newly reclaimed coastline.
- Not used as the aesthetic architectural design on the related buildings is related to the HKBCF contract.
- Not used as the construction works of the Contract will not disturb the vegetation in the HKBCF.
- For HKLR, providing aesthetic design on the viaduct, tunnel portals, at-grade roads and reclamation (e.g. subtle colour tone and slim form for viaduct to minimize the bulkiness of the structure and to blend the viaduct better with the background environment, featured form of tunnel portals, roadside planting along at-grade roads and landscape berm on & planting along edge of reclamation area) to beautify the HKLR alignment (refer to Figure 14.4.3 of the EIA Report).

14.2.5 The following mitigation measures should be monitored during construction and operation phases:

**Table 14.2 Mitigation Measures to be Monitored during Construction and Operation Phases**

Stage	Description of Mitigation Measures
During Construction Phase	<p>Mitigate both Landscape and Visual Impacts</p> <p>G1. Grass-hydroseed bare soil surface and stock pile areas.</p> <p>G2. Add planting strip and automatic irrigation system if appropriate at some portions of bridge or footbridge to screen bridge and traffic.</p> <p>G3. For HKLR, providing aesthetic design on the viaduct, tunnel portals, at-grade roads and reclamation (e.g. subtle colour tone and slim form for viaduct, featured form of tunnel portals, roadside planting along at-grade roads and landscape berm on &amp; planting along edge of reclamation area) to beautify the HKLR alignment.</p> <p>G4. Not used as this is for HKBCF</p> <p>G5. Vegetation reinstatement and upgrading to disturbed areas.</p> <p>G6. Maximize new tree, shrub and other vegetation planting to compensate tree felled and vegetation removed.</p> <p>G7. Provide planting area around peripheral of and within HKLR for tree screening buffer effect.</p> <p>G8. Plant salt tolerant native tree and shrubs etc along the planter strip at affected seawall.</p> <p>G9. Reserve of loose natural granite rocks for re-use. Provide new coastline to adopt “natural-look” by means of using armour rocks in the form of natural rock materials and planting strip area accommodating screen buffer to enhance “natural-look” of the new coastline (see Figure 14.4.2 of the EIA Report for example).</p>
	<p><u>Mitigate Visual Impacts</u></p> <p>V1. Minimize time for construction activities during construction period.</p> <p>V2. Provide screen hoarding at the portion of the project site / works areas / storage areas near VSRs who have close low-level views to the Project during HKLR construction.</p>
During Operation Phase	<p><u>Mitigate both Landscape and Visual Impacts</u></p> <p>G10. Provide proper planting maintenance on the new planting areas to enhance the aesthetic degree.</p> <p>V3. Lighting design to minimize glare at night. Decorative road lighting to be considered during detailed design stage</p>

Note:  
Figure 14.4.2 – Details of mitigation measure – G9 for the new coastline.

- 14.2.6 An implementation programme will be prepared as required by TM-EIAO. Reference will be made to the ETWB TC(W) No. 2/2004 on Maintenance of Vegetation and Hard Landscape Features which defines the management and maintenance responsibilities for natural vegetation and landscape works, including both softworks and hardworks, and the authorities for tree preservation and felling. The format of the preliminary arrangement of implementation programme is listed in **Table 14.3**.

**Table 14.3 Proposed Format for Preliminary Funding, Implementation, Management and Maintenance Proposal**

Mitigation items	Funding & Implementation unit (See Remark)	Maintenance unit (See Remark)
<i>During Construction</i>		
V1 and V2	Project Proponent (i.e. HyD)	The Contractor
G3	Project Proponent / Initiating Department (e.g. the relevant User Department of the building)	Project Proponent / Initiating Department (e.g. the relevant User Department of the building)
G1, G2, G3, G6, G7, G8 and G9	Project Proponent (i.e. HyD)	HyD / LCSD
<i>During Operation</i>		
V3	Project Proponent (i.e. HyD)	HyD
G10	Project Proponent (i.e. HyD)	HyD / LCSD

Note:

The proposed mitigation measures and arrangements are tentative. The responsible parties are also tentative and subject to further agreements amongst the Government Departments.

### Construction Phase & Establishment Period

- 14.2.7 The implementation of landscape construction works and subsequent maintenance operations during the 12-month Establishment Period must be supervised by qualified Landscape Resident Site Staff (Registered Landscape Architect or Professional Member of the Hong Kong Institute of Landscape Architects).
- 14.2.8 Measures to mitigate landscape and visual impacts during construction should be checked to ensure compliance with the intended aims of the measures.
- 14.2.9 The progress of the engineering works shall be regularly reviewed on site to identify the earliest practical opportunities for the landscape works to be undertaken.

### Long Term Management (10 Years)

- 14.2.10 The planting works shall be monitored during the first 10 years of the operation phase of the project. Any areas of vegetation which is failed to establish, should be corrected by the relevant maintenance parties at the earliest opportunity. The maintenance requirement of the planting works stated under the 10-Year Management Programme is included in the monitoring requirement.

## 14.3 Baseline Monitoring

- 14.3.1 A photographic record of the site at the time of the contractor's possession of the site shall be prepared by the Contractor and approved by the ER. The approved photographic record shall be submitted to the Project Proponent, ET, IEC and EPD for record.

## 14.4 Action Plan for Landscape and Visual Works

**Table 14.4 Action Plan for Landscape and Visual Works**

EVENT	ACTION			
	ET	IEC	SO	CONTRACTOR
Conflicts occur	卸 Check Contractor's proposed remedial design conforms to the requirements of EP and prepare report(s)	卸 Check and endorse ET's report(s) 卸 Check and certify Contractor's proposed remedial design	卸 Supervise the Contractor to carry out the proposed remediation work	卸 Propose remedial design and carry out the proposed work



## 15 Site Environmental Audit

### 15.1 Site Inspection

- 15.1.1 Site inspection provides a direct means to initiate and enforce specified environmental protection and pollution control measures. These shall be undertaken routinely to inspect construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. Site inspection is one of the most effective tools to enforce the environmental protection requirements at the works area.
- 15.1.2 The ET Leader shall be responsible for formulating the environmental site inspection, the deficiency and action reporting system, and for carrying out the site inspection works. Within 21 days of the construction contract commencement, he shall submit a proposal for site inspection and deficiency and action reporting procedures to the Contractor for agreement, and to the SO for approval. The ET's proposal for rectification would be made known to the IEC.
- 15.1.3 Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site. It should also review the environmental situations outside the works area which is likely to be affected, directly or indirectly, by the site activities. The ET Leader shall make reference to the following information in conducting the inspection:
- (i) EIA recommendations on environmental protection and pollution control mitigation measures;
  - (ii) works progress and programme;
  - (iii) individual works methodology proposals (which shall include proposal on associated pollution control measures);
  - (iv) contract specifications on environmental protection;
  - (v) relevant environmental protection and pollution control laws; and
  - (vi) previous site inspection results.
- 15.1.4 The Contractor shall keep the ET Leader updated with all relevant information on the construction contract necessary for him to carry out the site inspections. Inspection results and associated recommendations for improvements to the environmental protection and pollution control works shall be submitted to the IEC and the Contractor within 1 working day. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, and the deficiency and action reporting system formulated by the ET Leader, to report on any remedial measures subsequent to the site inspections.
- 15.1.5 Ad-hoc site inspections shall also be carried out if significant environmental problems are identified. Inspections 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.

### 15.2 Compliance with Legal and Contractual Requirements

- 15.2.1 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong with which construction activities must comply.
- 15.2.2 In order that the works comply with the contractual requirements, all works method statements submitted by the Contractor to the SO for approval shall be sent to the ET Leader for vetting to ensure sufficient

environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarised in **Appendix B**.

- 15.2.3 The ET Leader shall also review the progress and programme of the works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violating laws can be prevented.
- 15.2.4 The Contractor shall regularly copy relevant documents to the ET Leader so that checking can be carried out. The document shall at least include the updated Works Progress Reports, updated Works Programme, any application letters for different licence / permits under the environmental protection laws, and copies of all valid licences / permits. The site diary shall also be available for the ET Leader's inspection upon his request.
- 15.2.5 After reviewing the document, the ET Leader shall advise the IEC and Contractor of any non-compliance with contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence / permit application and any environmental protection and pollution control preparation works may result in potential violation of environmental protection and pollution control requirements, he shall also advise the Contractor and the SO accordingly.
- 15.2.6 Upon receipt of the advice, the Contractor shall undertake immediate actions to correct the situation. The SO shall follow up to ensure that appropriate action has been taken in order to satisfy contractual and legal requirements.

### 15.3 Environmental Complaints

- 15.3.1 Complaints shall be referred to the ET Leader for action. The ET Leader shall undertake the following procedures upon receipt of any complaint:
- (i) log complaint and date of receipt onto the complaint database and inform the IEC immediately;
  - (ii) investigate the complaint to determine its validity, and assess whether the source of the problem is due to works activities;
  - (iii) identify mitigation measures in consultation with the IEC if a complaint is valid and due to works;
  - (iv) advise the Contractor if mitigation measures are required;
  - (v) review the Contractor's response to identified mitigation measures, and the updated situation;
  - (vi) if the complaint is transferred from the EPD, submit interim report to the EPD on status of the complaint investigation and follow-up action within the time frame assigned by the EPD;
  - (vii) undertake additional monitoring and audit to verify the situation if necessary, and review that circumstances leading to the complaint do not recur;
  - (viii) report investigation results and subsequent actions to complainant (if the source of complaint is EPD, the results should be reported within the timeframe assigned by the EPD); and
  - (ix) record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

## 16 Reporting

### 16.1 General

- 16.1.1 Reports can be provided in an electronic medium upon agreeing the format with the SO and EPD. This would enable a transition from a paper / historic and reactive approach to an electronic / real time proactive approach. All the monitoring data (baseline and impact) shall also be submitted on diskettes or other approved media. The formats for air quality, noise and water quality monitoring data to be submitted shall be separately agreed.
- 16.1.2 The ET is responsible for establishing and maintaining a dedicated website throughout the entire construction period for publishing the all the relevant environmental monitoring data (including but not limited to the baseline and impact monitoring). The ET shall propose the format and functionality of the website for agreement with the SO and IEC prior to publishing of data. Once the monitoring data are available (e.g. noise, dust, water quality etc) and vetted by the IEC, the ET is responsible to upload the relevant data to the dedicated website.
- 16.1.3 Types of reports that the ET Leader shall prepare and submit include baseline monitoring report, monthly EM&A report, quarterly EM&A summary report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly, quarterly summary and final review EM&A reports shall be made available to the Director of Environmental Protection.

### 16.2 Baseline Monitoring Report

- 16.2.1 The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to the Contractor, the IEC, the SO and EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies they require. The report format and baseline monitoring data format shall be agreed with the EPD prior to submission.
- 16.2.2 The baseline monitoring report shall include at least the following:
- (i) up to half a page executive summary;
  - (ii) brief project background information;
  - (iii) drawings showing locations of the baseline monitoring stations;
  - (iv) monitoring results (in both hard and diskette copies) together with the following information:
    - monitoring methodology;
    - name of laboratory and types of equipment used and calibration details;
    - parameters monitored;
    - monitoring locations;
    - monitoring date, time, frequency and duration; and
    - quality assurance (QA) / quality control (QC) results and detection limits;
  - (v) details of 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 results;
- (vi) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored;
- (vii) revisions for inclusion in the EM&A Manual; and
- (viii) comments, recommendations and conclusions.

### 16.3 Monthly EM&A Reports

16.3.1 The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report shall be prepared and submitted within 10 working days of the end of each reporting month, with the first report due the month after construction commences. Each monthly EM&A report shall be submitted to the following parties: the Contractor, the IEC, the SO and EPD. Before submission of the first EM&A report, the ET Leader shall liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.

16.3.2 The ET leader shall 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.

#### First Monthly EM&A Report

16.3.3 The first monthly EM&A report shall include at least the following:

- (i) Executive summary (1-2 pages):
- breaches of Action and Limit levels;
  - complaint log;
  - notifications of any summons and successful prosecutions;
  - reporting changes; and
  - future key issues.
- (ii) Basic project information:
- project organisation including key personnel contact names and telephone numbers;
  - programme;
  - management structure, and
  - works undertaken during the month.
- (iii) Environmental status:

- works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc); and
  - drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations (with co-ordinates of the monitoring locations).
- (iv) A brief summary of EM&A requirements including:
- all monitoring parameters;
  - environmental quality performance limits (Action and Limit levels);
  - Event-Action Plans;
  - environmental mitigation measures, as recommended in the project EIA study final report; and
  - environmental requirements in contract documents.
- (v) Implementation status:
- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA.
- (vi) Monitoring results (in both hard and diskette copies) together with the following information:
- monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations;
  - monitoring date, time, frequency, and duration;
  - weather conditions during the period;
  - any other factors which might affect the monitoring results; and
  - QA/QC results and detection limits.
- (vii) Report on non-compliance, complaints, and notifications of summons and successful prosecutions:
- record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
  - record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;

- record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

(viii) Others

- an account of the future key issues as reviewed from the works programme and work method statements;
- advice on the solid and liquid waste management status; and
- comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

### Subsequent EM&A Reports

16.3.4 Subsequent monthly EM&A reports shall include the following:

(i) Executive summary (1 - 2 pages):

- breaches of Action and Limit levels;
- complaints log;
- notifications of any summons and successful prosecutions;
- reporting changes; and
- future key issues.

(ii) Basic project information:

- project organisation including key personnel contact names and telephone numbers;
- programme;
- management structure; and
- work undertaken during the month.

(iii) Environmental status:

- works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and

- drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- (iv) Implementation status:
- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA.
- (v) Monitoring results (in both hard and diskette copies) together with the following information:
- monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations;
  - monitoring date, time, frequency, and duration;
  - weather conditions during the period;
  - any other factors which might affect the monitoring results; and
  - QA / QC results and detection limits.
- (vi) Report on non-compliance, complaints, and notifications of summons and successful prosecutions:
- record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
  - record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
  - record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
  - review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
  - description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- (vii) Others
- an account of the future key issues as reviewed from the works programme and work method statements;
  - advice on the solid and liquid waste management status; and



- comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

(viii) Appendices

- Action and Limit levels;
- graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
  - a) major activities being carried out on site during the period;
  - b) weather conditions during the period; and
  - c) any other factors that might affect the monitoring results.
- monitoring schedule for the present and next reporting period;
- cumulative statistics on complaints, notifications of summons and successful prosecutions; and
- outstanding issues and deficiencies.

## 16.4 Quarterly EM&A Summary Reports

16.4.1 A quarterly EM&A summary report of around 5 pages shall be produced and shall contain at least the following information:

- (i) Executive summary (1 - 2 pages);
- (ii) Basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of works undertaken during the quarter;
- (iii) 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 Final Report;
- (iv) Advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Final Report, summarised in the updated implementation schedule;
- (v) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (vi) Graphical plots of any trends in 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;
- (vii) Advice on the solid and liquid waste management status;
- (viii) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (ix) A brief review of the reasons for and the implications of any non-compliance, including a review of pollution sources and working procedures;
- (x) A summary description of actions taken in the event of non-compliance and any follow-up procedures related to any earlier non-compliance;
- (xi) A summarised record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (xii) Comments (for examples, a review of the effectiveness and efficiency of the mitigation measures and the performance of the environmental management system, that is, of the overall EM&A programme); recommendations (for example, any improvement in the EM&A programme) and conclusions for the quarter; and
- (xiii) Project Proponent's contacts and any hotline telephone number for the public to make enquiries.

## 16.5 Final EM&A Review Report

16.5.1 The final EM&A report should contain at least the following information:

- (i) Executive summary (1 - 2 pages);
- (ii) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (iii) Basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;
- (iv) 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);
  - all monitoring parameters;
  - Event-Action Plans;

- (v) A summary of the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report, summarised in the updated implementation schedule;
- (vi) Graphical plots and the statistical analysis of the trends of monitored parameters over the course of the project, including the post-project monitoring for all 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;
- (vii) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (viii) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- (ix) A description of the actions taken in the event of non-compliance;
- (x) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (xi) A summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection / pollution control legislation, locations and nature of the breaches, investigation follow-up actions taken and results;
- (xii) A review of the validity of EIA predictions and identification of shortcomings in EIA recommendations;
- (xiii) Comments (for examples, a review of the effectiveness and efficiency of the mitigation measures and of the performance of the environmental management system, that is, of the overall EM&A programme); and
- (xiv) Recommendations and conclusions (for example, a review of success of the overall EM&A programme to cost-effectively identify deterioration and to initiate prompt effective mitigatory action when necessary).

## 16.6 Data Keeping

- 16.6.1 No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the monthly EM&A reports. However, any such document shall be well kept by the ET Leader and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. Monitoring data shall also be recorded in magnetic media form, and the software copy must be available upon request. Data format shall be agreed with EPD. All documents and data shall be kept for at least one year following completion of the construction contract.


## 16.7 Interim Notifications of Environmental Quality Limit Exceedances

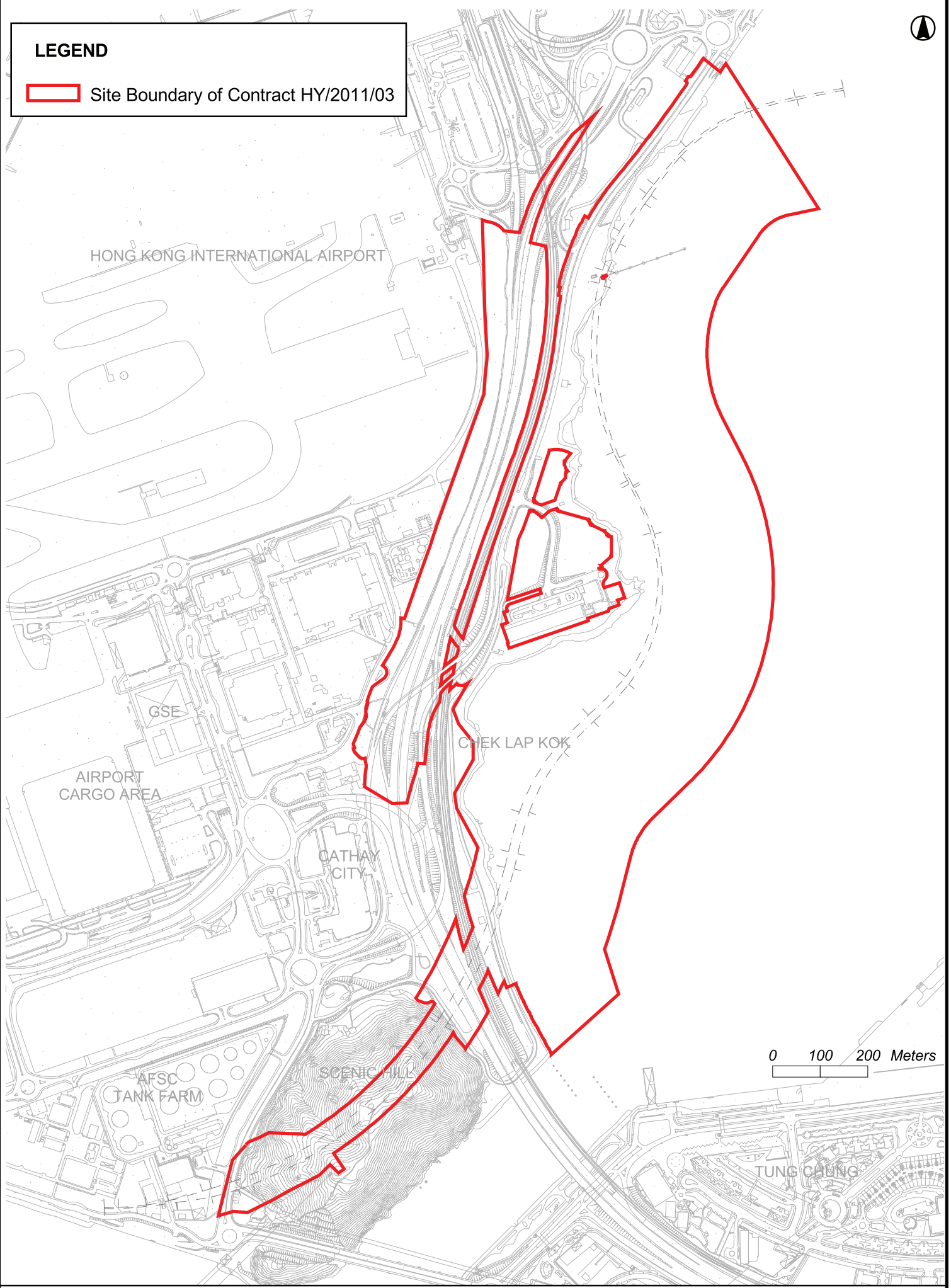
- 16.7.1 With reference to the Event and Action Plan, when the environmental quality performance limits are exceeded, the ET Leader shall immediately notify the IEC and EPD, as appropriate. The notification shall be followed up with advice to IEC and EPD on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals. A sample template for the interim notifications is presented in **Appendix F**.

# FIGURES

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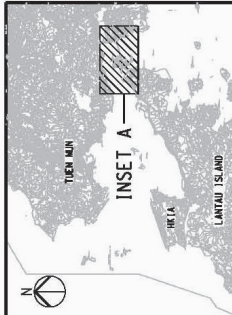
**LEGEND**

 Site Boundary of Contract HY/2011/03



**Figure 1 Location of the Site**





**KEY PLAN**

**NOTES**

1. EXACT LOCATIONS OF MONITORING STATIONS ARE SHOWN ON THIS DRAWING. THE CONTRACTOR SHALL CONSULT WITH THE ENVIRONMENTAL PROJECT OFFICE (EPO) AND THE ENVIRONMENTAL CHECKER (EC) AND THE ENVIRONMENTAL MONITORING AND CONTROL OFFICE (EMCO) TO DETERMINE THE PROPOSED LOCATION OF THE MONITORING STATIONS.
2. THE LOCATION AND EXTENT OF MUDFLAT SURVEY SHOWN ON THIS DRAWING ARE APPROXIMATE ONLY. THE CONTRACTOR AND EY SHALL DETERMINE AND AGREE THE DETAILS OF THE MUDFLAT SURVEY IN ACCORDANCE WITH THE REQUIREMENTS STIPULATED IN THE EIA REPORTS AND ESM MANUALS.
3. THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS STIPULATED IN THE EIA REPORTS AND ESM MANUALS TO CONDUCT THE ENVIRONMENTAL MONITORING AND AUDIT WORKS.

- LEGEND**
- WORKS BOUNDARY OF CONTRACT (HY2011/03)
  - IS IMPACT STATIONS (WATER QUALITY)
  - CS CONTROL/FIELD STATIONS (WATER QUALITY)
  - SR SENSITIVE RECEIVERS STATIONS (WATER QUALITY)
  - ST STATION FOR SENSITIVITY TEST RESULT (WATER QUALITY)
  - AMS MONITORING STATIONS (AIR QUALITY)
  - NMS MONITORING STATIONS (NOISE)
  - MUDFLAT ECOLOGICAL SAMPLING LOCATION

Rev	Description	AW	By	Date
A	TENDER ADDENDUM ISSUE	AW		11/11

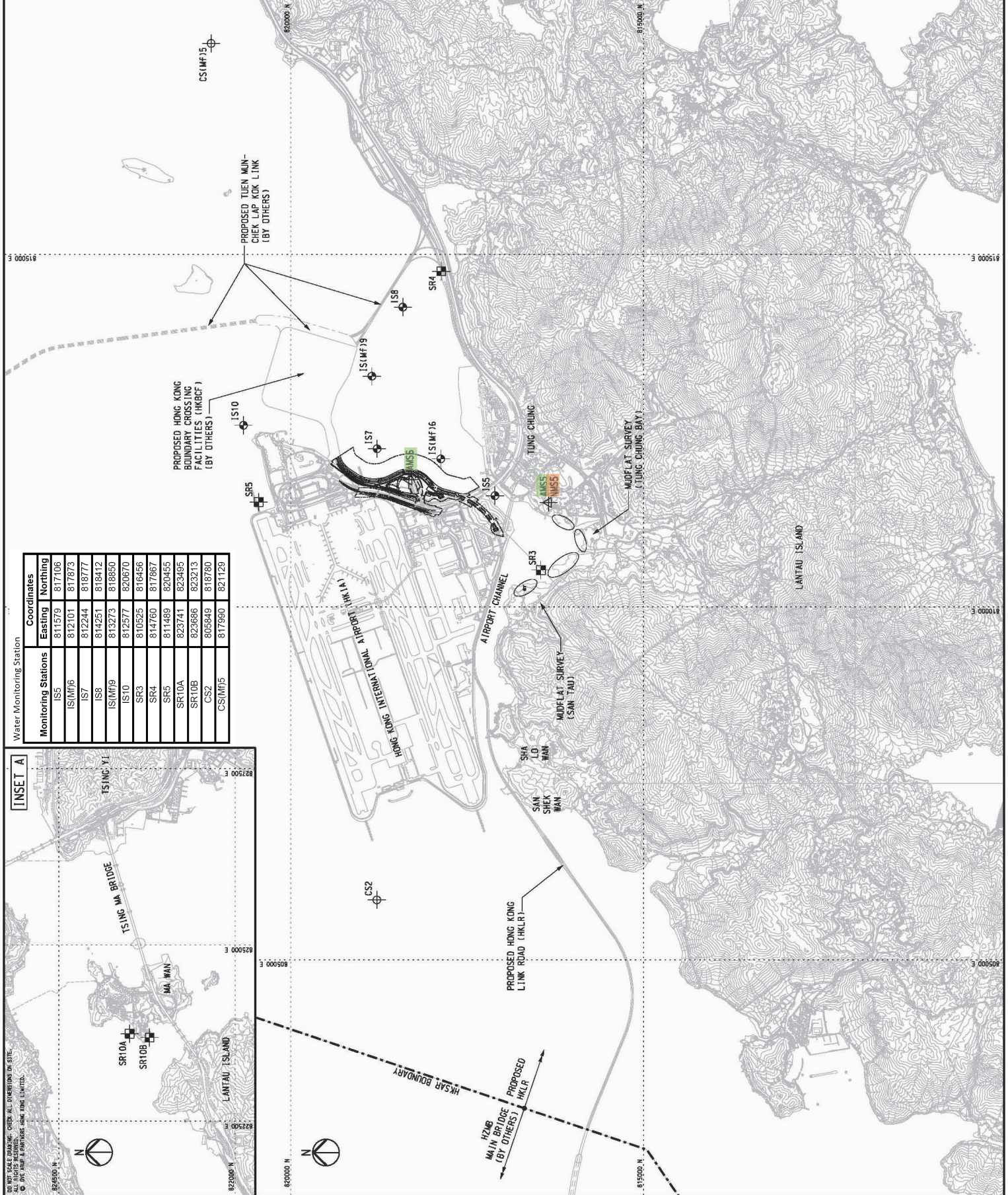
**ARUP** 威雅納工程顧問  
One Arup & Partners Hong Kong Limited

Contract No. and Title  
**Hong Kong-Zhuhai-Macao Bridge**  
 Hong Kong Link Road -  
 Section Between Scenic Hill and  
 Hong Kong Boundary Crossing Facilities

Drawing Title  
**ENVIRONMENTAL MONITORING STATIONS**

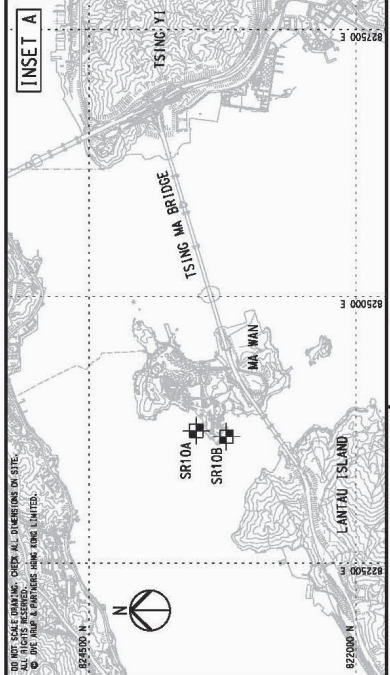
Drawing	Figure 2	Rev.	A
Drawn		Date	11/11
Checked		Status	Approved
Scale	1:25000 @A1		SK

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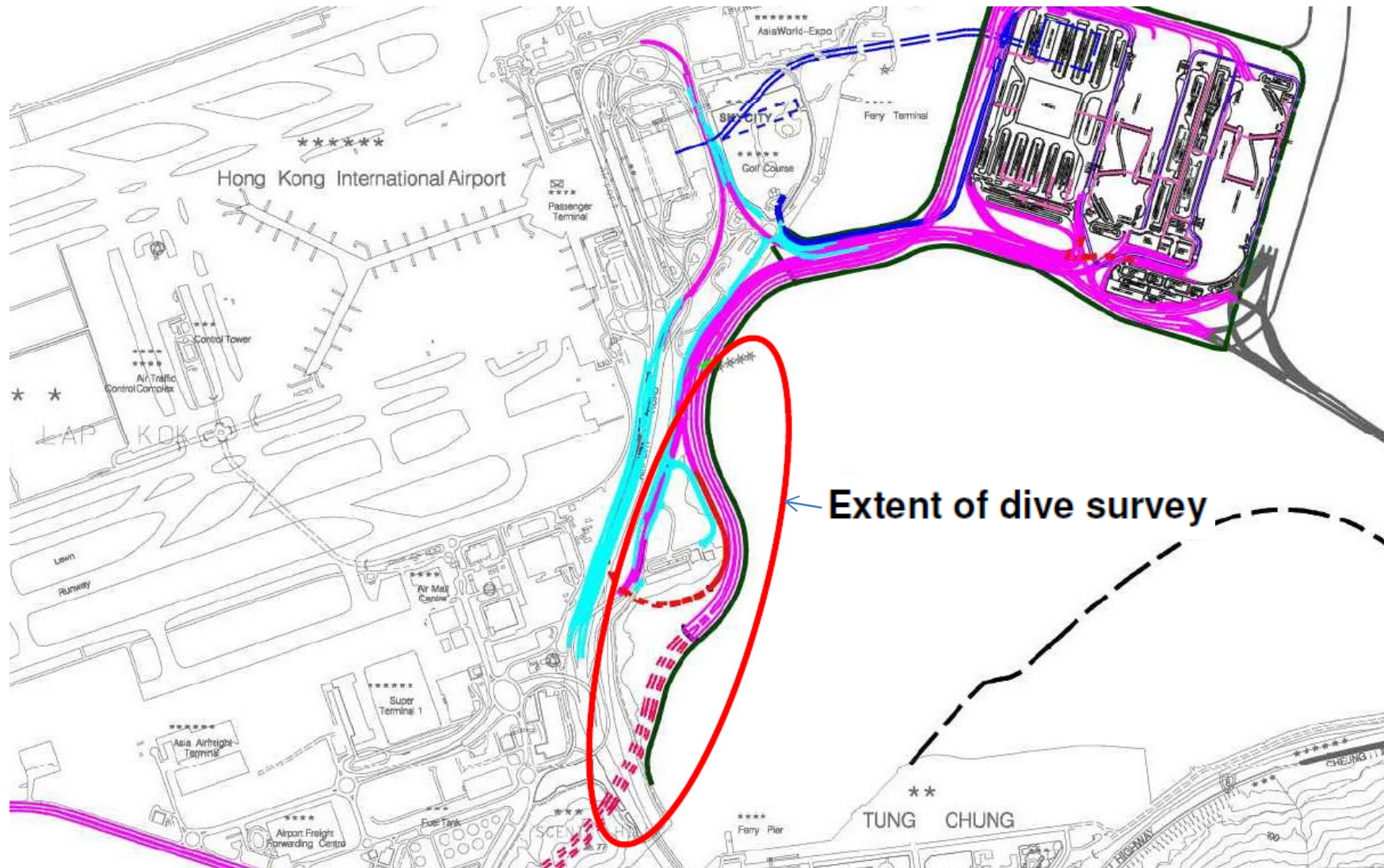
Water Monitoring Station

Monitoring Stations	Coordinates	
	Easting	Northing
IS5	811579	817106
IS(MT)6	812101	817873
IS7	812244	818777
IS8	814251	818412
IS(MT)9	813273	818850
IS10	812577	820670
SR3	810525	816456
SR4	814760	817867
SR5	811489	820455
SR10A	823741	823495
SR10B	823686	823213
CS2	805949	818780
CS(MT)5	817980	821129



1:5000 SCALE DRAWING. CHECK ALL DIMENSIONS ON SITE.  
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**Figure 3 Pre-construction Dive Survey for Corals**





Figure 4 - Line-transect Survey Areas for Chinese White Dolphin Monitoring

# APPENDIX A

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# CONSTRUCTION PROGRAMME

HY/2011/03 Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road Section Between Scenic Hill and Hong Kong Boundary Crossing Facilities – Works Programme Summary

<b>Description of Works</b>	<b>Tentative Commencement Date</b>	<b>Tentative Completion Date</b>
Award of Contract	31-5-2012	26-1-2017
Detailed Design	30-9-2012	13-8-2013
Site Preparation Works (Land-based)	31-5-2012	8-6-2013
Site Preparation Works (Marine)	21-6-2012	31-10-2012
Seawall Formation	29-10-2012	22-2-2014
Reclamation	27-7-2013	13-10-2014
Bridge 1A	15-08-2012	1-3-2014
SHT Cut and Cover Tunnel (Airport Road)	15-08-2013	15-08-2016
SHT Mined Tunnel	19-06-2013	13-1-2016
SHT Cut and Cover Tunnel (Reclamation)	20-03-2014	23-4-2016
Bridge 2A	10-09-2013	24-3-2015
West Portal	22-09-2013	26-4-2016
Ventilation Building	17-04-2015	14-10-2016
HAT Cut and Cover Tunnel	09-09-2013	26-01-2017
HAT Mined Tunnel	14-09-2012	26-01-2017
Roadworks	9-11-2012	26-01-2017
Admin Building	22-10-2014	11-8-2016
Utilities Works	9-11-2012	28-9-2016
Landscape Works	1-2-2016	26-01-2017
E&M Works	11-04-2015	26-01-2017
Completion of Works		26-01-2017

## APPENDIX B

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# ENVIRONMENTAL MITIGATION IMPLEMENTATION SCHEDULE (EMIS)

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
<b>Air Quality</b>							
S5.5.6.1	A1	1) The contractor shall follow the procedures and requirements given in the Air Pollution Control (Construction Dust) Regulation	Good construction site practices to control the dust impact at the nearby sensitive receivers to within the relevant criteria.	Contractor	All construction sites	Construction stage	√
S5.5.6.2	A2	2) Proper watering of exposed spoil should be undertaken throughout the construction phase: <ul style="list-style-type: none"> <li>•Any excavated or stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or backfilled or reinstated where practicable within 24 hours of the excavation or unloading;</li> <li>•Any dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads;</li> <li>•A stockpile of dusty material should not be extend beyond the pedestrian barriers, fencing or traffic cones.</li> <li>•The load of dusty materials on a vehicle leaving a construction site should be covered entirely by impervious sheeting to ensure that the dusty materials do not leak from the vehicle;</li> <li>•Where practicable, vehicle washing facilities with high pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;</li> </ul>	Good construction site practices to control the dust impact at the nearby sensitive receivers to within the relevant criteria.	Contractor	All construction sites	Construction stage	√
S5.5.6.2	A2	•When there are open excavation and reinstatement works, hoarding of not less than 2.4m high should be provided as far as practicable along the site boundary with provision for public crossing. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period;	Good construction site practices to control the dust impact at the nearby sensitive receivers to within the relevant criteria.	Contractor	All construction sites	Construction stage	√

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
S5.5.6.2	A2	<ul style="list-style-type: none"> <li>•The portion of any road leading only to construction site that is within 30m of a vehicle entrance or exit should be kept clear of dusty materials;</li> <li>•Surfaces where any pneumatic or power-driven drilling, cutting, polishing or other mechanical breaking operation takes place should be sprayed with water or a dust suppression chemical continuously;</li> <li>•Any area that involves demolition activities should be sprayed with water or a dust suppression chemical immediately prior to, during and immediately after the activities so as to maintain the entire surface wet;</li> <li>•Where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting should be provided to enclose the scaffolding from the ground floor level of the building, or a canopy should be provided from the first floor level up to the highest level of the scaffolding;</li> <li>•Any skip hoist for material transport should be totally enclosed by impervious sheeting;</li> <li>•Every stock of more than 20 bags of cement or dry pulverized fuel ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides;</li> </ul>	Good construction site practices to control the dust impact at the nearby sensitive receivers to within the relevant criteria.	Contractor	All construction sites	Construction stage	√
S5.5.6.2	A2	<ul style="list-style-type: none"> <li>• Cement or dry PFA delivered in bulk should be stored in a closed silo fitted with an audible high level alarm which is interlocked with the material filling line and no overfilling is allowed;</li> <li>• Loading, unloading, transfer, handling or storage of bulk cement or dry PFA should be carried out in a totally enclosed system or facility, and any vent or exhaust should be fitted with an effective fabric filter or equivalent air pollution control system; and</li> <li>• Exposed earth should be properly treated by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shotcrete or other suitable surface stabiliser within six months after the last construction activity on the construction site or part of the construction site where the exposed earth lies.</li> </ul>	Good construction site practices to control the dust impact at the nearby sensitive receivers to within the relevant criteria.	Contractor	All construction sites	Construction stage	N/A

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
S5.5.6.3	A3	3) The Contractor should undertake proper watering on all exposed spoil (with at least 8 times per day) throughout the construction phase.	Control construction dust	Contractor	All construction sites	Construction stage	√
S5.5.6	A5	5) Implement regular dust monitoring under EM&A programme during the construction stage.	Monitor the 24 hr and 1hr TSP levels at the representative dust monitoring stations to ensure compliance with relevant criteria throughout the construction period	Contractor	Selected representative dust monitoring station	Construction stage	√
S5.5.71	A6	<p>The following mitigation measures should be adopted to prevent fugitive dust emissions for concrete batching plant:</p> <ul style="list-style-type: none"> <li>• Loading, unloading, handling, transfer or storage of any dusty materials should be carried out in totally enclosed system;</li> <li>• All dust-laden air or waste gas generated by the process operations should be properly extracted and vented to fabric filtering system to meet the emission limits for TSP;</li> <li>• Vents for all silos and cement/pulverised fuel ash (PFA) weighing scale should be fitted with fabric filtering system;</li> <li>• The materials which may generate airborne dusty emissions should be wetted by water spray system;</li> <li>• All receiving hoppers should be enclosed on three sides up to 3m above unloading point;</li> <li>• All conveyor transfer points should be totally enclosed;</li> <li>• All access and route roads within the premises should be paved and wetted; and</li> <li>• Vehicle cleaning facilities should be provided and used by all concrete trucks before leaving the premises to wash off any dust on the wheels and/or body.</li> </ul>	Monitor the 24 hr and 1hr TSP levels at the representative dust monitoring stations to ensure compliance with relevant criteria throughout the construction period	Contractor	Selected representative dust monitoring station	Construction stage	√

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
S5.5.2.7	A7	<p>The following mitigation measures should be adopted to prevent fugitive dust emissions at barging point:</p> <ul style="list-style-type: none"> <li>•All road surface within the barging facilities will be paved;</li> <li>•Dust enclosures will be provided for the loading ramp;</li> <li>•Vehicles will be required to pass through designated wheels wash facilities; and</li> <li>•Continuous water spray at the loading points.</li> </ul>	Control construction dust	Contractor	All construction sites	Construction stage	√
<b>Noise</b>							
S6.4.10	N1	<p>1) Use of good site practices to limit noise emissions by considering the following:</p> <ul style="list-style-type: none"> <li>•only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme;</li> <li>•machines and plant (such as trucks, cranes) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;</li> <li>•plant known to emit noise strongly in one direction, where possible, be orientated so that the noise is directed away from nearby NSRs;</li> <li>•silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works</li> <li>•mobile plant should be sited as far away from NSRs as possible and practicable;</li> <li>•material stockpiles, mobile container site officer and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.</li> </ul>	Control construction airborne noise by means of good site practices	Contractor	All construction sites	Construction stage	√



EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
S6.4.11	N2	2) Install temporary hoarding located on the site boundaries between noisy construction activities and NSRs. The conditions of the hoardings shall be properly maintained throughout the construction period.	Reduce the construction noise levels at low-level zone of NSRs through partial screening.	Contractor	All construction sites	Construction stage	√
S6.4.12	N3	3) Install movable noise barriers (typically density @ 14kg/m <sup>2</sup> ), acoustic mat or full enclosure close to noisy plants including air compressor, generators, saw.	Screen the noisy plant items to be used at all construction sites	Contractor	For plant items listed in Appendix 6D of the EIA report at all construction sites	Construction stage	√
S6.4.13	N4	4) Select .Quiet plants. which comply with the BS 5228 Part 1 or TM standards.	Reduce the noise levels of plant items	Contractor	For plant items listed in Appendix 6D of the EIA report at all construction sites	Construction stage	√
S6.4.14	N5	5) Sequencing operation of construction plants where practicable.	Operate sequentially within the same work site to reduce the construction airborne noise	Contractor	All construction sites where practicable	Construction stage	√
	N6	6) Implement a noise monitoring under EM&A programme.	Monitor the construction noise levels at the selected representative locations	Contractor	Selected representative noise monitoring station	Construction stage	√
<b>Waste Management (Construction waste)</b>							
S8.3.8	WM1	<u>Construction and Demolition Material</u> The following mitigation measures should be implemented in handling the waste: <ul style="list-style-type: none"> <li>•Maintain temporary stockpiles and reuse excavated fill material for backfilling and reinstatement;</li> <li>•Carry out on-site sorting;</li> <li>•Make provisions in the Contract documents to allow and promote the use of recycled aggregates where appropriate;</li> <li>•Adopt .Selective Demolition. technique to demolish the existing structures and facilities</li> </ul>	Good site practice to minimize the waste generation and recycle the C&D materials as far as practicable so as to reduce the amount for final disposal	Contractor	All construction sites	Construction stage	√

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
		<p>with a view to recovering broken concrete effectively for recycling purpose, where possible;</p> <ul style="list-style-type: none"> <li>•Implement a trip-ticket system for each works contract to ensure that the disposal of C&amp;D materials are properly documented and verified; and</li> <li>•Implement an enhanced Waste Management Plan similar to ETWBTC (Works) No. 19/2005. Environmental Management on Construction Sites. to encourage on-site sorting of C&amp;D materials and to minimize their generation during the course of construction.</li> <li>•In addition, disposal of the C&amp;D materials onto any sensitive locations such as agricultural lands, etc. should be avoided. The Contractor shall propose the final disposal sites to the Project Proponent and get its approval before implementation</li> </ul>					
S8.3.9-S8.3.11	WM2	<p>C&amp;D Waste</p> <ul style="list-style-type: none"> <li>•Standard formwork or pre-fabrication should be used as far as practicable in order to minimise the arising of C&amp;D materials. The use of more durable formwork or plastic facing for the construction works should be considered. Use of wooden hoardings should not be used, as in other projects. Metal hoarding should be used to enhance the possibility of recycling. The purchasing of construction materials will be carefully planned in order to avoid over ordering and wastage.</li> <li>•The Contractor should recycle as much of the C&amp;D materials as possible on-site. Public fill and C&amp;D waste should be segregated and stored in different containers or skips to enhance reuse or recycling of materials and their proper disposal. Where practicable, concrete and masonry can be crushed and used as fill. Steel reinforcement bar can be used by scrap steel mills. Different areas of the sites should be considered for such segregation and storage.</li> </ul>	Good site practice to minimize the waste generation and recycle the C&D materials as far as practicable so as to reduce the amount for final disposal	Contractor	All construction sites	Construction stage	√

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
S8.2.12- S8.3.15	WM3	<p>Chemical Waste</p> <ul style="list-style-type: none"> <li>•Chemical waste that is produced, as defined by Schedule 1 of the Waste Disposal (Chemical Waste) (General) Regulation, should be handled in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.</li> <li>•Containers used for the storage of chemical wastes should 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 liters unless the specification has been approved by the EPD; and display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the regulation..</li> <li>•The storage area for chemical wastes should be clearly labeled and used solely for the storage of chemical waste; enclosed on at least 3 sides; have an impermeable floor and bunding of sufficient capacity to accommodate 110% of the volume of the largest container or 20 % of the total volume of waste stored in that area, whichever is the greatest; have adequate ventilation; covered to prevent rainfall entering; and arranged so that incompatible materials are adequately separated.</li> <li>•Disposal of chemical waste should be via a licensed waste collector; be to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Centre which also offers a chemical waste collection service and can supply the necessary storage containers; or be to a reuser of the waste, under approval from the EPD.</li> </ul>	Control the chemical waste and ensure proper storage, handling and disposal.	Contractor	All construction sites	Construction stage	√

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
S8.3.16	WM4	<p><u>Sewage</u></p> <ul style="list-style-type: none"> <li>• Adequate numbers of portable toilets should be provided for the workers. The portable toilets should be maintained in a state, which will not deter the workers from utilizing these portable toilets. Night soil should be collected by licensed collectors regularly.</li> </ul>	Proper handling of sewage from worker to avoid odour, pest and litter impacts	Contractor	All construction sites	Construction stage	√
S8.3.17	WM5	<p><u>General Refuse</u></p> <ul style="list-style-type: none"> <li>• General refuse generated on-site should be stored in enclosed bins or compaction units separately from construction and chemical wastes.</li> <li>• A reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily basis to minimize odour, pest and litter impacts. Burning of refuse on construction sites is prohibited by law.</li> <li>• Aluminium cans are often recovered from the waste stream by individual collectors if they are segregated and made easily accessible. Separate labelled bins for their deposit should be provided if feasible.</li> <li>• Office wastes can be reduced through the recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be considered by the Contractor. In addition, waste separation facilities for paper, aluminum cans, plastic bottles etc., should be provided.</li> <li>• Training should be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including reduction, reuse and recycling of wastes.</li> </ul>	Minimize production of the general refuse and avoid odour, pest and litter impacts	Contractor	All construction sites	Construction stage	√

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
<b>Water quality (Construction Phase)</b>							
S9.11.1-S9.11.1.2	W1	<ul style="list-style-type: none"> <li>Mitigation during the marine works to reduce impacts to within acceptable levels have been recommended and will comprise a series of measures that restrict the method and sequencing of filling work, as well as protection measures. Details of the measures are provided below and summarised in the Environmental Mitigation Implementation Schedule in EM&amp;A Manual.</li> <li>Construction of seawalls to be advanced by at least 100-200m before the filling can commence. It should be noted that the protection by advanced seawall is a dynamic process depending on the progress of the construction activities. The part of the works where such measures can be undertaken for the majority of the time includes the following locations: <ul style="list-style-type: none"> <li>- TMCLKL northern reclamation;</li> <li>- TMCLKL southern reclamation (after formation of the nips);</li> <li>- Reclamation filling for Portion 1 of HKLR;</li> </ul> </li> </ul>	To control construction water quality	Contractor	During seawall filling	Construction stage	√
S9.11.1-S9.11.1.2	W1	<ul style="list-style-type: none"> <li>Single layer silt curtains will be applied around all works;</li> <li>silt curtain shall be fully maintained throughout the works.</li> </ul>	To control construction water quality	Contractor	During seawall filling	Construction stage	√

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
S9.11.1-S9.11.1.2	W1	<ul style="list-style-type: none"> <li>•excess material shall be cleaned from the decks and exposed fittings of barges before the vessel is moved;</li> <li>•all vessels shall be sized such that adequate clearance is maintained between vessels and the sea bed at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash; and</li> <li>•the 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.</li> </ul>	To control construction water quality	Contractor	During seawall filling	Construction stage	√
S9.11.1-S9.11.1.2	W1	<ul style="list-style-type: none"> <li>•Mechanical grabs shall be designed and maintained to avoid spillage and should seal tightly while being lifted;</li> <li>•barges shall have tight fitting seals to their bottom openings to prevent leakage of material;</li> <li>• any pipe leakages shall be repaired quickly. Plant should not be operated with leaking pipes;</li> <li>•loading of barges shall be controlled to prevent splashing of filling materials to the surrounding water.</li> <li>•Barges shall not be filled to a level which will cause overflow of materials or pollution of water during loading or transportation;</li> <li>•adequate freeboard shall be maintained on barges to reduce the likelihood of decks being washed by wave action;</li> <li>•all vessels shall be sized such that adequate clearance is maintained between vessels and the sea bed at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash; and</li> <li>•the 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 .</li> </ul>	To control construction water quality	Contractor	During seawall filling	Construction stage	√

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
		into the drainage system, and to prevent storm run-off from getting into foul sewers; <ul style="list-style-type: none"> <li>•discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.</li> </ul>					
S9.14	W3	<ul style="list-style-type: none"> <li>•Implement a water quality monitoring programme</li> </ul>	Control water quality	Contractor	At identified monitoring	During construction	√
<b>Ecology (Construction Phase)</b>							
S10.7	E1	<ul style="list-style-type: none"> <li>•Good site practices to avoid runoff entering woodland habitats in Scenic Hill;</li> <li>•Reinstate works areas in Scenic Hill;</li> <li>•Avoid stream modification in Scenic Hill.</li> </ul>	Avoid potential disturbance on habitat of Romer.s Tree Frog in Scenic Hill	Designer; Contractor	Scenic Hill	During construction	√
S10.7	E2	<ul style="list-style-type: none"> <li>•Install silt curtain during the construction;</li> <li>•Construct seawall prior to reclamation filling where practicable;</li> <li>•Good site practices;</li> <li>•Site runoff control3;</li> <li>•Spill response plan.</li> </ul>	Minimise marine water quality impacts	Contractor	Seawall, reclamation area	During construction	√
S10.7	E4	<ul style="list-style-type: none"> <li>•Watering to reduce dust generation; prevention of siltation of freshwater habitats; Site runoff should be desilted, to reduce the potential for suspended sediments, organics and other contaminants to enter streams and standing freshwater.</li> </ul>	Prevent Sedimentation from Land-based works areas	Contractor	Land-based works areas	During construction	√
S10.7	E5	<ul style="list-style-type: none"> <li>•Good site practices, including strictly following the permitted works hours, using quieter machines where practicable, and avoiding excessive lightings during night time</li> </ul>	Prevent disturbance to terrestrial fauna and habitats	Contractor	Land-based works areas	During construction	√

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
S10.7	E6	<ul style="list-style-type: none"> <li>•Dolphin Exclusion Zone;</li> <li>•Dolphin watching plan .</li> </ul>	Minimize temporary marine habitat loss impact to dolphins	Contractor	Marine works	During marine works	√
S10.7	E7	<ul style="list-style-type: none"> <li>•Decouple compressors and other equipment on working vessels;</li> <li>• Avoidance of percussive piling;</li> <li>•Marine underwater noise monitoring;</li> <li>•Temporal suspension of drilling bored pile casing in rock during peak dolphin calving season in May and June;</li> <li>•Handling with care for the installation of sheet piling for reclamation site</li> </ul>	Minimize temporary marine habitat loss impact to dolphins	Contractor	Marine works	During marine works	√
S10.7	E8	<ul style="list-style-type: none"> <li>•Control vessel speed;</li> <li>•Skipper training;</li> <li>•Predefined and regular routes for working vessels; avoid Brothers Islands.</li> </ul>	Minimise marine traffic disturbance on dolphins	Contractor	Marine traffic	During marine works	√
S10.10	E9	<ul style="list-style-type: none"> <li>•Dolphin vessel monitoring;</li> <li>• Mudflat ecological monitoring.</li> </ul>	Minimise marine traffic disturbance on dolphins	Contractor	North Lantau and West Lantau	Prior to construction, during construction, and 1 year after operation	√
<b>Ecology (Operation Phase)</b>							
S10.7	E10	<ul style="list-style-type: none"> <li>•Preconstruction dive survey for corals</li> </ul>	Minimise impacts on marine ecology	Contractor	The marine pier sites nearest to intertidal zone and along the shore of the HKLR eclamation site	Prior to marine construction works in these locations	√



EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
<b>Fisheries</b>							
S11.7	F2	<ul style="list-style-type: none"> <li>•Reduce re-suspension of sediments</li> <li>•Good site practices</li> <li>•Spill response plan</li> </ul>	Minimise marine water quality impacts	Contractor	Seawall, reclamation area	During construction	√
S11.7	F3	<ul style="list-style-type: none"> <li>•Install silt-grease trap in the drainage system collecting surface runoff</li> </ul>	Minimise impacts on marine water quality impacts	Designer	Reclamation area	During construction	√
S11.7	F4	<ul style="list-style-type: none"> <li>•Maritime Oil Spill Response Plan (MOSRP);</li> <li>•Contingency plan.</li> </ul>	Minimise impacts on marine water quality impacts	Management	HKLR	During operation stage	√
<b>Landscape &amp; Visual (Detailed Design Phase)</b>							
S14.3.3.1	LV1	<p>General design measures include:</p> <ul style="list-style-type: none"> <li>•Roadside planting and planting along the edge of the reclamation is proposed;</li> <li>•Transplanting of mature trees in good health and amenity value where appropriate and reinstatement of areas disturbed during construction by compensatory hydro-seeding and planting;</li> <li>•Protection measures for the trees to be retained during construction activities;</li> <li>•Optimizing the sizes and spacing of the bridge columns;</li> <li>•Fine-tuning the location of the bridge columns to avoid visually sensitive locations;</li> <li>•Aesthetic design of the bridge form and its structural elements for HKLR, e.g. parapet, soffit, columns, lightings and so on;</li> </ul> <p>Considering the decorative urban design elements for HKLR, e.g. decorative road lightings;</p>	Minimise visual & landscape impact	Detailed designer	HKLR	Design stage	

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
		<ul style="list-style-type: none"> <li>•Maximizing new tree, shrub and other vegetation planting to compensate tree felled and vegetation removed;</li> <li>•Providing planting area around peripheral of HKLR for tree planting screening effect.</li> </ul>					
S14.3.3.1	LV1	<ul style="list-style-type: none"> <li>•Providing salt-tolerant native trees along the planter strip at affected seawall and newly reclaimed coastline.</li> <li>•Providing salt-tolerant native trees along the planter strip at affected seawall and newly reclaimed coastline.</li> <li>•For HKLR, providing aesthetic design on the viaduct, tunnel portals, at-grade roads and</li> <li>•reclamation (e.g. subtle colour tone and slim form for viaduct to minimize the bulkiness of the structure and to blend the viaduct better with the background environment, featured form of tunnel portals, roadside planting along at-grade roads and landscape berm on &amp; planting along edge of reclamation area) to beautify the HKLR alignment (refer to Figure 14.4.3).</li> </ul>	Minimise visual & landscape impact	Detailed designer	HKLR	Design stage	
<b>Landscape &amp; Visual (Construction Phase)</b>							
S14.3.3.3	LV2	<p>Mitigate both Landscape and Visual Impacts</p> <p>G1. Grass-hydroseed bare soil surface and stock pile areas.</p> <p>G2. Add planting strip and automatic irrigation system if appropriate at some portions of bridge or footbridge to screen bridge and traffic.</p> <p>G3. For HKLR, providing aesthetic design on the viaduct, tunnel portals, at-grade roads and reclamation (e.g. subtle colour tone and slim form for viaduct, featured form of tunnel portals, roadside planting along at-grade roads and landscape berm on &amp; planting along edge of reclamation area) to beautify the HKLR alignment.</p> <p>G4. Vegetation reinstatement and upgrading to disturbed areas.</p>	Minimise visual & landscape impact	Contractor	HKLR	Construction stage	√

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	Implementation Status
		<p>G5. Maximize new tree, shrub and other vegetation planting to compensate tree felled and vegetation removed.</p> <p>G6. Provide planting area around peripheral of and within HKLR for tree screening buffer effect.</p> <p>G7. Plant salt tolerant native tree and shrubs etc along the planterstrip at affected seawall.</p> <p>G8. Reserve of loose natural granite rocks for re-use. Provide new coastline to adopt .natural-look. by means of using armour rocks in the form of natural rock materials and planting strip area accommodating screen buffer to enhance .natural-look. of the new coastline (see Figure 14.4.2 for example).</p>					
S14.3.3.3	LV3	<p>Mitigate Visual Impacts</p> <p>V1.Minimize time for construction activities during construction period.</p> <p>V2.Provide screen hoarding at the portion of the project site / works areas / storage areas near VSRs who have close low-level views to the Project during HKLR construction.</p>					√
<b>EM&amp;A</b>							
S15.5-S15.6	EM2	<p>1) An Environmental Team needs to be employed as per the EM&amp;A Manual.</p> <p>2) Prepare a systematic Environmental Management Plan to ensure effective implementation of the mitigation measures.</p> <p>3) An environmental impact monitoring needs to be implementing by the Environmental Team to ensure all the requirements given in the EM&amp;A Manual are fully complied with.</p>	Perform environmental monitoring & auditing	Contractor	All construction sites	Construction stage	√

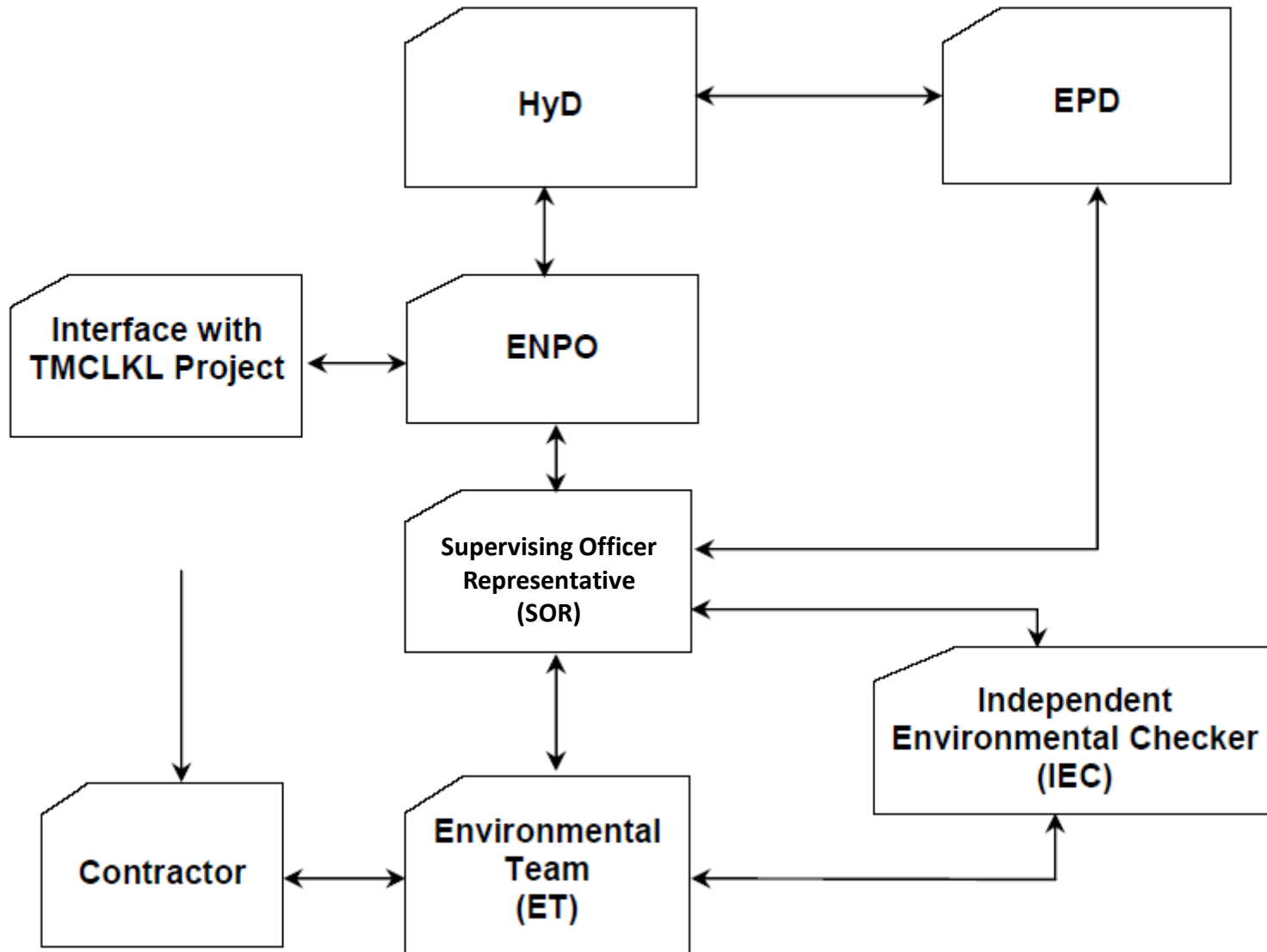
# APPENDIX C

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## PROJECT ORGANIZATION

# Project Organization for Environmental Works

↔ Line of communication



# APPENDIX D

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# ENVIRONMENTAL MONITORING DATA RECORD SHEET SAMPLE

**Data Sheet for TSP Monitoring**

Monitoring Location		
Details of Location		
Sampler Identification		
Date & Time of Sampling		
Elapsed-time Meter Reading	Start (min.)	
	Stop (min.)	
Total Sampling Time (min.)		
Weather Conditions		
Site Conditions		
Initial Flow Rate, Qsi	Pi (mmHg)	
	Ti (C)	
	Hi (in.)	
	Qsi (Std. m <sup>3</sup> )	
Final Flow Rate, Qsf	Pf (mmHg)	
	Tf (C)	
	Hf (in.)	
	Qsf (Std. m <sup>3</sup> )	
Average Flow Rate (Std. m <sup>3</sup> )		
Total Volume (Std. m <sup>3</sup> )		
Filter Identification No.		
Initial Wt. of Filter (g)		
Final Wt. of Filter (g)		
Measured TSP Level (µg/m <sup>3</sup> )		

Name & Designation

Signature

Date

Field Operator :

Laboratory Staff :

Checked by :

### Noise Monitoring Field Record Sheet

Monitoring Location		
Description of Location		
Date of Monitoring		
Measurement Start Time (hh:mm)		
Measurement Time Length(min.)		
Noise Meter Model/Identification		
Calibrator Model/Identification		
Measurement Results	L <sub>90</sub> (dB(A))	
	L <sub>10</sub> (dB(A))	
	Leq (dB(A))	
Major Construction Noise Source(s) During Monitoring		
Other Noise Source(s) During Monitoring		
Remarks		

Name & Designation

Signature

Date

Recorded By : \_\_\_\_\_

Checked By : \_\_\_\_\_



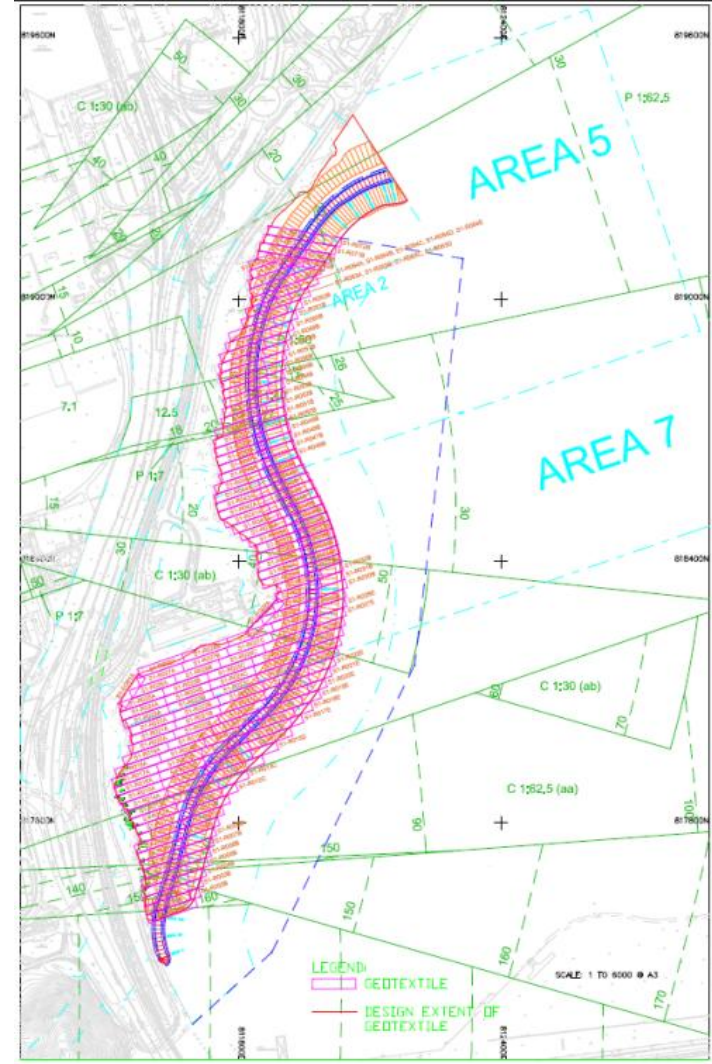
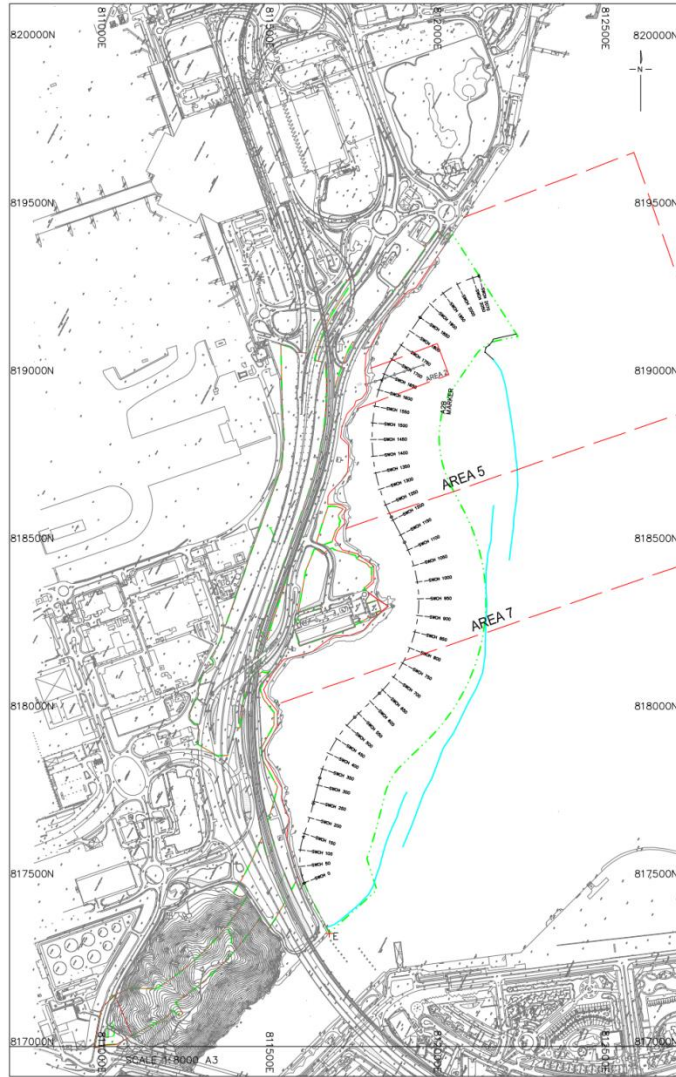
# APPENDIX E

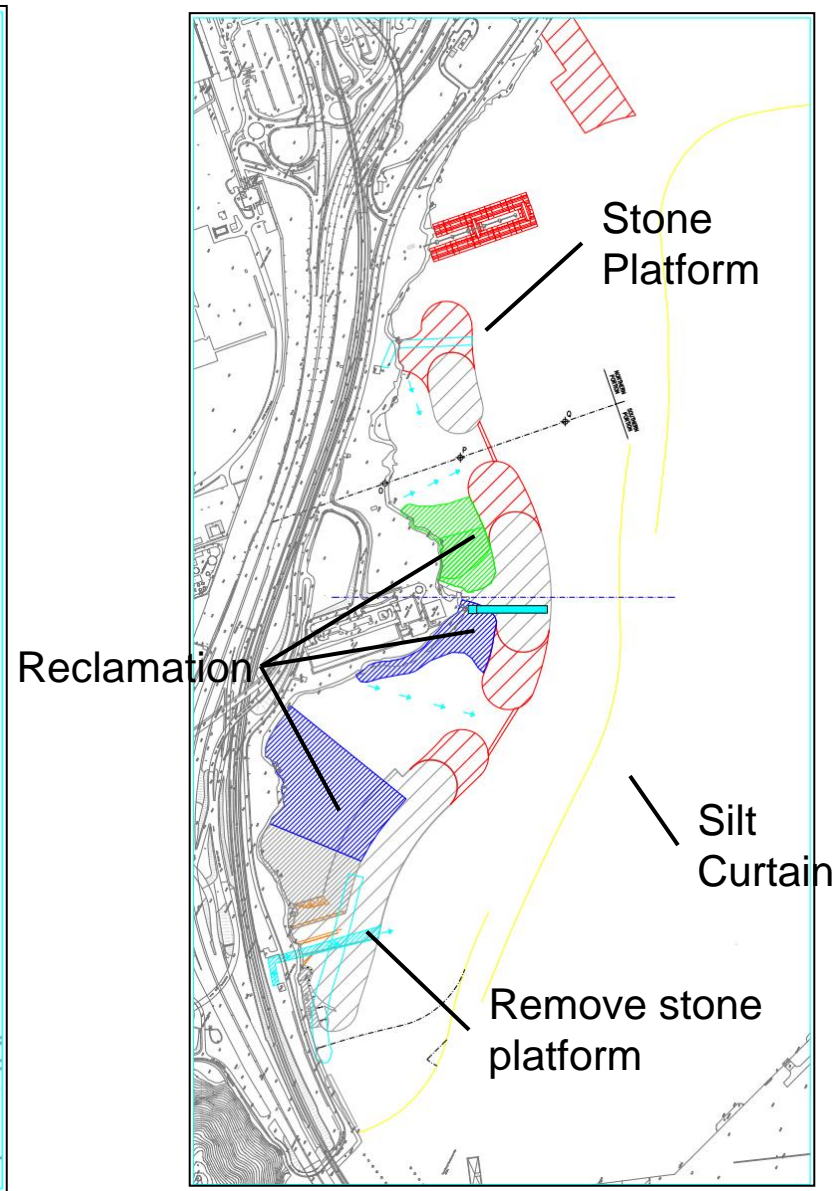
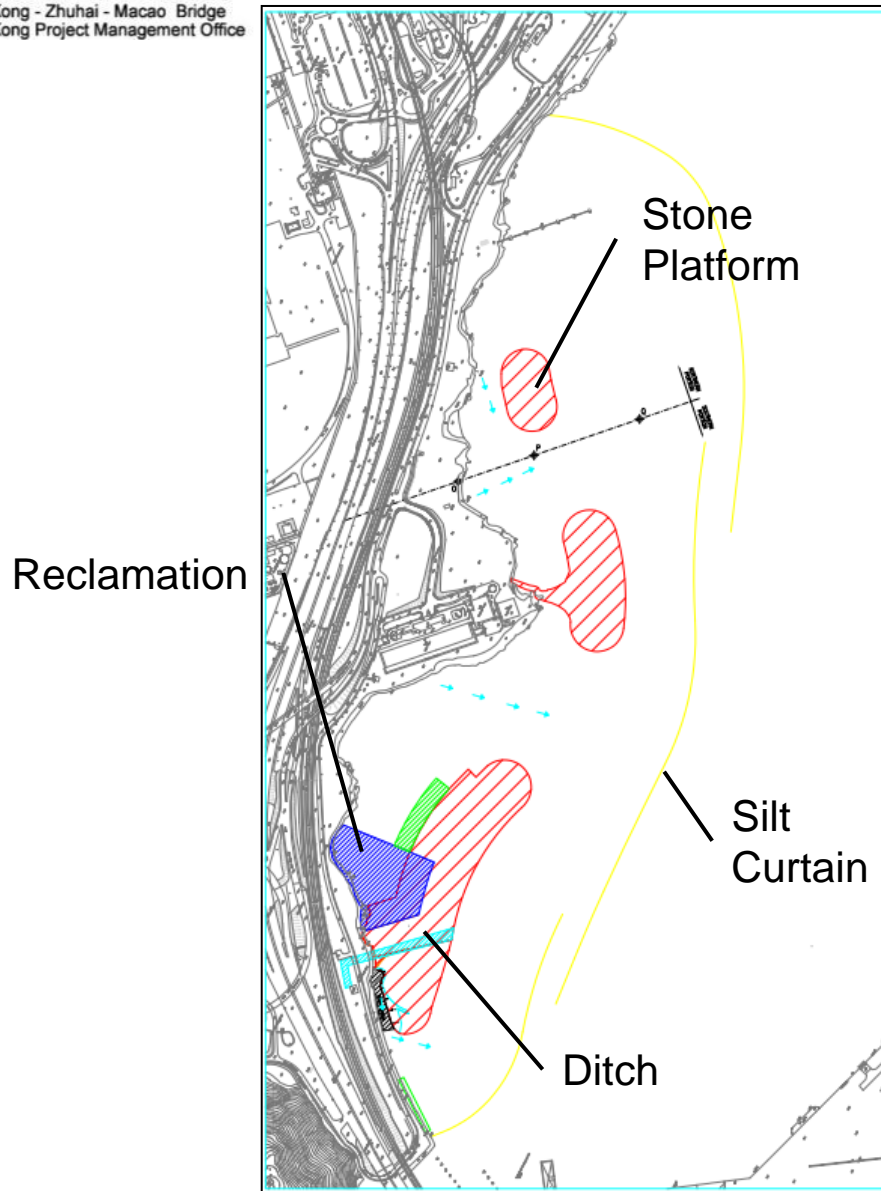
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## TYPICAL ARRANGEMENT OF RECLAMATION FOR HKLR

## Overall Construction Sequence of Marine Works (Indicative Only)

- |  |             |   |             |
|--|-------------|---|-------------|
| • Marine Ground Investigation              | 21 Jun 2012 | ~ | 31 Oct 2012 |
| • Installation of Silt Curtain             | 27 Aug 2012 | ~ | 31 Aug 2012 |
| • Laying of Geotextile                     | 8 Oct 2012  | ~ | 10 Oct 2013 |
| • Construction of Temporary Stone Platform | 10 Sep 2012 | ~ | 31 Dec 2013 |
| • Construction of Permanent Seawall        | 1 Aug 2013  | ~ | 28 Mar 2014 |
| • Reclamation                              | 27 Jul 2013 | ~ | 12 Sep 2014 |
| • Construction of Surcharge                | 6 Mar 2014  | ~ | 9 Jan 2015  |







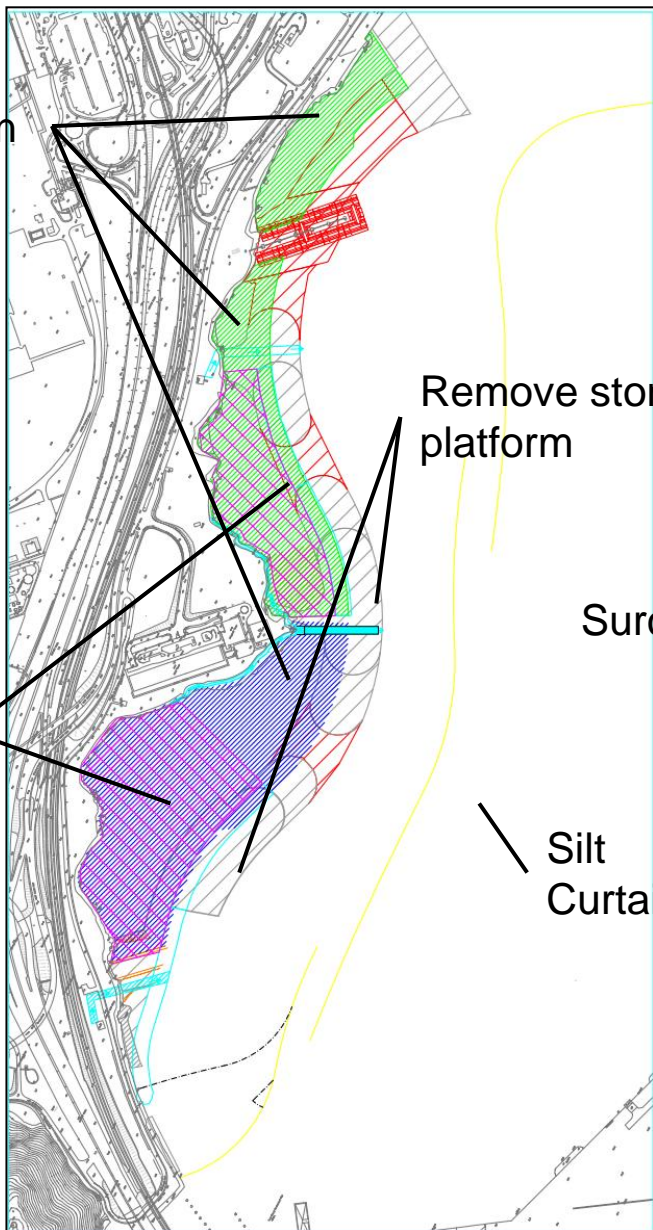
Reclamation

Surcharge

Remove stone  
platform

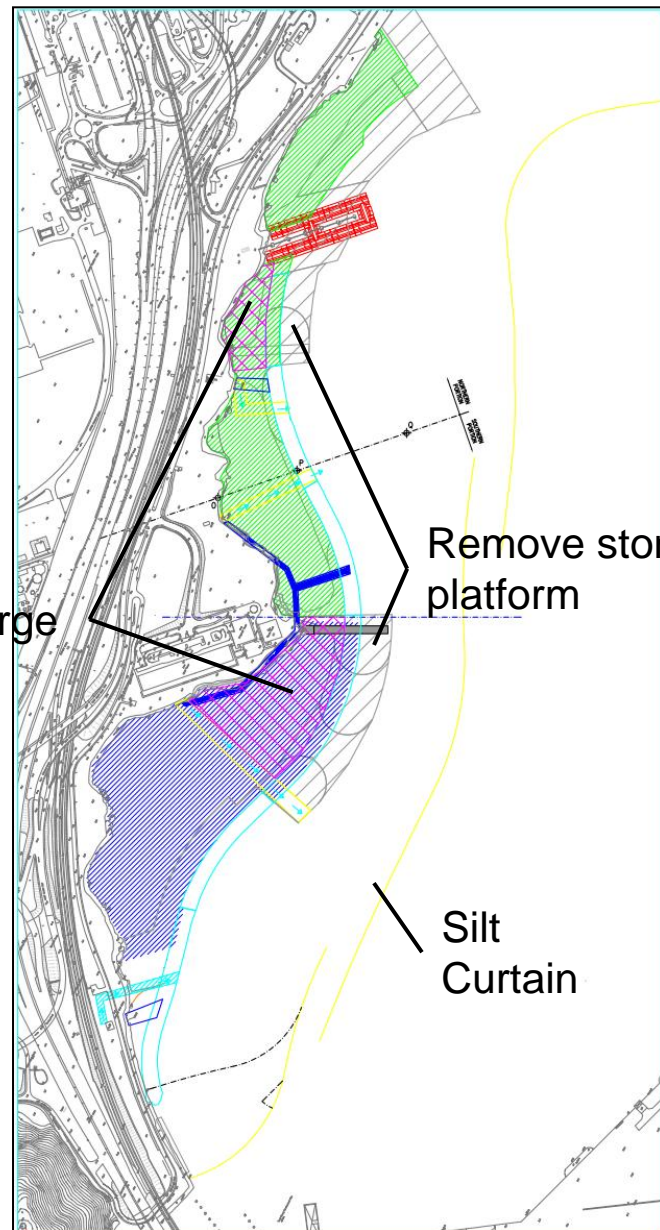
Surcharge

Silt  
Curtain

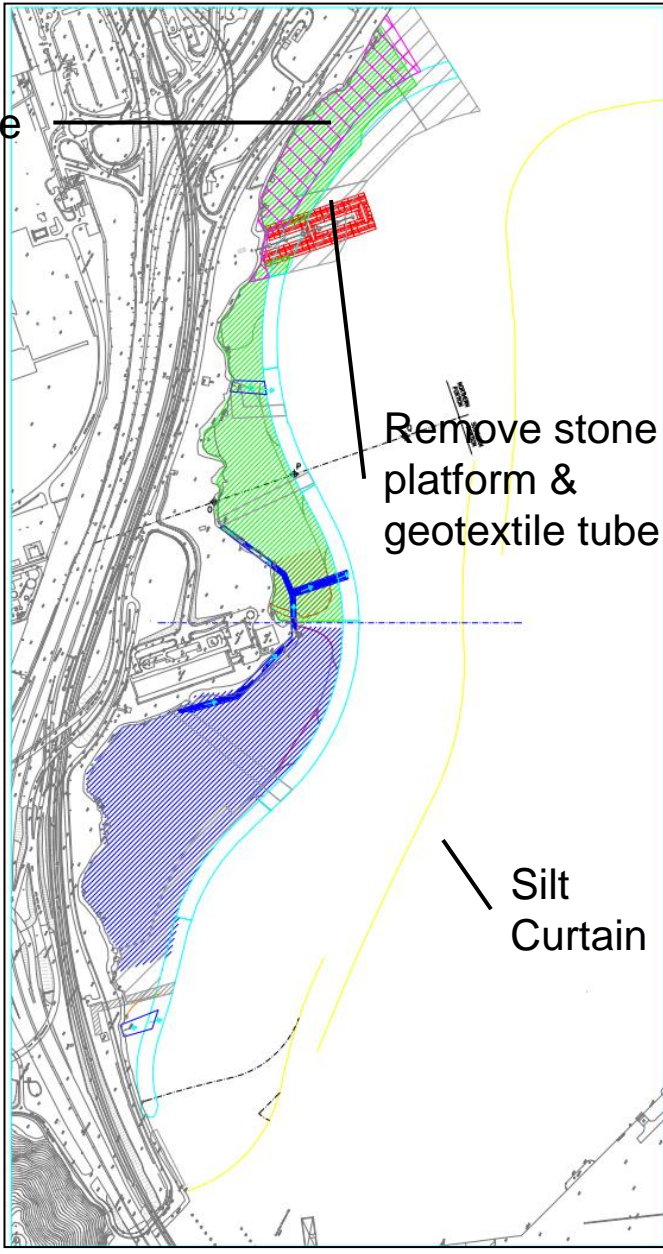


Remove stone  
platform

Silt  
Curtain

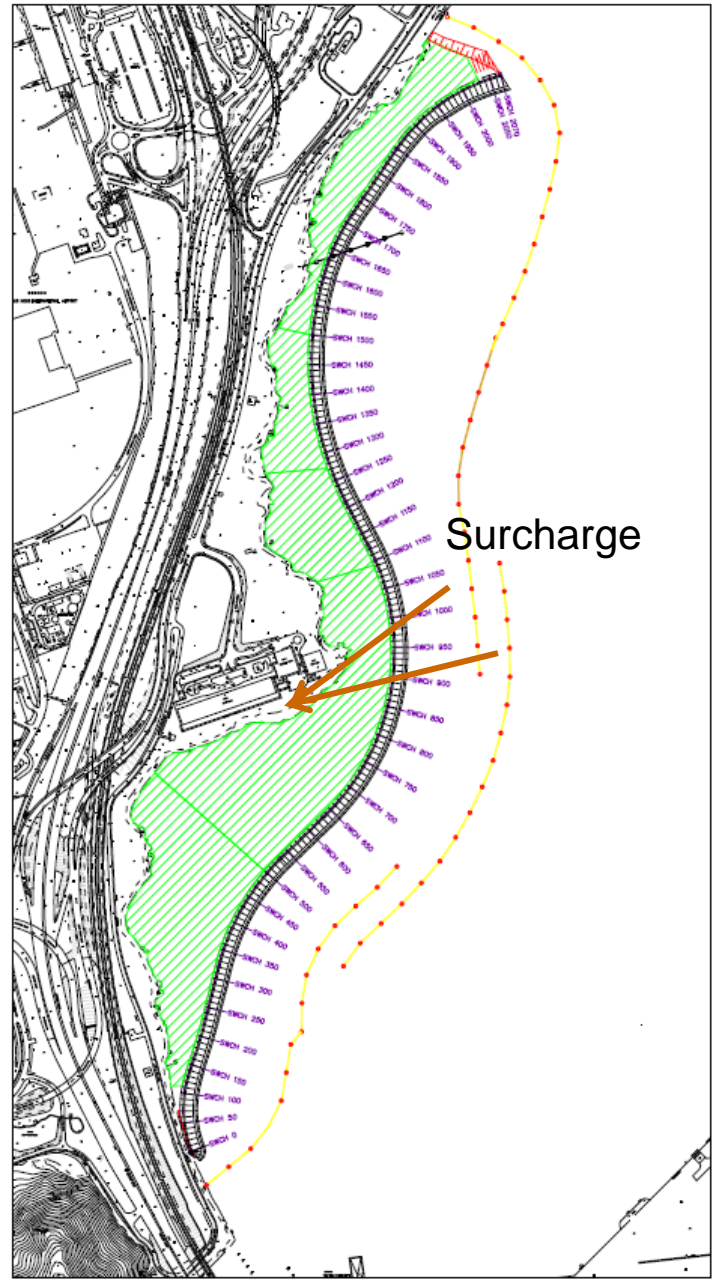


Surcharge



Remove stone platform & geotextile tube

Silt Curtain



Surcharge

## APPENDIX F

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# SAMPLE TEMPLATE FOR INTERIM NOTIFICATIONS

Sample Template for Interim Notifications of Environmental Quality Limits Exceedances

**Incident Report on Action Level or Limit Level Non-compliance**

Project	
Date	
Time	
Monitoring Location	
Parameter	
Action & Limit Levels	
Measured Level	
Possible reason for Action or Limit Level Non-compliance	
Actions taken / to be taken	
Remarks	

Location Plan

Prepared by :

Designation :

Signature :

Date :

