

Highways Department  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route –**  
**Design and Construction**  
Environmental Monitoring and Audit  
Manual

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Job number 217722

**Arup-Mott MacDonald**  
**Joint Venture**

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# 1 INTRODUCTION

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## 1.1 Background

The need for additional traffic capacity on the east-west road links across central Kowloon, particularly for coping with the new developments on its western and eastern sides, has been recognized for a number of years. Since 1990, it was proposed in the West Kowloon Reclamation Transport Study that a route in tunnel, which is known as the Central Kowloon Route (CKR), should be developed to link the West Kowloon Highway with the future highway system.

Highways Department (HyD) commissioned the Design and Construction Assignment for the Central Kowloon Route in June 1998. An alignment study, preliminary design and impact assessments were carried out without proceeding to the detailed design or construction phases due to substantial changes in scope of CKR. The study was based on a dual two-lane configuration. Its findings indicated the need for resumption of some residential buildings in the vicinity of Bailey Street in To Kwa Wan and included an outline proposal for Re-provisioning of some government and community facilities in Yau Ma Tei. These facilities included Yau Ma Tei Police Station, Kowloon Government Offices, Yau Ma Tei Multi-storey Carpark Building, Yau Ma Tei Jockey Club Polyclinic Building and Specialist Clinic Extension Building, Yau Ma Tei Jade Hawker Bazaar, public toilet and refuse collection point adjoining Temple Street, and other minor facilities.

In March 1999, Government confirmed that a toll plaza for CKR would no longer be necessary. This removed a major constraint on the vertical alignment of CKR at the east portion. The alternative alignment options for CKR were then re-examined taking into account the updated planning of the then South East Kowloon Development for reduced scale of reclamation. In August 1999, HyD commissioned a further study to investigate alternative routes to the east of Ho Man Tin with a view to minimise resumption of residential properties while dovetailing with the overall planning of the road network in the then SEKD. The study recommended a new alignment running through the bus terminus at Kowloon City Ferry Pier, which could avoid resumption of residential buildings.

Agreement No. CE 58/2006 (HY) – Central Kowloon Route and Widening of Gascoigne Road Flyover – Investigation was commissioned by HyD in August 2007 to conduct the investigation and preliminary design of the CKR (in dual 3-lane configuration) and Widening of GRF projects.

On 30 June 2011, HyD appointed the Arup – Mott MacDonald Joint Venture (AMMJV) under Agreement No. CE43/2010(HY) to provide consultancy services in respect of Central Kowloon Route – Design and Construction (the Assignment). This consultancy also includes the compilation of an Environmental Impact Assessment (EIA) Report to fulfil the relevant legislative requirements.

Through a number of studies and verifications of engineering feasibility, CKR is now a proposed dual 3-lane trunk road across central Kowloon linking the West Kowloon in the west and the proposed Kai Tak Development (KTD) in the east. The CKR will be about 4.7 km long with an underground tunnel section of about 3.9 km long, in particular, there will be an underwater tunnel of about 370 m long in Kowloon Bay to the north of the To Kwa Wan Typhoon Shelter. It will connect the West Kowloon Highway at Yau Ma Tei Interchange with the road network at Kowloon Bay and the future Trunk Road T2 at KTD which will connect to the future Tseung Kwan O – Lam Tin Tunnel (TKO-LTT) and Cross Bay Link (CBL). CKR, Trunk Road T2 and TKO-LTT will form a strategic highway link, namely Route 6, connecting West Kowloon and Tseung Kwan O. Consultancy studies for Trunk Road T2, TKO-LTT and CBL have been commissioned by CEDD. In addition, 3 ventilation buildings, which will be located in Ya Ma Tei, Ho Man Tin and ex-Kai Tak airport area, are proposed to ensure acceptable air quality within the tunnel.

The Project would involve temporary reclamation works, dredging, cut-and-cover tunnel, drill-and-blast tunnel, road bridges, landscaped decks and full enclosure over roads. These are designated projects under Schedule 2 of the EIA Ordinance (Cap. 499) and hence Environmental Permits (EPs) are required for their construction and operation. The general alignment layout of CKR is given in **Figure 1.1**.

## 1.2 Purposes of the Manual

The purposes of this Environmental Monitoring and Audit (EM&A) Manual are to:

- Guide the set up of an EM&A programme to ensure compliance with the EIA recommendations;
- Specify the requirements for monitoring equipments;
- Propose environmental monitoring points, monitoring frequency etc;
- Propose Action / Limit Level; and
- Propose Event / Action Plan.

This Manual outlines the monitoring and audit programme for the construction and operation of the proposed CKR and provides systematic procedures for monitoring, auditing and minimizing environmental impacts.

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 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).

This Manual contains the following information:

- Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), Environmental Team (ET), and the Independent Environmental Checker (IEC) under the context of EM&A;
- Project organization for the EM&A works;

- The basis for, and description of the broad approach underlying the EM&A programme;
- 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.

For the purpose of this manual, the ER shall refer to the Engineer as defined in the Construction Contract, in cases where the Engineer's powers have been delegated to the ER, in accordance with the Construction Contract. The ET leader, 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.

## 2 Project Description

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### 2.1 General Alignment

A number of alignment options have been considered for the west, east and central portions. These options have been evaluated by considering a number of factors including engineering, public comments, environmental factors etc. The preferred alignment for each portion has been recommended and **Figure 1.1** shows the entire preferred alignment.

A brief summary of key elements of the Project is given below.

<u>Key Elements</u>	<u>Description</u> (Approximate dimension only)
Total Alignment	~ 4.7 km (dual 3-lane east-west trunk road)
Tunnel	~ 3.9 km (including a 370 m long underwater tunnel)
Ventilation Buildings (VB) and Administration Building	3 VBs and 1 Administration Building in total <ul style="list-style-type: none"> <li>- Ventilation Building at Yau Ma Tei Interchange (approx. footprint: 5,000 m<sup>2</sup> with a building height of approximately 20m above ground)</li> <li>- Ventilation Building at Ho Man Tin (approx. footprint: 3,300 m<sup>2</sup> with a building height about 10m above ground)</li> <li>- Ventilation and Administration Building at Kai Tak (approx. footprint: 6,200 m<sup>2</sup> with building height less than 25m above ground)</li> </ul>
Slip Roads / Connection Roads	In west and east ends of the tunnel for connecting to existing and future road networks
Landscaped Decks	3 nos. in total (one at the west portal in Yau Ma Tei, one at the Kowloon City Ferry Pier PTI at Ma Tau Kok and one above the depressed road at east portion in Kai Tak)
Demolition and / or Re-provisioning Works	<ul style="list-style-type: none"> <li>- Yau Ma Tei Multi-Storey Car Park Building</li> <li>- Special Clinic Extension Building</li> <li>- Jade Hawker Bazaar</li> <li>- Hong Kong Automobile Association</li> <li>- Re-provisioning of Gascoigne Road Flyover (GRF)</li> <li>- Landing Step for Temporary Relocation of Ma Tau Kok Public Pier</li> </ul>
Enhancement	<ul style="list-style-type: none"> <li>- Ma Tau Kok waterfront area and Kowloon City Ferry</li> </ul>

Works	Pier Public Transport Interchange with cover
Full Enclosures	3 nos. in total <ul style="list-style-type: none"> <li>- West Portal End (approx. 100 m)</li> <li>- Re-provisioning of Gascoigne Road Flyover (approx. 200 m)</li> <li>- Gascoigne Road Flyover (Ferry Street Section) (approx. 100 m)</li> </ul>

## 2.2 Summary of Design

A board summary of the general design of CKR is given below:

**Table 2.1** Summary of design of CKR

Type	Location	Design
Alignment	East Portion	At-grade Road + cut-and-cover tunnel
	Central Portion	Drill-and-blast tunnel
	West Portion	At-grade Road + Flyover + Drill-and-break tunnel + Drill-and-blast tunnel
Ventilation buildings	One for each of the East, Central and West Portions	At-grade structure

## 2.3 Implementation Programme

According to the latest programme, the construction of CKR is to commence in 2015. The construction works would take about 5 years and the target commissioning date is around end 2020. The construction programme is presented in **Appendix A**.

## 2.4 Concurrent Projects

The possible potential concurrent projects in the vicinity of the CKR are identified as follows. **Figure 2.1** shows the location and alignment of these concurrent projects.

- Kai Tak Development;
- Kai Tak Development – Roads D3A &D4A;
- Trunk Road T2;
- Proposed Road Improvement Works in West Kowloon Reclamation Development;

- Kwun Tong Line Extension & Associated Essential Public Infrastructure Works (EPIW);
- Shatin to Central Link – Tai Wai to Hung Hom Section;
- Express Rail Link – West Kowloon Terminus;
- Road Works at West Kowloon;
- Upgrading of Central and East Kowloon sewerage;
- Replacement and Rehabilitation of Watermains;
- Widening of Gascoigne Road;
- Submarine Gas Pipelines and Associated Facilities from Ma Tau Kok to North Point;
- Tseung Kwun O – Lam Tin Road;
- Cross Bay Link; and
- West Kowloon Cultural District.

### 2.4.1 Summary of Concurrent Projects

The table below summarizes the major concurrent projects in the vicinity of the Project and the potential cumulative impacts during the construction and operation of the proposed CKR. **Figure 2.1** illustrates the locations of each concurrent project.

**Table 2.2** Summary of Potential Concurrent Projects

No.	Concurrent Project	Potential Cumulative Impacts	
		Construction Phase	Operational Phase
1	Agreement No. CE 35/2006(CE) Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction		
	Agreement No. CE 30/2008(CE) Kai Tak Development – Infrastructure at Former Runway and Remaining Areas of North Apron and Improvement of adjacent Waterways – Design and Construction		
	<ul style="list-style-type: none"> <li>• A Site Formation for Kai Tak Cruise Terminal Development</li> </ul>	<ul style="list-style-type: none"> <li>• Hydrodynamic and Water Quality</li> </ul>	<ul style="list-style-type: none"> <li>• Nil</li> </ul>
	<ul style="list-style-type: none"> <li>• Kai Tak Development - Advance infrastructure works for developments at the southern part of the former runway (Including Roads D4, D3A, D4A and part of Roads D3)</li> </ul>	<ul style="list-style-type: none"> <li>• Fugitive dust</li> <li>• Airborne noise</li> <li>• Landscape &amp; visual</li> </ul>	<ul style="list-style-type: none"> <li>• Traffic noise and vehicular emission caused by induced traffic</li> </ul>
	<ul style="list-style-type: none"> <li>• Kai Tak Development -</li> </ul>	<ul style="list-style-type: none"> <li>• Fugitive dust</li> </ul>	<ul style="list-style-type: none"> <li>• Traffic noise and</li> </ul>

No.	Concurrent Project	Potential Cumulative Impacts	
		Construction Phase	Operational Phase
	Remaining Infrastructure Works for Developments at the Former Runway (Including part of Roads D3)	<ul style="list-style-type: none"> <li>Airborne noise</li> <li>Landscape &amp; visual</li> </ul>	vehicular emission caused by induced traffic
	<ul style="list-style-type: none"> <li>Kai Tak Development Infrastructure at north apron area of Kai Tak Airport (Including part of Roads D3)</li> </ul>	<ul style="list-style-type: none"> <li>Fugitive dust</li> <li>Airborne noise</li> <li>Landscape &amp; visual</li> </ul>	<ul style="list-style-type: none"> <li>Traffic noise and vehicular emission caused by induced traffic</li> </ul>
	<ul style="list-style-type: none"> <li>Kai Tak Nullah modification works</li> </ul>	<ul style="list-style-type: none"> <li>Fugitive dust</li> <li>Airborne noise</li> <li>Landscape &amp; visual</li> </ul>	<ul style="list-style-type: none"> <li>Nil</li> </ul>
	<ul style="list-style-type: none"> <li>Road D2 and associated works</li> </ul>	<ul style="list-style-type: none"> <li>Fugitive dust</li> <li>Airborne noise</li> <li>Landscape &amp; visual</li> </ul>	<ul style="list-style-type: none"> <li>Traffic noise and vehicular emission caused by induced traffic</li> </ul>
	<ul style="list-style-type: none"> <li>Kai Tak Development - Kai Tak Approach Channel and Kwun Tong Typhoon Shelter Improvement Works (Phase 1)</li> </ul>	<ul style="list-style-type: none"> <li>Hydrodynamic and Water Quality</li> </ul>	<ul style="list-style-type: none"> <li>Nil</li> </ul>
	<ul style="list-style-type: none"> <li>600-metre opening at former airport runway</li> </ul>	<ul style="list-style-type: none"> <li>Hydrodynamic and Water Quality</li> </ul>	<ul style="list-style-type: none"> <li>Nil</li> </ul>
2	Multi-Purpose Stadium Complex at Kai Tak	<ul style="list-style-type: none"> <li>Fugitive dust</li> <li>Airborne noise</li> </ul>	<ul style="list-style-type: none"> <li>Landscape &amp; visual</li> </ul>
3	Design-Build-Operate a District Cooling System (Phase II Works) at Kai Tak Development	<ul style="list-style-type: none"> <li>Nil</li> </ul>	<ul style="list-style-type: none"> <li>Nil</li> </ul>
4	Provision of Interception Facilities at Jordan Valley Box Culvert	<ul style="list-style-type: none"> <li>Nil</li> </ul>	<ul style="list-style-type: none"> <li>Nil</li> </ul>
5	Kai Tak Development – Trunk Road T2 and Infrastructure at South Apron – Investigation, Design and Construction	<ul style="list-style-type: none"> <li>Fugitive dust</li> <li>Airborne noise</li> </ul>	<ul style="list-style-type: none"> <li>Traffic noise and vehicular emission caused by induced traffic</li> </ul>
6	Proposed Road Improvement in West Kowloon Reclamation Development - Feasibility	<ul style="list-style-type: none"> <li>Fugitive dust</li> <li>Airborne noise</li> </ul>	<ul style="list-style-type: none"> <li>Traffic noise and vehicular emission caused by induced traffic</li> </ul>
7	Kwun Tong Line Extension (Construction of Ho Man Tin Station & EPIW)	<ul style="list-style-type: none"> <li>Nil</li> </ul>	<ul style="list-style-type: none"> <li>Nil</li> </ul>
8	Shatin to Central Link (Tai Wai to Hung Hom)	<ul style="list-style-type: none"> <li>Fugitive dust</li> <li>Landscape &amp; visual</li> </ul>	<ul style="list-style-type: none"> <li>Nil</li> </ul>
9	Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (Construction of West Kowloon Terminus)	<ul style="list-style-type: none"> <li>Nil</li> </ul>	<ul style="list-style-type: none"> <li>Nil</li> </ul>
10	Road Works at West Kowloon	<ul style="list-style-type: none"> <li>Nil</li> </ul>	<ul style="list-style-type: none"> <li>Traffic noise and vehicular emission caused by induced traffic</li> </ul>
11	Upgrading of Central and East	<ul style="list-style-type: none"> <li>Nil</li> </ul>	<ul style="list-style-type: none"> <li>Nil</li> </ul>

No.	Concurrent Project	Potential Cumulative Impacts	
		Construction Phase	Operational Phase
	Kowloon sewerage - phase 2		
12	Upgrading of Central and East Kowloon sewerage	• Nil	• Nil
13	Replacement and Rehabilitation of Watermains, Stage 4 Phase 1	• Nil	• Nil
14	Replacement and Rehabilitation of Watermains Stage 4 - remaining works	• Nil	• Nil
15	Widening of Gascoigne Road Flyover	• Nil	• Traffic noise and vehicular emission caused by induced traffic
16	Installation of Submarine Gas Pipelines and Associated Facilities from To Kwa Wan to North Point for Former Kai Tak Airport Development	• Nil	• Nil
17	Tseung Kwan O – Lam Tin Tunnel <sup>[1]</sup>	• Nil	• Traffic noise and vehicular emission caused by induced traffic
18	Cross Bay Link <sup>[1]</sup>	• Nil	• Traffic noise and vehicular emission caused by induced traffic
19	West Kowloon Cultural District <sup>[1]</sup>	• Nil	• Traffic noise and vehicular emission caused by induced traffic

## 3 Project Organization

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### 3.1 Project Organization

The proposed project organization and lines of communication with respect to environmental protection works are shown in **Appendix B**.

The leader of the ET shall be an independent party from the Contractor and has relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the Engineer's Representative (ER) and EPD.

The responsibilities of respective parties are:

#### **The Contractor**

- Employ an Environmental Team (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 compliant investigation.

#### **Environmental Team**

- Set up all the required environmental monitoring stations;
- Monitor various environmental parameters as required in the EM&A Manual;
- Analyse 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 ER 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 ER of any potential non-compliance; and
- Follow up and close out non-compliance actions.

### **Engineer or Engineer's Representative**

- 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.

### **Independent Environmental Checker**

- 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 ER 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 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 ER and EPD.

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.

The ET Leader shall have at least 7 years of experience in conducting EM&A for infrastructure projects. His / Her qualification shall be vetted by the ER and the IEC.

## 4 Environmental Submission

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### 4.1 Introduction

The Contractor shall prepare the Environmental Management Plan (EMP) (including a Waste Management Plan), Construction Method Statement prior to the commencement of construction works and obtain approval from ER and IEC and other relevant authorities to encompass the recommended environmental protection / mitigation measures with respect to their latest construction methodology and programme.

### 4.2 Environmental Management Plan

A systematic EMP shall be set up by the Contractor to ensure effective implementation of the mitigation measures, monitoring and remedial requirements presented in EIA, EM&A and Environmental Mitigation Implementation Schedule (EMIS) (See **Appendix C**). The ER 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 ER through contractual means.

The EMP will require the Contractor (together with its sub-contractors) to define in details how to implement the recommended mitigation measures in order to achieve the environmental performance defined in the Hong Kong environmental legislation and the EIA documentation.

The review of on-site environmental performance shall be undertaken by ER 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 ETWBTC 19 / 2005 “Environmental Management on Construction Sites” or its latest versions, and any other relevant Technical Circulars.

### 4.3 Waste Management Plan

As part of EMP, the Contractor shall include WMP for the construction of the project and prior to the commencement of construction works submit to the ER and IEC 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.

For the purpose of enhancing the management of Construction and Demolition (C&D) materials including rock, and minimizing its generation at source, construction would be undertaken in accordance with the Section 4.1.3 of Chapter 4 in the Project Administration Handbook for Civil Engineering Works (PAH).

## 4.4 Construction Method Statement

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 ER 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.

## 5 Air Quality Impact

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### 5.1 Introduction

The EIA has considered the potential air quality impacts during both the construction and operational phases of the Project. Fugitive dust and vehicular emission would be the key impacts during the construction phase and operational phase respectively.

### 5.2 Mitigation Measures

The EIA Report has recommended dust control measures including watering all works area once per hour during working hours. Mitigation measures are not required for the operational phase. All the proposed mitigation measures are summarized in the Environmental Mitigation Implementation Schedule (EMIS) in **Appendix C**.

### 5.3 Air Quality Parameters

Monitoring and audit of the 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.

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 method which are capable of producing comparable results as that by the high volume sampling method, to indicate short event impacts.

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**.

### 5.4 Monitoring Equipment

High volume samplers (HVSs) complying with the following specifications shall be used for carrying out the 1-hour and 24-hour TSP monitoring:

- a) 0.6 – 1.7 m<sup>3</sup> per minute adjustable flow range;
- b) Equipped with a timing / control device with +/1 5 minutes accuracy for 24 hours operations;
- c) Installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
- d) Capable of providing a minimum exposed area of 406cm<sup>2</sup>;
- e) Flow control accuracy: +/-2.5% deviation over 24-hour sampling period;

- f) Equipped with a shelter to protect the filter and sampler;
- g) Incorporated with an electronic mass flow rate controller or other equivalent devices;
- h) Equipped with a flow recorder for continuous monitoring;
- i) Provided with a peaked roof inlet;
- j) Incorporated with a manometer;
- k) Able to hold and seal the filter paper to the sampler housing at horizontal position;
- l) Easily changeable filter; and
- m) Capable of operating continuously for a 24-hour period.

The ET is responsible for the provision, installation, operation, maintenance, dismantle 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 labelled.

Initial calibration of dust monitoring equipment shall be conducted upon installation and thereafter at fortnightly 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.

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**.

If the ET proposes to use a direct reading dust meter to measure 1-hour TSP levels, they shall submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable results 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.

Wind data monitoring equipment shall also be provided and 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 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:

- a) The wind sensors should be installed at 10m above ground so that they are clear of obstructions or turbulence caused by buildings;
- b) The wind data should be captured by a data logger, the data shall be downloaded for analysis at least once a month;

- c) The wind data monitoring equipment should be re-calibrated at least once every six months; and
- d) Wind direction should be divided into 16 sectors of 22.5 degrees each.

In exceptional situations, the ET may propose alternative methods to obtain representative wind data upon approval from the ER and agreement from the IEC.

## 5.5 Laboratory Measurement / Analysis

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.

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 ER and the measurement procedures shall be demonstrated to the satisfaction of the ER and IEC. IEC shall regularly audit the measurement performed by the laboratory to ensure the accuracy of measurement results. The ET Leader shall provide the ER with one copy of the Title 40 of Code of Federal Regulations, Chapter 1 (Part 50), **Appendix B** for his / her reference.

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.

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.

## 5.6 Monitoring Locations

**Figure 5.1** to **Figure 5.3** show the locations of the proposed construction dust monitoring station. 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 ER and agreement from the IEC.

**Table 5.1** Construction dust monitoring locations

ID	Location
W-A5	The Coronation
W-A11	Hong Kong Community College (HKCC) of the HK
M-A6	Ko Fai House, Kwun Fai Court
E-A1	Hong Kong International Trade and Exhibition Centre
E-A14	Wyler Gardens

When alternative monitoring locations are proposed, the proposed site should, as far as practicable:

- a) be at the site boundary or such locations close to the major dust emission source;
- b) be close to the sensitive receptors; and
- c) take into account the prevailing meteorological conditions.

The ET shall agree with the ER 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) a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
- b) no two samplers should be placed less than 2 meters apart;
- c) 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;
- d) a minimum of 2 meters of separation from walls, parapets and penthouses is required for rooftop samplers;
- e) a minimum of 2 meters separation from any supporting structure, measured horizontally is required;
- f) no furnace or incinerator flue is nearby;
- g) airflow around the sampler is unrestricted;
- h) the sampler is more than 20 meters from the dripline;
- i) 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.

The ET 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.

## 5.7 Baseline Monitoring

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.

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 ER can conduct on-site audit to ensure accuracy of the baseline monitoring results.

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 ER and agreed with the IEC.

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 ER for approval.

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.

## 5.8 Impact Monitoring

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.

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.

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 ER and the IEC.

## 5.9 Action / Limit Levels

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 / Limit Levels for Air Quality

Parameters	Action	Limit
24-hour TSP Level in mg m <sup>-3</sup>	For baseline level ≤ 200 mg m <sup>-3</sup> , Action level = (baseline level * 1.3 + Limit level)/2; For baseline level > 200 mg m <sup>-3</sup> Action level = Limit level	260mg/m <sup>3</sup>
1-hour TSP	For baseline level ≤ 384 mg m <sup>-3</sup> , Action level = (baseline level * 1.3 + Limit level)/2	500mg/m <sup>3</sup>

<b>Parameters</b>	<b>Action</b>	<b>Limit</b>
Level in mg m <sup>-3</sup>	1.3 + Limit level)/2; For baseline level > 384 mg m <sup>-3</sup> , Action level = Limit level	

## 5.10 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 / Action Plan for Air Quality

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
ACTION LEVEL				
1. Exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform IEC and ER; 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.
2. Exceedance for two or more consecutive samples	1. Identify source; 2. Inform IEC and ER; 3. Advise the ER on the effectiveness of the proposed remedial measures; 4. Repeat measurements to confirm findings; 5. Increase monitoring frequency to daily; 6. Discuss with IEC and Contractor on remedial actions required; 7. If exceedance continues, arrange meeting with IEC and ER;	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ET on the effectiveness of the proposed remedial measures; 5. Supervise Implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented.	1. Submit proposals for remedial to ER within 3 working days of notification; 2. Implement the agreed proposals; 3. Amend proposal if appropriate.

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
	8. If exceedance stops, cease additional monitoring.			
<b>LIMIT LEVEL</b>				
1. Exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform ER, Contractor and EPD; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily; 5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ER on the effectiveness of the proposed remedial measures; 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented.	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to IEC within 3 working days of notification; Implement the agreed proposals; 4. Amend proposal if appropriate.
2. Exceedance for two or more consecutive samples	1. Notify IEC, ER, 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	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER 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	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

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
	ER to discuss the remedial actions to be taken; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.		work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	works as determined by the ER until the exceedance is abated.

Note:

ET – Environmental Team

IEC – Independent Environmental Checker

ER – Engineer's Representative

## 6 Noise Impact

### 6.1 Introduction

The EIA has considered the potential airborne noise impacts during both the construction and operational phases of the Project. Construction noise from mechanical equipment would be the key impacts during the construction phases during which excavation, construction of approach roads and bridges etc. would need to be conducted. Vehicles running on new roads and bridges and fixed noise from ventilation buildings would also affect the neighbouring sensitive receivers during operational phase.

Prediction of construction groundborne noise indicates the criteria will be achieved and mitigation measures are not required.

### 6.2 Mitigation Measures

#### 6.2.1 Construction Phase

The EIA Report has recommended construction noise mitigation measures including the use of quiet plant and temporary noise barriers, etc.. All the proposed mitigation measures are summarized in the EMIS in **Appendix C**.

#### 6.2.2 Operational Phase

##### Road Traffic Noise

A series of mitigation measures including noise barriers, semi/ full noise enclosure and application of low noise surfacing material would need to be implemented along the roads and flyovers of CKR. These mitigation measures include the following and are shown in **Figure 6.1** to **Figure 6.8**:

**Table 6.1** Noise mitigation measures for operational phase

Noise Mitigation Measures ID	Location	Type of Noise Mitigation Measures [1]	Height above road level (m)	Approximate Length (m)
F01	West portal of CKR	Full enclosure including landscape deck	9	250
F02	Gascoigne Road Flyover (Ferry Street section)	Full enclosure	10	110
F03	Gascoigne Road Flyover (Kansu Street section) (NB+SB)	Full enclosure	7	200
S01	Lin Cheung Road	Semi-enclosure with opening at west	10	120
S02	Re-aligned Hoi Wang Road	Semi-enclosure with opening at west	10	270

Noise Mitigation Measures ID	Location	Type of Noise Mitigation Measures [1]	Height above road level (m)	Approximate Length (m)
S03	Gascoigne Road Flyover (Ferry Street section) (SB)	Absorptive Semi-enclosure with opening at south	7	85
S04	Gascoigne Road Flyover (Kansu Street section) (NB+SB)	Semi-enclosure with opening at south	7	45
S05	Gascoigne Road Flyover (Kansu Street section) (SB)	Semi-enclosure with opening at north	7	60
C01	Connection E	5m high with 3m cantilever at 45° cantilevered barrier	7.1	155
C02	Lin Cheung Road	5m high with 3m cantilever at 45° cantilevered barrier	7.1	85
C03	Lin Cheung Road	5m high with 3m cantilever at 45° cantilevered barrier	7.1	85
C04	Connection D	5m high with 3m cantilever at 45° cantilevered barrier	7.1	190
C05	Connection C2	5m high with 3m cantilever at 45° cantilevered barrier	7.1	120
C06	Connection A	5m high with 3m cantilever at 45° cantilevered barrier	7.1	170
C07	Ferry Street Road (At-grade)	5m high with 1m cantilever at 45° cantilevered barrier	5.7	160
V01	Lin Cheung Road	4m vertical barrier	4	120
V02	Connection D	3.8m vertical barrier	3.8	190
V03	Connection E	5.8m vertical barrier	5.8	100
V04	Widening of Lai Cheung Road	4m vertical barrier	4	50
V05	Gascoigne Road Flyover (Ferry Street section)	3.3m vertical barrier	3.3	110

Noise Mitigation Measures ID	Location	Type of Noise Mitigation Measures [1]	Height above road level (m)	Approximate Length (m)
	(SB)			
V06	Gascoigne Road Flyover (Ferry Street section) (central divider)	3.8m vertical barrier	3.8	100
V07	Gascoigne Road Flyover (Kansu Street section) (SB)	4.3m vertical barrier	4.3	60
V08	Gascoigne Road Flyover (Kansu Street section) (central divider)	2.8m vertical barrier	2.8	60

Notes:

[1] The side(s) of noise mitigation measures facing to the road traffic will be installed with absorptive materials/ panels.

### Fixed Plant Noise

The ventilation buildings shall be installed with sufficient sound attenuators to control its sound power level emitting to the environment.

## 6.2.3 Groundborne Noise

Since all the predicted groundborne noise impacts for construction phase groundborne noise comply with the legislative requirements, no mitigation measures are required and hence no groundborne noise monitoring is recommended.

## 6.3 Noise Monitoring Parameter and Monitoring Equipment

### 6.3.1 Noise Monitoring Parameter for Construction Phase

Construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level ( $L_{eq}$ ).  $L_{eq(30min)}$  shall be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays. For all other time periods,  $L_{eq(5min)}$  shall be employed for comparison with the Noise Control Ordinance (NCO) criteria.

As supplementary information for data auditing, statistical results such as  $L_{10}$  and  $L_{90}$  shall also be obtained for reference.

### 6.3.2 Noise Monitoring Parameter for Operational Phase

The traffic noise level shall be measured twice within the first year of the road opening. Measurement shall be made in terms of A-weighted  $L_{10}$  over three half-hour periods during the peak traffic hour. Other metrics like  $L_{eq}$  may be added as seen fit. A sample data record sheet is shown in **Appendix D** for reference.

Fixed plant noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level ( $L_{eq}$ ).  $L_{eq(30min)}$  shall be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays.

For all other time periods,  $L_{eq(5min)}$  shall be employed for comparison with the Noise Control Ordinance (NCO) criteria.

As supplementary information for data auditing, statistical results such as  $L_{10}$  and  $L_{90}$  shall also be obtained for reference.

### 6.3.3 Monitoring Equipment for Construction and Operational Phases

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.

Noise measurements should be made in accordance with standard acoustical principles and practices in relation to weather conditions.

The ET is responsible for the provision, installation, operation, maintenance, dismantle 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.

## 6.4 Construction Noise Impact

### 6.4.1 Monitoring Locations

The locations of construction airborne noise monitoring stations are summarised in table below and shown in **Figure 6.9** to **Figure 6.12**.

**Table 6.2** Proposed airborne construction noise monitoring locations

ID	Description	Figure
W-N1A	Yau Ma Tei Catholic Primary School (Hoi Wang Road)	Figure 6.9
W-N8A	Tak Cheong Building	Figure 6.10
W-N25A	Prosperous Garden Block 1	Figure 6.10
W-P11	The Coronation Tower 1	Figure 6.10
M-N6	Ko Fai House, Kwun Fat Court	Figure 6.11
E-N12	Grand Waterfront Tower 3	Figure 6.12
E-N21	Hang Chien Court Block J	Figure 6.12

The ET shall select the monitoring locations 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 locations 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.

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.

The ET 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.

#### 6.4.2 Baseline Monitoring

The ET shall carry out baseline noise 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 0700 and 1900, and 5 minutes between 1900 and 0700. A schedule on the baseline monitoring shall be submitted to the ER and IEC for approval before the monitoring starts.

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 ER for approval.

#### 6.4.3 Impact Monitoring

During normal construction working hour (0700-1900 Monday to Saturday), monitoring of  $L_{eq, (30min)}$  noise levels (as six consecutive  $L_{eq, (5min)}$  readings) shall be carried out at the agreed monitoring locations once every week in accordance with the methodology in the TM.

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.

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.

A schedule on the compliance monitoring shall be submitted to the ER and IEC for approval before the monitoring starts.

#### 6.4.4 Event and Action Plan

**Table 6.3** Action and Limit Levels for Construction Noise

Time Period	Action Level	Limit Level
0700 - 1900 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.

\* Reduce to 70 dB(A) for schools and 65 dB(A) during school examination periods.

**Table 6.4** Event / Action Plan for Construction Noise

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
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, ER 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 ER 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>
Limit Level	<ol style="list-style-type: none"> <li>1. Identify source;</li> <li>2. Inform IEC, ER, 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, ER and EPD the</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>2. Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the ER 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</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 ER until the exceedance is</li> </ol>

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
	<p>causes and actions taken for the exceedances;</p> <p>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results;</p> <p>8. If exceedance stops, cease additional monitoring.</p>		<p>instruct the Contractor to stop that portion of work until the exceedance is abated.</p>	<p>abated.</p>

Note:

ET – Environmental Team

IEC – Independent Environmental Checker

ER – Engineer's Representative

## 6.5 Operational Noise Impact

### 6.5.1 Monitoring Locations

The locations of road traffic noise and fixed noise monitoring stations are summarised in table below and shown in **Figure 6.9 to Figure 6.12**.

**Table 6.5** Proposed operational noise monitoring locations

ID	Description	Road Traffic Noise	Fixed Noise	Figure
W-N8A	Tak Cheong Building	√	X	Figure 6.10
W-N25A	Prosperous Garden Block 1	√	X	Figure 6.10
W-P11	The Coronation Tower 1	√	√	Figure 6.10
M-N6	Ko Fai House, Kwun Fai Court	X	√	Figure 6.11

### 6.5.2 Impact Monitoring for Road Traffic Noise during Operational Phase

The ET should prepare and deposit to EPD, at least 6 months before the operation of the proposed roads under the Project, a monitoring plan for the purpose of assessing the accuracy of traffic noise predictions by comparing the noise impact predictions with the actual impacts. The monitoring plan should contain monitoring locations, monitoring schedules, methodology of noise monitoring including noise measurement procedures, traffic counts and speed checks, and methodology of comparison with the predicted levels. The ET should implement the monitoring plan in accordance with the deposited monitoring plan unless with prior justifications. Monitoring details and results including the comparison between the measured noise levels and the predicted levels should be recorded in a report to be deposited with EPD within one month of the completion of the monitoring. The report should be certified by the ET Leader before deposit with EPD.

Traffic noise monitoring shall be carried out at all the designated traffic noise monitoring stations. The following is an initial guide on the traffic noise monitoring requirements during the operational phase:

- one set of measurements at the morning traffic peak hour on normal weekdays;
- one set of measurements at the evening traffic peak hour on normal weekdays;
- a concurrent census of traffic flow and percentage heavy vehicles shall be conducted for the Project Road and the existing road network in the vicinity of each measurement points;
- average vehicle speed estimated for Project Road and the existing road network in the vicinity of each measuring points; and
- the two sets of monitoring data shall be obtained within the first year of operation.

Measured noise levels shall be compared with the predicted noise levels by applying appropriate conversion corrections to allow for the traffic conditions at the time of measurement. A sample data record sheet for traffic noise monitoring is shown in **Appendix D**.

### 6.5.3 Event and Action Plan

For the traffic noise, the measured/monitored noise levels shall be compared with the predicted results and the predicted traffic flow conditions (calculated noise levels based on concurrent traffic census obtained). In case discrepancies are observed, explanation shall be given to justify the discrepancies.

### 6.5.4 Impact Monitoring for Fixed Plant Noise during Operational Phase

The EIA report has provided the maximum allowable sound power levels for fixed noise sources. The SWL criteria shall be implemented by the Contractor. The Contractor should also carry out a noise commissioning test for all fixed noise sources before operation of the Project, in order to ensure compliance of the operational airborne noise levels with the TM's stipulated noise standard.

Apart from commissioning test for the fixed noise sources, monitoring of fixed noise sources at sensitive receivers is also suggested. The fixed noise will be operated with full power for 30 minutes during daytime and night-time and the monitoring of  $L_{Aeq,30min}$  noise levels during daytime and night-time will be carried out in accordance with the methodology stated in the TM at the proposed monitoring stations. Any non-related operation activities in the vicinity of the monitoring stations during the monitoring shall be noted and the source and location shall be recorded. The  $L_{max}$ ,  $L_{10}$  and  $L_{90}$  shall also be recorded at the specified interval.

The ET should prepare and deposit to EPD, at least 6 months before the operation of the proposed roads under the Project, a monitoring plan for the purpose of fixed noise. The monitoring plan should contain monitoring locations, monitoring schedules, methodology of noise monitoring including noise measurement procedures and data analysis of measured noise level. The ET should implement the monitoring plan in accordance with the deposited monitoring plan unless with prior justifications. The monitoring plan should be certified by the ET Leader before deposit with EPD.

## 7 Water Quality Impact

### 7.1 Introduction

The EIA Report has assessed the water quality impacts associated with the Project. According to the EIA Report, the water quality impact could be minimized with the implementation of mitigation measures. The water quality monitoring programme as discussed below could ensure the implementation of the recommended mitigation measures and provide continue improvements to the environmental conditions.

### 7.2 Mitigation Measures

The EIA Report has recommended construction phase mitigation measures. All the prepared mitigation measures are summarized in the EMIS in **Appendix C**.

### 7.3 Performance Review for Stone Column Installation

Before the commencement of stone column installation, performance review is required. The review shall be conducted following the Performance Review Proposal as shown in **Appendix E**. The prepared Performance Review Proposal shall be reviewed and updated by ET, taking account of the Contractor's proposed actual locations of his initial period of installation. The ET may counter propose alternative review methodology subject to approval of IEC and EPD.

### 7.4 Monitoring Locations

Water quality monitoring at inshore waters during CKR construction is not required, marine water quality monitoring, however, shall be carried out while dredging activities are being conducted.

The water quality monitoring stations and control stations of CKR are shown in **Figure 7.1**. The co-ordinates of the proposed monitoring stations (construction phase – dredging activities) are listed in below. As shown in **Figure 7.1**, the proposed locations are classified as Impact Station and Control Station according to their functions. The ET shall seek approval from IEC and EPD for any alternative monitoring locations.

**Table 7.1** Water Quality Monitoring Stations for Baseline and Construction Phase Monitoring

Station	Description	Easting	Northing
IS1	Planned Kai Tak Cooling Water Intake (subject to its implementation)	839050	819377
IS2	To Kwa Wan Typhoon Shelter	838450	819399
IS3	Tai Wan Salt Water Intake	837948	818202
CS1	Control Station 1	837787	817712
CS2	Control Station 2	838237	818804
CS3	Control Station 3	839105	819019

## 7.5 Monitoring Parameters

The monitoring shall normally be established by measuring the Dissolved Oxygen (DO), temperature, turbidity, pH, salinity, Suspended Solids (SS) and copper level at all designated locations as specified in **Section 7.3** above.

The measurements shall be taken at all designated monitoring stations including control stations, 3 days per week, at mid-flood and mid-ebb tides. Tidal range of individual flood and ebb tides should be not less than 0.5m.

All the monitoring shall be taken at 3 water depths, namely 1m below water surface, mid-depth and 1m above sea bed, except where the water depth less than 6m, the mid-depth station may be omitted. Should the water depth be less than 3m, only the mid-depth station will be monitored.

Replicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database. DO, pH value, salinity, temperature and turbidity should be measured in-situ whereas SS and copper should be determined by an accredited laboratory.

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

## 7.6 Baseline Monitoring

Baseline conditions for marine water quality shall be established and agreed with EPD prior to commencement of dredging works. The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of the dredging works and to demonstrate the suitability of the proposed impact and control monitoring stations.

The baseline monitoring shall be conducted for at least 4 weeks prior to the commencement of dredging works. The proposed water quality monitoring schedule shall be submitted to EPD by the ET at least 2 weeks before the first day of the monitoring month. The interval between two sets of monitoring shall not be less than 36 hours. EPD shall also be notified immediately for any changes in schedule.

In general, where the difference in value between the first and second in-situ measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading shall be discarded and further readings should be taken.

There should be no marine work in the vicinity of the stations during the baseline monitoring. The monitoring programme may overlap with other non-project marine activities. The monitoring exercise should be scheduled as far as possible to avoid concurrent dredging / backfilling activities around the monitoring stations such that representative ambient data could be sampled.

As it is likely to have concurrent activities such as dredging works of T2, the ET shall seek approval from the IEC and EPD on an appropriate set of data, such as EPD's routine monitoring data, baseline monitoring data for cruise terminal, etc., to be used with the baseline data collected by this study to establish the Action / Limit Levels. The determination of Action / Limit Levels will be discussed in **Section 7.9**.

**Table 7.2** below summarizes the proposed monitoring frequency and water quality parameters for baseline monitoring.

**Table 7.2** Proposed water quality monitoring programme

	<b>Baseline Monitoring</b>
Monitoring Period	At least 4 weeks prior to the commencement of dredging work
Monitoring Frequency	3 Days in a Week, at mid-flood and mid-ebb tides
Monitoring Locations	IS1, IS2, IS3, CS1, CS2 and CS3
Monitoring Parameters	DO, temperature, turbidity, pH, salinity, SS, copper, total PAH
Intervals between 2 Sets of Monitoring	Not less than 36 hours
Tide Range	Individual flood and ebb tides not less than 0.5m

## 7.7 Impact Monitoring

The impact monitoring shall be conducted during dredging period. The purpose of impact monitoring is to ensure the implementation of the recommended mitigation measures, provide effective control of any malpractices, and provide continuous improvements to the environmental conditions. The proposed water quality monitoring schedule shall be submitted to EPD by the ET at least 2 weeks before the first day of the monitoring month. The interval between two sets of monitoring shall not be less than 36 hours. EPD shall also be notified immediately for any changes in schedule.

In general, where the difference in value between the first and second in-situ measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading shall be discarded and further readings should be taken.

In case of project-related exceedances of Action and/or Limit Levels, the impact monitoring frequency shall be increased according to the requirement of Event and Action Plan. The details of Event Action Plan will be discussed in **Section 7.10**.

**Table 7.3** below summarises the proposed monitoring frequency and water quality parameters for and impact monitoring.

**Table 7.3** Proposed water quality monitoring programme

	<b>Impact Monitoring</b>
Monitoring Period	During dredging period

	<b>Impact Monitoring</b>
Monitoring Frequency	3 Days in a Week, at mid-flood and mid-ebb tides
Monitoring Locations	IS1, IS2, IS3, CS1, CS2, and CS3
Monitoring Parameters	DO, temperature, turbidity, pH, salinity, SS, copper, total PAH
Intervals between 2 Sets of Monitoring	Not less than 36 hours
Tide Range	Individual flood and ebb tides not less than 0.5m

## 7.8 Monitoring Equipments

### 7.8.1 Dissolved Oxygen and Temperature Measuring Equipment

The dissolved oxygen (DO) measuring instruments should be portable and weatherproof. The equipment should also complete with cable and sensor, and DC power source. It 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

The equipment should have a membrane electrode with automatic temperature compensation complete with a cable.

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

### 7.8.2 Turbidity Measuring Equipments

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

### 7.8.3 Salinity Measuring Equipments

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.

#### 7.8.4 pH Measuring Equipments

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

#### 7.8.5 Positioning Equipments

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.

#### 7.8.6 Water Depth Detector

A portable, battery-operated echo sounder should be used for water depths determination at each designated monitoring station. The detector 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.

#### 7.8.7 Water Sampling Equipment

A water sampler is required for SS, Ammonia (as N), Nitrite (as N) and Nitrate (as N) monitoring. 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).

#### 7.8.8 Sample Containers and Storage

Water samples for SS, Ammonia (as N), Nitrite (as N) and Nitrate (as N) determinations should be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4°C without being frozen) 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. Water samples for Ammonia (as N), Nitrite (as N) and Nitrate (as N) shall be preserved with sulphuric acid (H<sub>2</sub>SO<sub>4</sub>)

#### 7.8.9 Calibration of In-Situ Instruments

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 quarterly basis 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 station.

### 7.8.10 Back-up Equipment and Vessels

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, malfunction, etc.

The water quality monitoring will involve three monitoring stations and measurements should be conducted within the prescribed tidal conditions 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. Depending on the actual operation, more than one field survey vessels might be required simultaneously to ensure the monitoring are conducted within the acceptable monitoring period. 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 ER, IEC and EPD.

## 7.9 Laboratory Measurement / Analysis

At least 3 replicate samples from each independent sampling event are required for the SS, copper measurement which shall be carried in a HOKLAS or 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, Ammonia (as N), Unionized Ammonia, Nitrite (as N) and Nitrate (as N) is presented in **Table 7.4**.

**Table 7.4** Laboratory Analysis for Various Water Quality Parameters

Parameters	Analytical Method	Reporting Limit
Suspended Solid (SS)	APHA 2540-D	0.1 mg/L
Copper (Cu)	ICP-MS USEPA 6020A	1 µg/L
Total PAH[1]	GC-MSD USEPA 3510C, USEPA 3630C, USEPA 8270C	0.1 µg/L (individually)

Note [1] Low Molecular Weight PAHs shall include acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene and phenanthrene. High Molecular Weight PAHs shall include benzo[a]anthracene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-c,d]pyrene and benzo[g,h,i]perylene.

## 7.10 Action and Limit Levels

The Action and Limit Levels for water quality are defined in **Table 7.5** below.

**Table 7.5** Action and Limit levels for Water Quality

Parameters	Action Level	Limit Level
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> 4mg/L or 1 percentile of baseline data for surface and middle layer  <u>Bottom</u> 2mg/L or 1 percentile of baseline data for bottom layer
SS in mg/L (Surface, Middle & Bottom)	95 percentile of baseline data or 120% of upstream control station's SS at the same tide of the same day	99 percentile of baseline data or 130% of upstream control station's SS at the same tide of the same day or 10mg/L for WSD Seawater intakes
Turbidity in NTU (Surface, Middle & Bottom)	95 percentile of baseline data or 120% of upstream control station's Turbidity at the same tide of the same day	99 percentile of baseline data or 130% of upstream control station's Turbidity at the same tide of the same day or 10 NTU. WSD Seawater intakes
Copper in µg/L (depth averaged)	95 percentile of baseline data or 120% of upstream control station's nutrient level at the same tide of the same day	99 percentile of baseline or 130% of upstream control station's nutrient level at the same tide of the same day or 5 µg/L
Total PAH in µg/L (depth averaged)	95 percentile of baseline data or 120% of upstream control station's nutrient level at the same tide of the same day	99 percentile of baseline or 130% of upstream control station's nutrient level at the same tide of the same day or 3 µg/L

Notes: 1. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.  
2. For turbidity, SS, Copper and Total PAH, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

3. 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.
4. For baseline monitoring, seasonal and spatial variation should be taken into account when setting up the baseline data.

## 7.11 Event and Action Plan

Should non-compliance of the criteria occur, action in accordance with the Action Plan in the **Table 7.6** below shall be carried out.

**Table 7.6** Event / Action Plan for Water Quality

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Inform IEC, contractor and ER;</li> <li>2. Check monitoring data, all plant, equipment and Contractor's working methods; and</li> <li>3. Discuss remedial measures with IEC and Contractor and ER.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET, ER and Contractor on the implemented mitigation measures;</li> <li>2. Review proposals on remedial measures submitted by Contractor and advise the ER accordingly; and</li> <li>3. Review and advise the ET and ER on the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with IEC, ET and Contractor on the implemented mitigation measures;</li> <li>2. Make agreement on the remedial measures to be implemented;</li> <li>3. Supervise the implementation of agreed remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source(s) of impact;</li> <li>2. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>3. Rectify unacceptable practice;</li> <li>4. Check all plant and equipment;</li> <li>5. Consider changes of working methods;</li> <li>6. Discuss with ER, ET and IEC and purpose remedial measures to IEC and ER; and</li> <li>7. Implement the agreed mitigation measures.</li> </ol>
Action level being exceeded by more than one consecutive sampling days	<ol style="list-style-type: none"> <li>1. Repeat in-situ measurement on next day of exceedance to confirm findings;</li> <li>2. Inform IEC, contractor and ER;</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET, Contractor and ER on the implemented mitigation measures;</li> <li>2. Review the proposed</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET, IEC and Contractor on the proposed mitigation measures;</li> <li>2. Make agreement on the remedial measures to be</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source(s) of impact;</li> <li>2. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>3. Rectify unacceptable practice;</li> </ol>

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
	3. Check monitoring data, all plant, equipment and Contractor's working methods; 4. Discuss remedial measures with IEC, contractor and ER 5. Ensure remedial measures are implemented	remedial measures submitted by Contractor and advise the ER accordingly; and 3. Review and advise the ET and ER on the effectiveness of the implemented mitigation measures.	implemented ; and 3. Discuss with ET, IEC and Contractor on the effectiveness of the implemented remedial measures.	4. Check all plant and equipment and consider changes of working methods; 5. Discuss with ET, IEC and ER and submit proposal of remedial measures to ER and IEC within 3 working days of notification; and 6. 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. Inform IEC, contractor and ER; 3. Rectify unacceptable practice; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Consider changes of working methods; 6. Discuss mitigation measures with IEC, ER and Contractor; and 7. Ensure the agreed remedial	1. Discuss with ET, Contractor and ER on the implemented mitigation measures; 2. Review the proposed remedial measures submitted by Contractor and advise the ER accordingly; and 3. Review and advise the ET and ER on the effectiveness of the implemented mitigation measures.	1. Discuss with ET, IEC and Contractor on the implemented remedial measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the remedial measures to be implemented; and 4. Discuss with ET, IEC and Contractor on the effectiveness of the implemented remedial measures.	1. Identify source(s) of impact; 2. Inform the ER and confirm notification of the non-compliance in writing; 3. Rectify unacceptable practice; 4. Check all plant and equipment and consider changes of working methods; 5. Discuss with ET, IEC and ER and submit proposal of additional mitigation measures to ER and IEC within 3 working days of notification; and 6. Implement the agreed remedial measures.

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
	measures are implemented			
Limit level being exceeded by more than one consecutive sampling days	<ol style="list-style-type: none"> <li>1. Inform IEC, contractor and ER;</li> <li>2. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>3. Discuss mitigation measures with IEC, ER and Contractor; and</li> <li>4. Ensure mitigation measures are implemented; and</li> <li>5. Increase the monitoring frequency to daily until no exceedance of Limit Level for two consecutive days</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET, Contractor and ER on the implemented mitigation measures;</li> <li>2. Review the proposed remedial measures submitted by Contractor and advise the ER accordingly; and</li> <li>3. Review and advise the ET and ER on the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET, IEC and Contractor on the implemented remedial measures;</li> <li>2. Request Contractor to critically review the working methods;</li> <li>3. Make agreement on the remedial measures to be implemented;</li> <li>4. Discuss with ET and IEC on the effectiveness of the implemented mitigation measures; and</li> <li>5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the dredging activities until no exceedance of Limit level.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source(s) of impact;</li> <li>2. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>3. Rectify unacceptable practice;</li> <li>4. Check all plant and equipment and consider changes of working methods;</li> <li>5. Discuss with ET, IEC and ER and submit proposal of additional mitigation measures to ER and IEC within 3 working days of notification; and</li> <li>6. Implement the agreed remedial measures.</li> <li>7. As directed by the ER, to slow down or stop all or part of the dredging activities until no exceedance of Limit level.</li> </ol>

Note:

ET – Environmental Team

IEC – Independent Environmental Checker

ER – Engineer's Representative

## 8 Waste Management Implications

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### 8.1 Introduction

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 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. All the proposed mitigation measures are stipulated in the EIA Report and summarised in the EMIS in **Appendix C**.

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 operational 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. Recommendations have been made to ensure proper treatment and proper disposal of these wastes in the EIA Report and summarised in the EMIS in **Appendix C**. The mitigation measures should form the basis of the Environmental Management Plan (EMP).

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

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.

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.

Regular audits and site inspections should be carried out during construction phase by the ET to ensure that the recommended good site practices and other recommended mitigation measures are properly implemented by the Contractor. The audits should concern all aspects of on-site waste management practices including waste generation, storage, recycling, transport and disposal. Apart from site inspection, documents including licences, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation and contract requirements.

The requirements of the environmental audit programme are set out in **Section 14** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

## 9 Land Contamination Impact

### 9.1 Introduction

Based on the site investigation (SI) works conducted in accordance with the endorsed Contamination Assessment Plan and the endorsed Supplementary Contaminated Assessment Plan, it was estimated that approximate 157m<sup>3</sup> of contaminated soil would be generated from the cut-and-cover section on the Western Portion.

Considering the small quantity of contaminated soil to be generated and that the level of contamination detected only exceeded the RBRGs for “Rural Residential” and “Urban Residential”, but not the RBRGs for “Public Park” which is a more representative land use for CKR, on-site reuse of the contaminated soil within the boundary of CKR, such as using to backfill in non-pedestrian use area under new flyover, was recommended as the remediation option. The estimated contamination zone is shown in **Figure 9.1**.

### 9.2 Excavation of the Contaminated Soil

Prior to commencement of the excavation works at the contamination zone, the zone should be clearly marked out on site and the surface levels recorded. Excavation of contaminated material should be undertaken using dedicated earth-moving plant that should be thoroughly cleaned (e.g. jet-washed) following completion of the excavation works. The excavated contaminated soils would be stockpiled at designed area on site and covered by sheet to prevent dispersion of contamination during stockpiling.

The Contractor should pay attention to the selection of suitable groundwater lowering schemes and discharge points if the groundwater table is higher than the contaminated soils during excavation. The Contractor should also obtain a valid Water Pollution Control Ordinance (WPCO) discharge licence from EPD where applicable.

### 9.3 Closure Assessment

Following completion of the excavation to the specified depth, at least one sample from the base of the excavation and four samples evenly distributed along the boundary of the excavation shall be taken for a closure assessment testing. The purpose of the closure assessment is to determine if all contaminated soil has been excavated. The acceptance criterion for the closure assessment is shown in **Table 9.1**.

**Table 9.1** Acceptance criterion for the closure assessment

Locations	Testing Parameter	Acceptance Criterion
PBH4	PCBs	RBRGs (Public Park)

If the analysis indicates presence of contamination (i.e. non-compliance of the acceptance criteria), further excavation shall be carried out in 0.5m increment vertically and/or horizontally depending on the location(s) of the sample(s) which has exceeded the acceptance criteria. Further sampling shall also be conducted for

compliance testing. The process of excavation, sampling and compliance testing should continue until all contaminated materials are removed and should be supervised by a Land Contamination Specialist.

## 9.4 Protective and Safety Measures

In order to minimise the potential adverse effects on health and safety of the workers during the course of site remediation works, and to ensure there are no significant residual health and safety risk imposed on the workers, the following good practices are recommended:

- Personal Protective Equipment (PPE) such as safety hat, chemical protective gloves, masks, eye goggles, protective clothing (upgraded if contact with contaminated material cannot be avoided) and protective footwear etc. must be provided to staff, which would be involved in the remediation work. No works should be allowed without the suitable PPE.
- Workers should inspect and check their PPE before, during and after use. In cases where any of the PPE is broken, the worker shall stop work immediately and inform the on-site registered safety officer. The worker is not allowed to re-start his work until the broken PPE is replaced.
- Hand washing basins or other washing facilities shall be provided in areas easily accessible to all workers.
- Workers should always maintain basic hygiene standard (e.g. hand wash before leaving the contaminated work zone). Workers shall also be responsible for cleaning and storing their own PPE in a secure place before leaving the site.
- Eating, drinking and smoking must be strictly prohibited within the site areas.

It should be noted that these precautions are additional to any other health and safety requirements that will be applied on the site such as those requiring protective footwear and headgear.

## 9.5 Remediation Report

A Remediation Report (RR) to demonstrate adequate clean-up shall be prepared by the Contractor and submitted to EPD for endorsement prior to the commencement of any construction/ development works within the site. No construction/ development works shall be carried out prior to the endorsement of the RR.

## 10 Hazard to Life

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### 10.1 Introduction

Blasting activities regarding transport and use of explosives should be supervised and audited by the competent site staff to ensure that the assumptions and recommendations from the quantitative risk assessment (QRA) are implemented in accordance with the intent of the Hazard to Life assessment.

### 10.2 Mitigation Measures

The recommended mitigation measures as outlined in the EMIS included in **Appendix C** of this EM&A Manual should be implemented to meet the TM-EIAO requirements.

# 11 Landscape and Visual Impact

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## 11.1 Introduction

The EIA has recommended EM&A for landscape and visual resources is undertaken during the design, construction and operational stages of the project. The design, implementation and maintenance of landscape mitigation measures is a key aspect of this and should be checked to ensure that they are fully realised and that potential conflicts between the proposed landscape measures and any other project works and operational requirements are resolved at the earliest possible date and without compromise to the intention of the mitigation measures. In addition, implementation of the mitigation measures recommended by the EIA will be monitored through the site audit programme.

## 11.2 Mitigation Measures

The Landscape and Visual Assessment of the EIA proposes a number of mitigation measures to ameliorate the landscape and visual impacts of the Project. These measures include , but are not limited to the following and implementation is summarised in the EMIS in **Appendix C**.

- Reduction of construction stage to the shortest possible time;
- Incorporation of landscape and visual considerations into the detailed design;
- General good site management;
- Screen hoarding;
- Erosion control;
- Measures concerning trees, including tree protection and preservation, tree transplantation and compensatory planting;
- Screen planting;
- Reinstatement and re-provisioning of public open space;
- General landscape enhancement; and specific landscape enhancement through such means as vertical greening, landscape deck, planters on viaducts, roadside planting and green roofs;
- Lighting control during both construction and operation.

The landscape and visual mitigation measures proposed should be incorporated in the landscape and engineering design. Mitigation measures to be implemented during construction should be adopted from the start of construction and be in place throughout the entire construction period. Mitigation measures to be implemented during operation should be integrated into the detailed design and built as part of the construction works so that they are in place on commissioning

of the Project. Tree transplantation and compensatory planting should be carried out as early as possible in the Project with transplantation carried out prior to construction starting in any particular area.

### 11.3 Audit Requirement

The measures proposed within the EIA to mitigate the landscape and visual impacts of the Project should be embodied into the detailed landscape design drawings and contract documents including the protection of existing trees where possible, the transplanting of existing trees, the planting of new trees and shrubs, re-provisioning of public open space.

The design stage EM&A requirements for landscape and visual resources comprise the audit of the detailed landscaping and visual specifications to be prepared during the detailed design together with ensuring that the design is sensitive to landscape and visual impacts. The landscape and visual auditor shall review the designs as and when they are prepared and liaise with the landscape architect and design engineer to ensure all measures have been incorporated in the design in a format that can be specified to the Contractor for implementation. In the event of non-compliance, the responsibilities of the relevant parties are detailed in the Event/Action plan provided in **Table 11.1**.

**Table 11.1 Event / Action Plan for Design Stage**

Action Level	Landscape and Visual Auditor	Project Engineer (PE)	Project Landscape Architect (PLA)
Non Conformity (with Design Standards and Specification)	<ol style="list-style-type: none"> <li>1. Identify Source</li> <li>2. Inform PE and PLA</li> <li>3. Discuss remedial actions and preventive measures with PE, PLA</li> <li>4. Verify remedial actions when complete</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify PLA</li> <li>2. Discuss remedial actions and preventive measures with PLA</li> <li>3. Ensure remedial designs and preventive measures are fully incorporated</li> </ol>	<ol style="list-style-type: none"> <li>1. Amend designs</li> <li>2. Discuss remedial actions and preventive measures with PE</li> </ol>

Note: PE – Project Engineer; PLA – Project Landscape Architect

Site audits should be undertaken during the construction stage of the Project to check that the proposed landscape and visual mitigation measures are properly implemented and maintained as per their intended objectives. Site inspections should be undertaken by the ET at least once every two weeks during the construction period.

Soft landscaping works have an establishment period of 24 months. This period will start once plants have been planted, and this may be prior to, during or post-construction and/or during operation stages. Should the establishment period start or continue outside the construction stage (when regular inspections are taken every two weeks), regular inspections (e.g. quarterly) should be undertaken until the end of the establishment period.

In the event of non-compliance, the responsibilities of the relevant parties are detailed in the Event/Action plan provided in **Table 11.2**.

**Table 11.2** Event / Action Plan for Landscape and Visual during construction phase

Action Level	ET	IEC	ER	Contractor
Non-conformity on one occasion	<ol style="list-style-type: none"> <li>1. Identify source(s)</li> <li>2. Inform the Contractor, IEC and ER</li> <li>3. Discuss remedial actions and preventive measures with IEC, ER and Contractor</li> <li>4. Monitor remedial action(s) and preventive measures until rectification has been completed</li> </ol>	<ol style="list-style-type: none"> <li>1. Check inspection report</li> <li>2. Check Contractor's working method</li> <li>3. Discuss with ET, ER and Contractor on possible remedial measure(s) and preventive measure(s)</li> <li>4. Advise ER on effectiveness of proposed remedial measure(s) and preventive measure(s)</li> <li>5. Check implementation of proposed remedial measure(s) and preventive measure(s)</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of non-conformity in writing</li> <li>2. Notify the Contractor</li> <li>3. Review and agree on the remedial measure(s) and preventive measures proposed by the Contractor</li> <li>4. Check implementation of remedial measure(s) and preventive measures</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source and investigate the non-conformity</li> <li>2. Implement remedial measure(s) and preventive measure(s)</li> <li>3. Amend working methods agreed with ER as appropriate</li> <li>4. Rectify damage and undertake any necessary replacement</li> </ol>
Repeated Non-conformity	<ol style="list-style-type: none"> <li>1. Identify source(s)</li> <li>2. Inform Contractor, IEC and ER</li> <li>3. Discuss inspection frequency</li> <li>4. Discuss remedial action(s) and preventive measures with IEC, ER and Contractor</li> <li>5. Monitor remedial action(s) and preventive measure(s) until rectification has been completed</li> <li>6. If non-conformity stops, cease any</li> </ol>	<ol style="list-style-type: none"> <li>1. Check inspection report</li> <li>2. Check Contractor's working method</li> <li>3. Discuss with ET, ER and Contractor on possible remedial measure(s) and preventive measure(s)</li> <li>4. Advise ER on effectiveness of proposed remedial measure(s) and preventive measures</li> <li>5. Supervise implementation of proposed remedial measure(s) and preventive measure(s)</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the Contractor</li> <li>2. In consultation with the ET and IEC, agree with the Contractor on the remedial measure(s) and preventive measure(s) to be implemented</li> <li>3. Supervise implementation of remedial measure(s) and preventive measure(s)</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source and investigate the non-conformity</li> <li>2. Implement remedial measure(s) and preventive measure(s)</li> <li>3. Amend working methods agreed with ER as appropriate</li> <li>4. Rectify damage and undertake any necessary replacement. Stop relevant portion of works as determined by ER until the non-conformity is abated.</li> </ol>

Action Level	ET	IEC	ER	Contractor
	additional monitoring			

Note:

ET – Environmental Team

IEC – Independent Environmental Checker

ER – Engineer’s Representative

## 12 Impact on Cultural Heritage (Terrestrial and Marine Archaeology)

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### 12.1 Introduction

The assessment has considered both the construction and operational phases of the project.

### 12.2 Mitigation Measures

#### **Terrestrial Archaeology**

Any development encroaching on sites of archaeological interest should be avoided as far as possible. The contractor should be alerted during the construction on the possibility of locating archaeological remains as a precautionary measure. AMO shall be informed immediately in case of discovery of antiquities or supposed antiquities in the subject areas.

According to the EIA, no mitigation will be required during the construction and operational phase. Therefore, no monitoring and audit programme will be required.

#### **Marine Archaeology**

According to the EIA, there are buried unidentified objects beneath the disused fuel dolphin located by geophysical survey. The dredging contractor should be alerted during the construction on the possibility of locating archaeological remains such as cannon and AMO shall be informed immediately in case of discovery of antiquities or supposed antiquities in the subject areas.

As no additional mitigation is required, monitoring and audit programme will be not required.

## 13 Impact on Cultural Heritage (Built Heritage)

### 13.1 Introduction

A cultural and heritage impact assessment on built heritage for the Project has been conducted according to the EIA Study Brief. The assessment has considered both the construction and operational phases of the project.

The assessment has recommended some mitigation measures for both the archaeological sites and some of the historical buildings where impacts would be envisaged.

### 13.2 Mitigation Measures

#### 13.2.1 Construction Phase

All the proposed mitigation measures are presented below and summarised in the EMIS in **Appendix C**.

#### **Yau Ma Tei Police Station**

**Table 13.1** Mitigation Recommendations for Yau Ma Tei Police Station (Construction Phase) of CKR

Wing	Mitigation Recommendation
New Wing (CKR-01) <b>(Figure 13.1)</b>	<ul style="list-style-type: none"> <li>• Protective covering should be provided for the buildings in the form of plastic sheeting;</li> <li>• Buffer zones should be provided between the construction works and the external walls of the buildings and should be as large as site restrictions allow and be marked out by temporary fencing or hoarding;</li> <li>• An underpinning scheme is required to transfer the existing column loadings to a deeper rock stratum. The supporting system includes cutting the existing ground floor slab to expose the existing pile caps and then construct transfer beams at both sides of the pile caps. The transfer beams will tie up with the existing caps. Loadings of the transfer beams will be transferred to the rock socket piles installed at the two ends of the beams;</li> <li>• the AAA settlement and tilting limit should be 6/8/10 mm and 1/2000, 1/1500 and 1/1000;</li> <li>• Monitoring of vibration levels will be undertaken during the construction phase and the Alert, Alarm and Action (AAA) vibration limit will be set at 5/6/7.5 mm/s;</li> <li>• A monitoring proposal will be submitted to AMO before commencement of work;</li> <li>• Regular site inspections and monitoring works will be carried out by the contractor and the monitoring results will be submitted to the resident site staff of HyD to ensure</li> </ul>

Wing	Mitigation Recommendation
	compliance.
Old Wing (CKR-01) (Figure 13.1)	<ul style="list-style-type: none"> <li>• Adopting diaphragm wall construction method;</li> <li>• Grout curtain should be provided in front of the building;</li> <li>• Recharging system should be installed as a contingency measure to mitigate the fluctuation of water table;</li> <li>• the AAA settlement and tilting limit should be 6/8/10 mm and 1/2000, 1/1500 and 1/1000;</li> <li>• Monitoring of vibration levels will be undertaken during the construction phase and the Alert, Alarm and Action (AAA) vibration limit will be set at 5/6/7.5 mm/s;</li> <li>• A monitoring proposal will be submitted to AMO before commencement of work;</li> <li>• Regular site inspections and monitoring works will be carried out by the contractor and the monitoring results will be submitted to the resident site staff of HyD to ensure compliance.</li> </ul>

### **Other Built Heritage**

**Table 13.2** Mitigation Recommendations for Other Impacted Heritage Features (Construction Phase) of CKR

Resource	Mitigation Recommendation
Tin Hau Temple (CKR-02) (Figure 13.1)	<p>The Alert, Alarm and Action (AAA) vibration limit will be set at 3/4/5 mm/s and a condition survey shall be carried out by the project proponent prior to the construction phase to confirm this assessment</p> <p>Vibration monitoring of the structure shall be employed during the construction phase to ensure that the level is not exceeded. A monitoring proposal will be submitted to AMO before commencement of work.</p>
Kowloon Methodist Church (CKR-10) (Figure 13.1)	<p>The Alert, Alarm and Action (AAA) vibration limit will be set at 5/6/7.5 mm/s.</p> <p>Vibration monitoring of the structure shall be employed during the construction phase to ensure that the level is not exceeded and as such appropriate vibration monitoring on the building should be complied with as appropriate. A monitoring proposal will be submitted to AMO before commencement of work.</p>
Ma Tau Kok Animal Quarantine Depot (CKR-12) (Figure 13.2)	<p>The Alert, Alarm and Action (AAA) vibration limit will be set at 5/6/7.5 mm/s.</p> <p>Vibration monitoring of the structure shall be employed during the construction phase to ensure that the level is not exceeded, and as such appropriate vibration monitoring on the building should be complied with as appropriate. A monitoring proposal will be submitted to AMO before commencement of work.</p>

Resource	Mitigation Recommendation
Kowloon City Ferry Pier (CKR-13) (Figure 13.2)	A monitoring system for settlement, vibration and tilting will be determined and implemented pending determination of the future grading. A monitoring proposal will be submitted to AMO before commencement of work if a historic building grade is accorded.
Air raid precaution tunnels of the K1 Network (CKR-14) (Figure 13.1)	An evaluation of the structural integrity and condition of the tunnel network is outside the scope of this BHIA study.  A condition survey for the tunnel network should be undertaken by the project proponent to determine the present condition of the air raid tunnels and to recommend protective measures to ensure that the tunnels are not damaged by the construction works. and as such appropriate vibration monitoring on the building should be complied with as appropriate. . A monitoring proposal will be submitted to AMO before commencement of work.
Ma Tau Kok Public Pier (CKR-16) (Figure 13.2)	No mitigation is required at present. If the public pier is granted Grade 1, Grade 2 or Grade 3 status, the mitigation will be revised to adhere to the requirements for protective measures for Graded Historic Buildings.
The Kowloon City Vehicular Ferry Pier (CKR-17) (Figure 13.2)	A monitoring system for settlement, vibration and tilting will be determined and implemented pending determination of the future grading. A monitoring proposal will be submitted to AMO before commencement of work if a historic building grade is accorded.
Kowloon Permanent Pier No. 70 (CKR-18) (Figure 12.4)	The pier contains active gas pipelines and will be strictly monitored for safety precautions during the works based on guidelines from the HK China Gas Company. It is concluded that these guidelines will provide sufficient protection for the pier structure and no additional precautions from a heritage perspective would be required. However, if the pier is granted Grade 1, Grade 2 or Grade 3 status, the mitigation will be revised if necessary, to adhere to the requirements for protective measures for Graded Historic Buildings.

### 13.2.2 Operational Phase

The operation of the CKR will not impose any adverse impacts on any built heritage. No mitigation will be required regarding this issue.

## 13.3 Audit Requirements

The ET shall audit the relevant condition survey and ground-borne vibration to ensure that the peak vibration levels are not exceeded.

**Table 13.3:** Audit Requirements and Frequency

<b>ID</b>	<b>Structure / buildings</b>	<b>Audit Requirements</b>	<b>Audit frequency</b>
CKR-02	Tin Hau Temple	The Alert, Alarm and Action (AAA) vibration limit will be set at 3/4/5 mm/s.	On a weekly basis throughout the construction period for bored tunnel formation and daily within 100m (vector distance) of the historic building
CKR-10	Kowloon Methodist Church	The Alert, Alarm and Action (AAA) vibration limit will be set at 5/6/7.5 mm/s.	On a weekly basis throughout the construction period for bored tunnel formation and daily within 100m (vector distance) of the historic building
CKR-12	Ma Tau Kok Animal Quarantine Depot	The Alert, Alarm and Action (AAA) vibration limit will be set at 5/6/7.5 mm/s.	On a weekly basis throughout the construction period for bored tunnel formation and daily within 100m (vector distance) of the historic building

In addition, the appropriate vibration monitoring on the attached built heritage resources will be agreed with BD/GEO under the requirement of Buildings Ordinance and/or Blasting Permit as appropriate. The project proponent should ensure that vibration levels are controlled to appropriate level. Vibration monitoring should be carried out by the contractor.

## 14 Site Environmental Audit

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### 14.1 Site Inspection

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.

The ET shall be responsible for formulating the environmental site inspection programme as well as the deficiency and action reporting system, and for carrying out the site inspections. The proposal for rectification, if any, should be prepared and submitted to the ET Leader and IEC by the Contractor.

Regular site inspections shall be carried out and led by the ER and attended by the Contractor and ET at least once per week during the construction phase. 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 construction site activities of the Project. The ET shall make reference to the following information in conducting the inspection. During the inspection, the following information should be referred to:

- (i) EIA Report recommendations on environmental protection and pollution control mitigation measures;
- (ii) works progress and programme;
- (iii) individual works methodology proposals (which shall include the proposal on associated pollution control measures);
- (iv) contract specifications on environmental protection;
- (v) relevant environmental protection and pollution control legislations; and
- (vi) previous site inspection results.

The Contractor shall keep the ER and ET Leader updated with all relevant environmental related information on the construction contract necessary for him to carry out the site inspections. Site inspection results and associated recommendations for improvements to the environmental protection and pollution control efforts should be recorded and followed up by the Contractor in an agreed time-frame. 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, to report on any remedial measures subsequent to the site inspections.

The ER, ET and the Contractor should also carry out ad-hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of a valid environmental complaint, or as part of the investigation work, as specified in the Action Plan for the EM&A programme.

## 14.2 Environmental Compliance

There are statutory requirements on environmental protection and pollution control requirements with which construction activities must comply.

In order that the works comply with all method statements of works should be submitted by the Contractor to the ER for approval and to the ET Leader to ensure sufficient environmental protection and pollution control measures have been included. The Environmental Mitigation Implementation schedule (EMIS) is summarised in **Appendix C**. Any proposed changes to the mitigation measures shall be certified by the ET Leader and verified by the IEC as conforming to the relevant information and recommendations contained in the EIA Report.

The ER and ET shall also review the progress and programme of the works to check that relevant environmental legislations have not been violated, and that any foreseeable potential for violating laws can be prevented.

The Contractor should provide the update of the 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, method statements, any application letters for different licences / permits under the environmental protection laws, and copies of all valid licences / permits. The site diary and environmental records shall also be available for inspection by the relevant parties.

After reviewing the document, the ET shall advise the IEC and Contractor of any non-compliance with legislative requirements on environmental protection and pollution control so that they can timely take follow-up actions as appropriate. If the follow-up actions may still result in potential violation of environmental protection and pollution control requirements, the ER and ET should provide further advice to the Contractor to take remedial action to resolve the problem.

Upon receipt of the advice, the Contractor shall undertake immediate actions to correct the situation. The ER and ET shall follow up to ensure that appropriate action has been taken in order to satisfy legal requirements.

## 14.3 Choice of Construction Method

At times during the construction phase the Contractor may submit method statements for various aspects of construction. This state of affairs would only apply to those construction methods that the EIA has not imposed conditions while for construction methods that have been assessed in the EIA, the Contractor is bound to follow the requirements and recommendations in the EIA study. The Contractor's options for alternative construction methods may introduce adverse environmental impacts into the Project. It is the responsibility of the Contractor and ET, in accordance with established standards, guidelines and EIA study recommendations and requirements, to review and determine the adequacy of the environmental protection and pollution control measures in the Contractor's proposal in order to ensure no unacceptable impacts would result. To achieve this end, the ET shall provide a copy of the Proactive Environmental Protection Proforma as shown in **Appendix G** to the IEC for approval. The IEC should audit the review of the construction method and endorse the proposal on the basis of no adverse environmental impacts.

## 14.4 Environment Complaints

The following procedures should be undertaken upon receipt of any environmental complaint:

- (i) The Contractor to log complaint and date of receipt onto the complaint database and inform the ER, ET and IEC immediately;
- (ii) The Contractor to investigate, with the ER and ET, the complaint to determine its validity, and assess whether the source of the problem is due to construction works of the Project with the support of additional monitoring frequency and stations, if necessary;
- (iii) The Contractor to identify remedial measures in consultation with the IEC, ET and ER if a complaint is valid and due to the construction works of the Project;
- (iv) The Contractor to implement the remedial measures as required by the ER and to agree with the ET and IEC any additional monitoring frequency and stations, where necessary, for checking the effectiveness of the remedial measures;
- (v) The ER, ET and IEC to review the effectiveness of the Contractor's remedial measures and the updated situation;
- (vi) The ET to undertake additional monitoring and audit to verify the situation if necessary, and oversee that circumstances leading to the complaint do not recur;
- (vii) If the complaint is referred by the EPD, the Contractor to prepare interim report on the status of the complaint investigation and follow-up actions stipulated above, including the details of the remedial measures and additional monitoring identified or already taken, for submission to EPD within the time frame assigned by the EPD; and
- (viii) The ET to record the details of the complaint, results of the investigation, subsequent actions taken to address the complaint and updated situation including the effectiveness of the remedial measures, supported by regular and additional monitoring results in the monthly EM&A reports.

## 15 Reporting

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### 15.1 General

Reports can be provided in an electronic medium upon agreeing the format with the ER 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.

The ET is responsible for establishing and maintaining a dedicated website throughout the entire construction period for publishing 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 ER 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.

Types of reports that the ET shall prepare and submit include baseline monitoring report, monthly EM&A report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly and final review EM&A reports shall be made available to the Director of Environmental Protection.

### 15.2 Baseline Monitoring Report

The ET should prepare and submit a Baseline Environmental Monitoring Report at least one month before commencement of construction of the Project. Copies of the Baseline Environmental Monitoring Report should be submitted to the IEC, ER and EPD. The ET should liaise with the relevant parties on the exact number of copies require.

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 monitoring results;
- (vi) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data;
- (vii) revisions for inclusion in the EM&A Manual; and
- (viii) comments, recommendations and conclusions.

### 15.3 Monthly Monitoring Reports

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 and endorsed by the IEC. The EM&A report shall be prepared and submitted to EPD within 10 working days of the end of each reporting month, with the first report due the month after construction commences. Copies of each monthly EM&A report shall be submitted to the following parties: the IEC, the ER and EPD. Before submission of the first EM&A report, the ET shall liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.

The ET 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**

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

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

- (iii) Environmental status:
- advice on the status of statutory environmental compliance such as the status of compliance with the environmental permit (EP) conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
  - works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and
  - drawings showing the project are, 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 Report.
- (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;
  - monitoring parameters;
  - 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-compliances, 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;
- record of any project changes from the originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc.); and
- comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for examples, any improvement in the EM&A programme) and conclusions.

**Subsequent monthly EM&A Reports**

Subsequent monthly EM&A reports shall include at least the following:

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

- any updates as needed to the scope of works and construction methodologies.
- (iii) Environmental status:
- advice on the status of statutory environmental compliance such as the status of compliance with the environmental permit (EP) conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
  - works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and
  - drawings showing the project are, 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 Report.
- (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;
  - monitoring parameters;
  - 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-compliances, 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;
- record of any project changes from the originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc.); and
- comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for examples, any improvement in the EM&A programme) and conclusions.

(viii) Appendices

- Action and Limit levels;
- graphical plots of trends of the monitoring 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.

## 15.4 Final EM&A Review Reports

The EM&A programme should be terminated upon the completion of the construction activities that have the potential to result in significant environmental impacts.

Prior to the proposed termination, it may be advisable to consult relevant local communities. The proposed termination should only be implemented after the proposal has been endorsed by the IEC, the Engineer and the Project Proponent followed by approval from the Director of Environmental Protection.

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

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

- (ii) Drawings showing the project are, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (iii) Basic project information including a synopsis of the project organization, 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 measure, as recommended in the project EIA Report;
  - environmental impact hypotheses tested;
  - environmental quality performance limits (Action and Limit levels);
  - all monitoring parameters;
  - Event and Action Plans;
- (v) A summary of the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report, summarized in the updated implementation schedule;
- (vi) Graphical plots and the statistical analysis of the trends of monitoring parameter 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 actions taken and results;
- (xi) A review of the validity of EIA predictions and identification of shortcomings in EIA recommendations;
- (xii) 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
- (xiii) 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).

## 15.5 Data Keeping

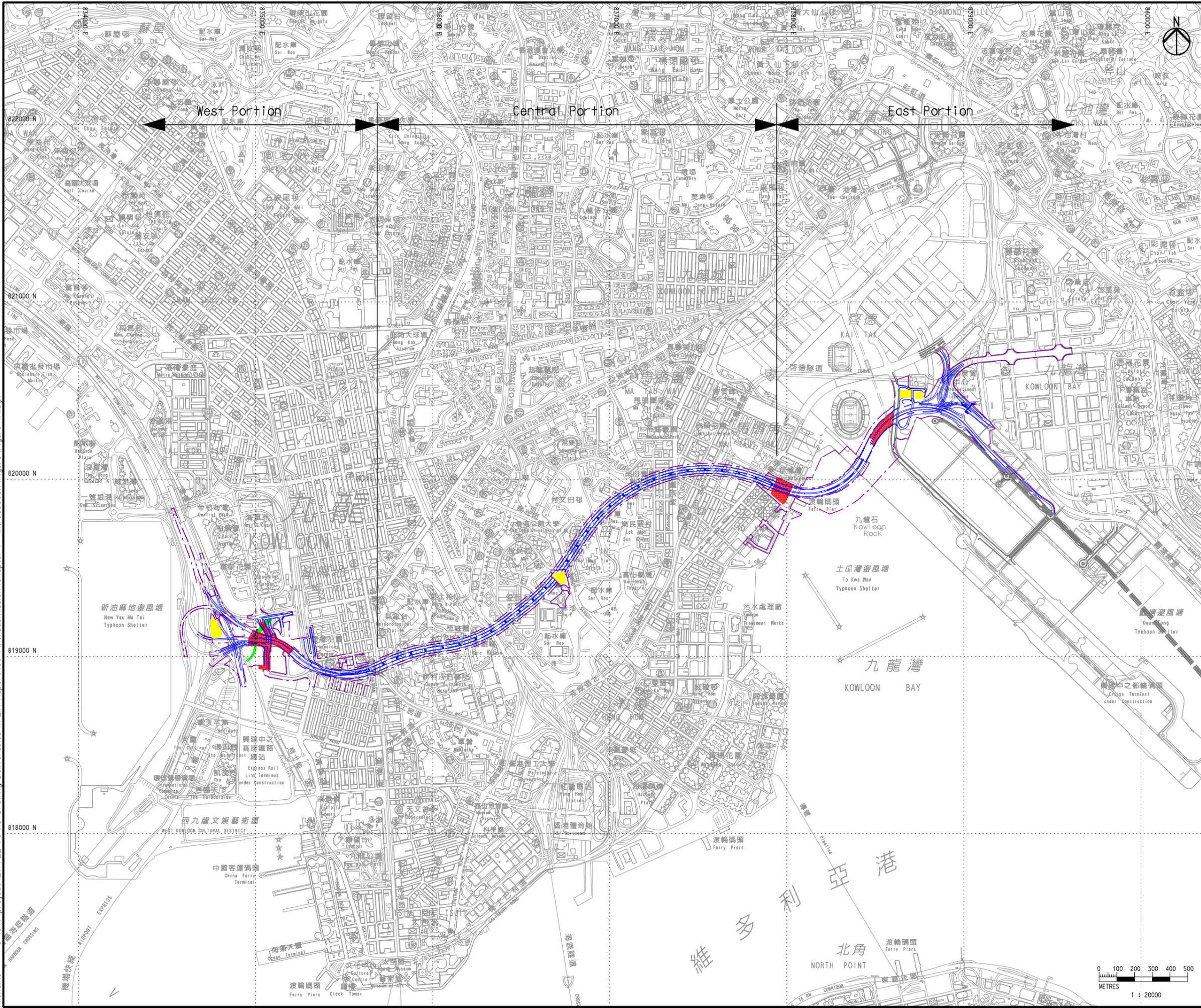
No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the monthly EM&A reports. However, any such document shall be well kept by the ET and be ready for inspection upon request. All relevant information shall 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.

## 15.6 Interim Notifications of Environmental Quality Limit Exceedances

With reference to the Event and Action Plans, when the environmental quality performance limits are exceeded and if they are proven to be valid, the ET should immediately notify the IEC and EPD, as appropriate. The notification should be followed up with advice to the 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 notification is presented in **Appendix F**.

## Figures

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 Filename : G:\env\project\217722-70\13 Drawing Deliverables\11 EIA Report\06 Final Submission\Chapter 1 - Introduction\Figure\Figure 1.1.dgn



**Legend**

- CKR Alignment
- - - CKR Works Limit
- Landscape Deck
- Proposed Diversion of Box Culvert
- Ventilation Building and Admistration Building

F	SIXTH ISSUE	GL	01/13
E	FIFTH ISSUE	GL	12/12
D	FOURTH ISSUE	GL	09/12
C	THIRD ISSUE	GL	06/12
B	SECOND ISSUE	GL	02/12
A	FIRST ISSUE	GL	12/11
Rev	Description	By	Date

Consultant

**ARUP** **Mott MacDonald**

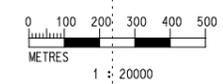
Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route - Design and Construction**

Drawing title  
 General Layout Plan of CKR

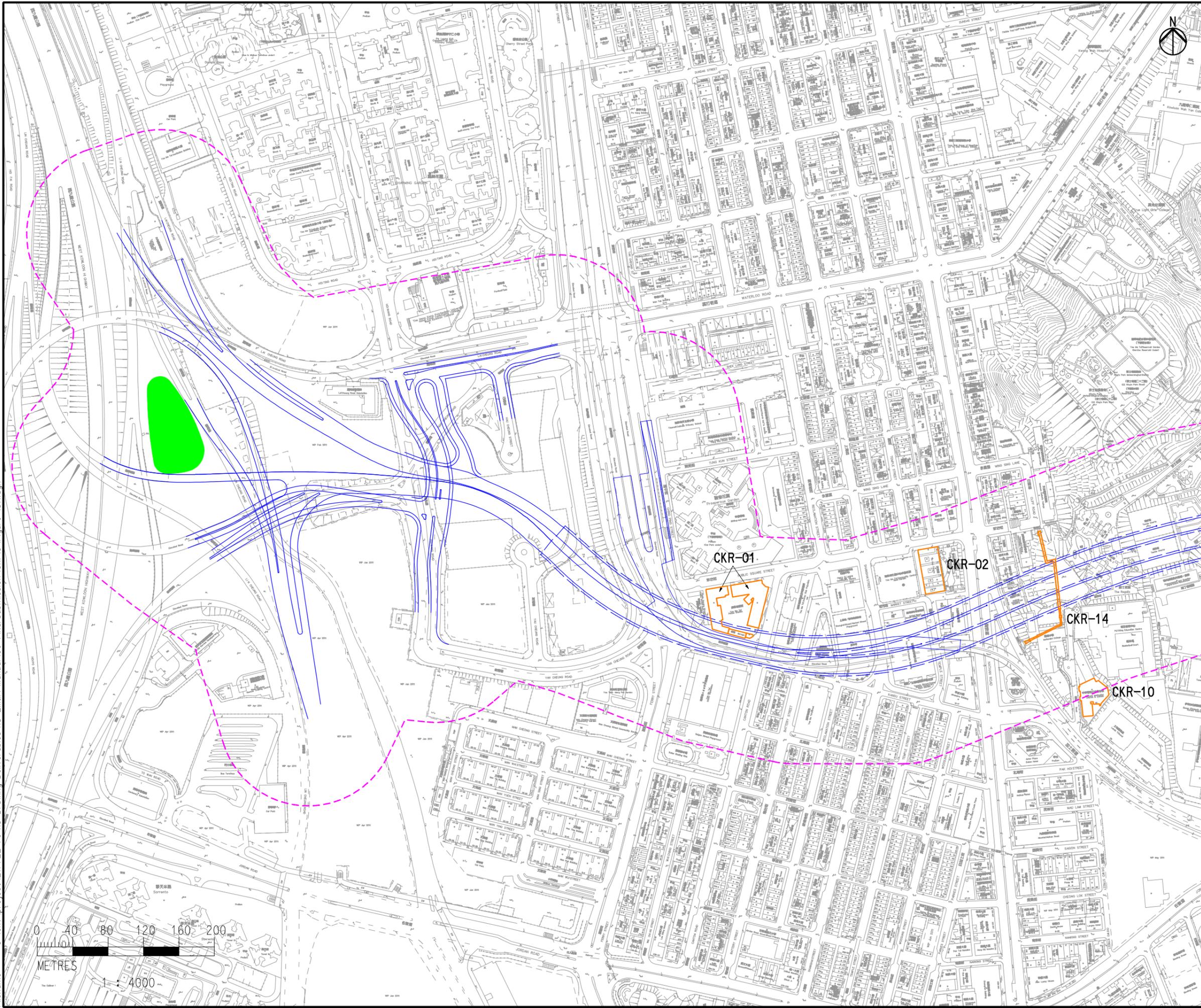
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- Legend
- CKR Alignment
  - - - 100m Study Boundary
  - Built Heritage
  - Ventilation Building / Administration Building



E	FIFTH ISSUE	GL	01/13
D	FOURTH ISSUE	GL	12/12
C	THIRD ISSUE	GL	09/12
B	SECOND ISSUE	GL	05/12
A	FIRST ISSUE	GL	12/11
Rev	Description	By	Date

Consultant

Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route - Design and Construction**

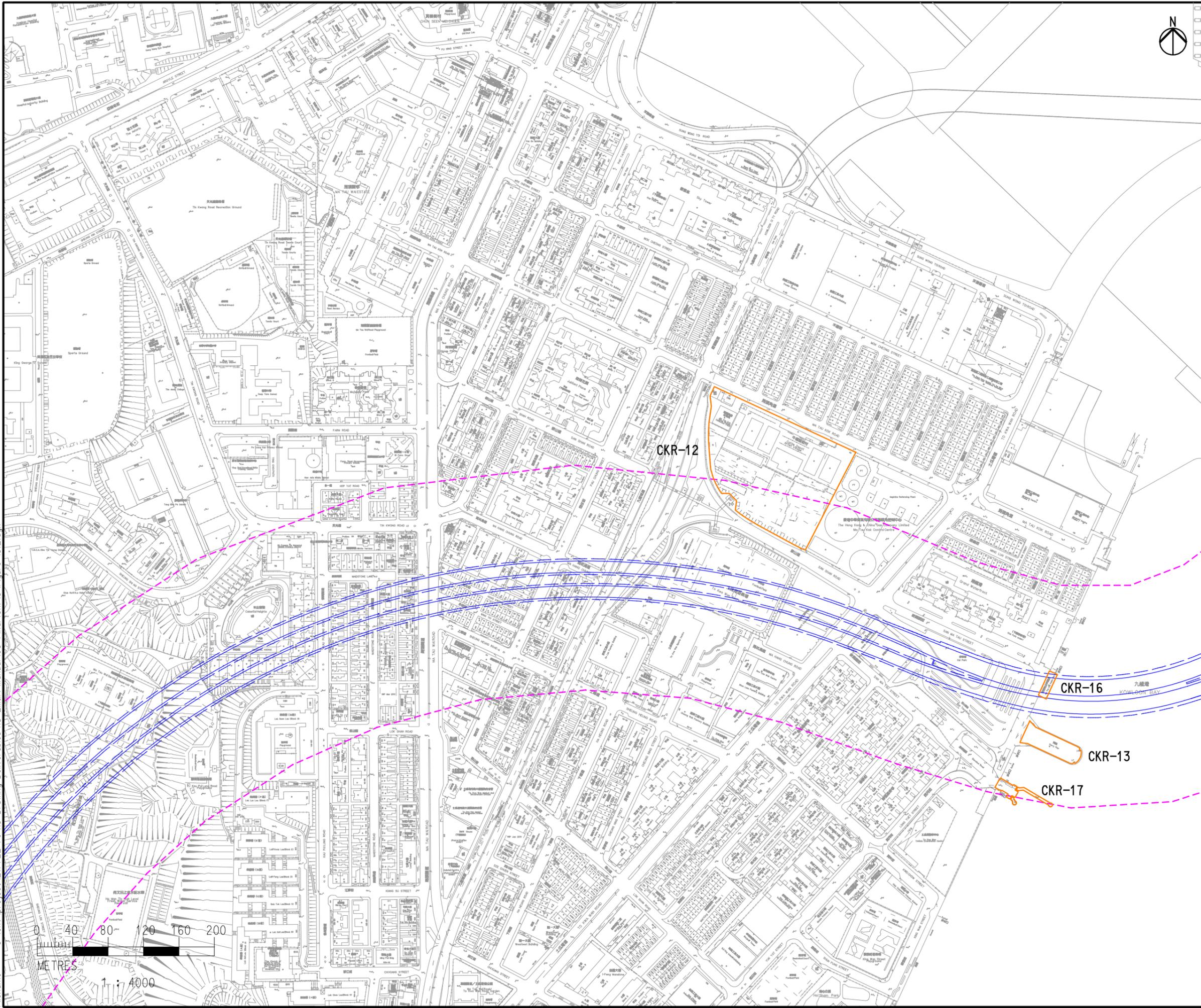
Drawing title  
**Location of Built Heritage Resources in Yau Ma Tei Required Mitigation Recommendations**

Drawing no. <b>Figure 13.1</b>		Rev. <b>E</b>	
Drawn GL	Date 01/13	Checked FC	Approved ST
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Legend

- CKR Alignment
- - - 100m Study Boundary
- Built Heritage

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A	FIRST ISSUE		GL 12/11
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C	THIRD ISSUE		GL 09/12
D	FOURTH ISSUE		GL 12/12

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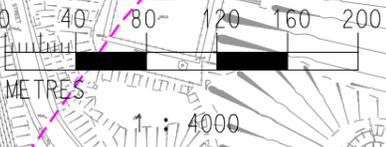
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**Central Kowloon Route - Design and Construction**

Drawing title  
**Location of Built Heritage Resources in Ma Tau Kok Required Mitigation Recommendations**

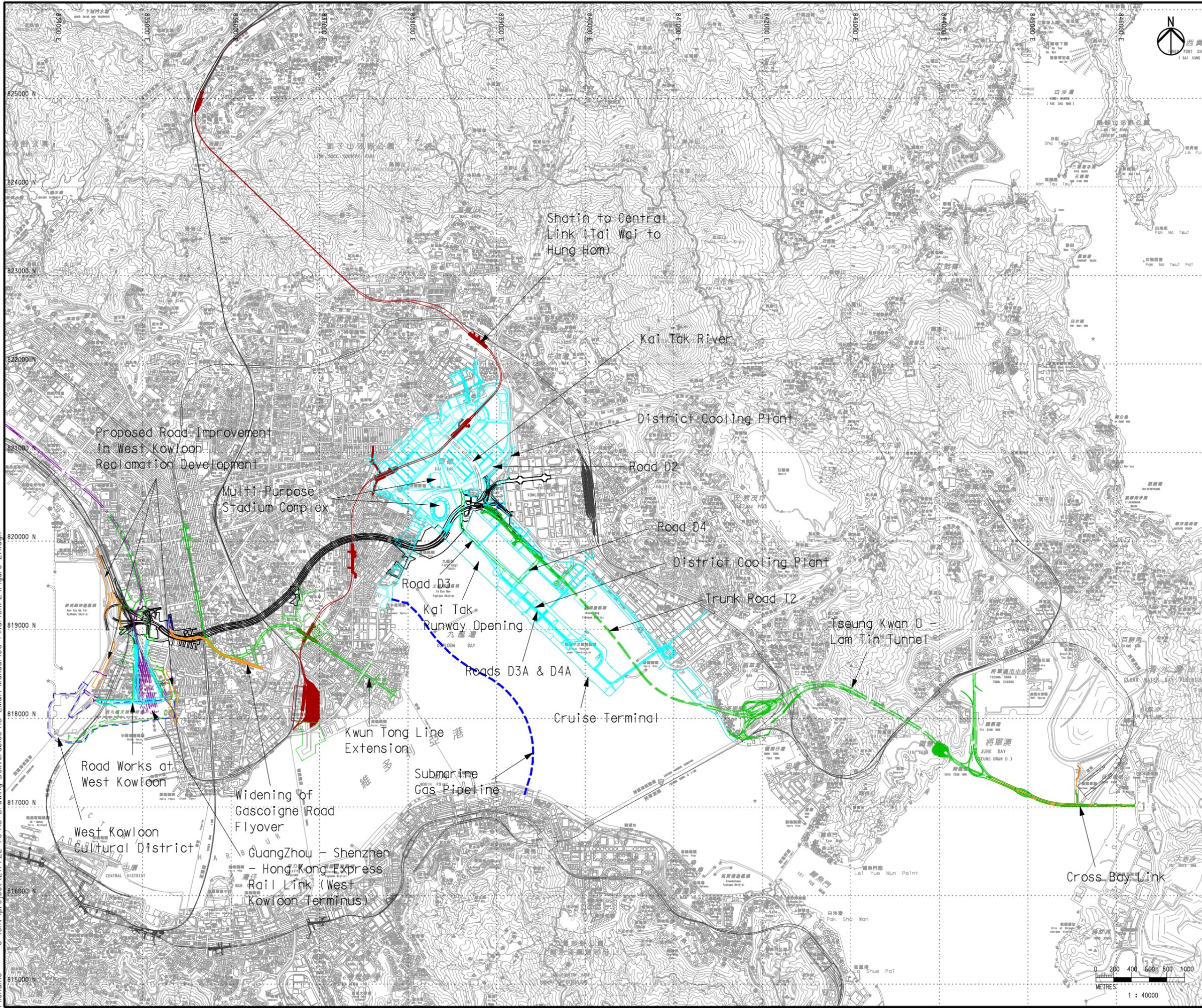
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Legend

Proposed CKR

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D	FOURTH ISSUE	GL	12/12
C	THIRD ISSUE	GL	09/12
B	SECOND ISSUE	GL	06/12
A	FIRST ISSUE	GL	12/11

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Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route - Design and Construction**

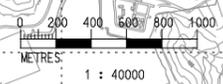
Drawing title  
**Location of Concurrent Projects**

Drawing no. <b>Figure 2.1</b>		Rev. <b>D</b>	
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- Legend**
- Construction Dust Monitoring Station
  - CKR Alignment
  - CKR Works Limit
  - - - 500m Study Boundary

Rev	Description	By	Date
A	FIRST ISSUE	GL	12/11
B	SECOND ISSUE	GL	01/12
C	THIRD ISSUE	GL	09/12
D	FOURTH ISSUE	GL	12/12
E	FIFTH ISSUE	GL	01/13

Consultant

**ARUP** 

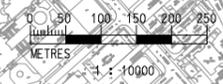
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**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route -  
 Design and Construction**

Drawing title  
**Location of Construction  
 Dust Monitoring Stations  
 (West Portion)**

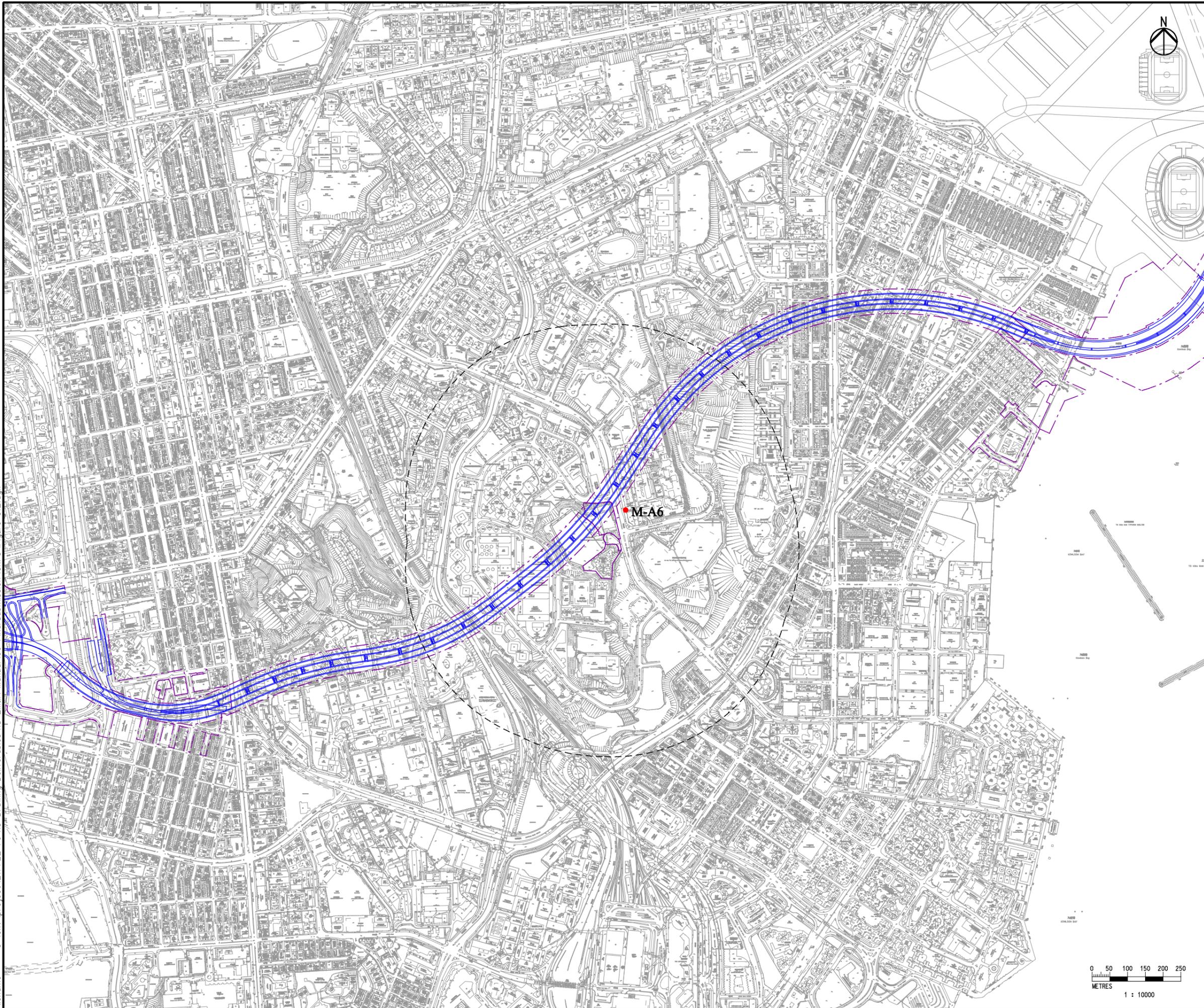
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- Legend**
- Construction Dust Monitoring Station
  - CKR Alignment
  - - - CKR Works Limit
  - - - 500m Study Boundary

E	FIFTH ISSUE	GL	01/13
D	FOURTH ISSUE	GL	12/12
C	THIRD ISSUE	GL	09/12
B	SECOND ISSUE	GL	01/12
A	FIRST ISSUE	GL	12/11
Rev	Description	By	Date

Consultant

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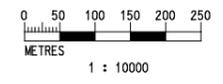
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**Central Kowloon Route -  
 Design and Construction**

Drawing title  
**Location of Construction  
 Dust Monitoring Stations  
 (Central Portion)**

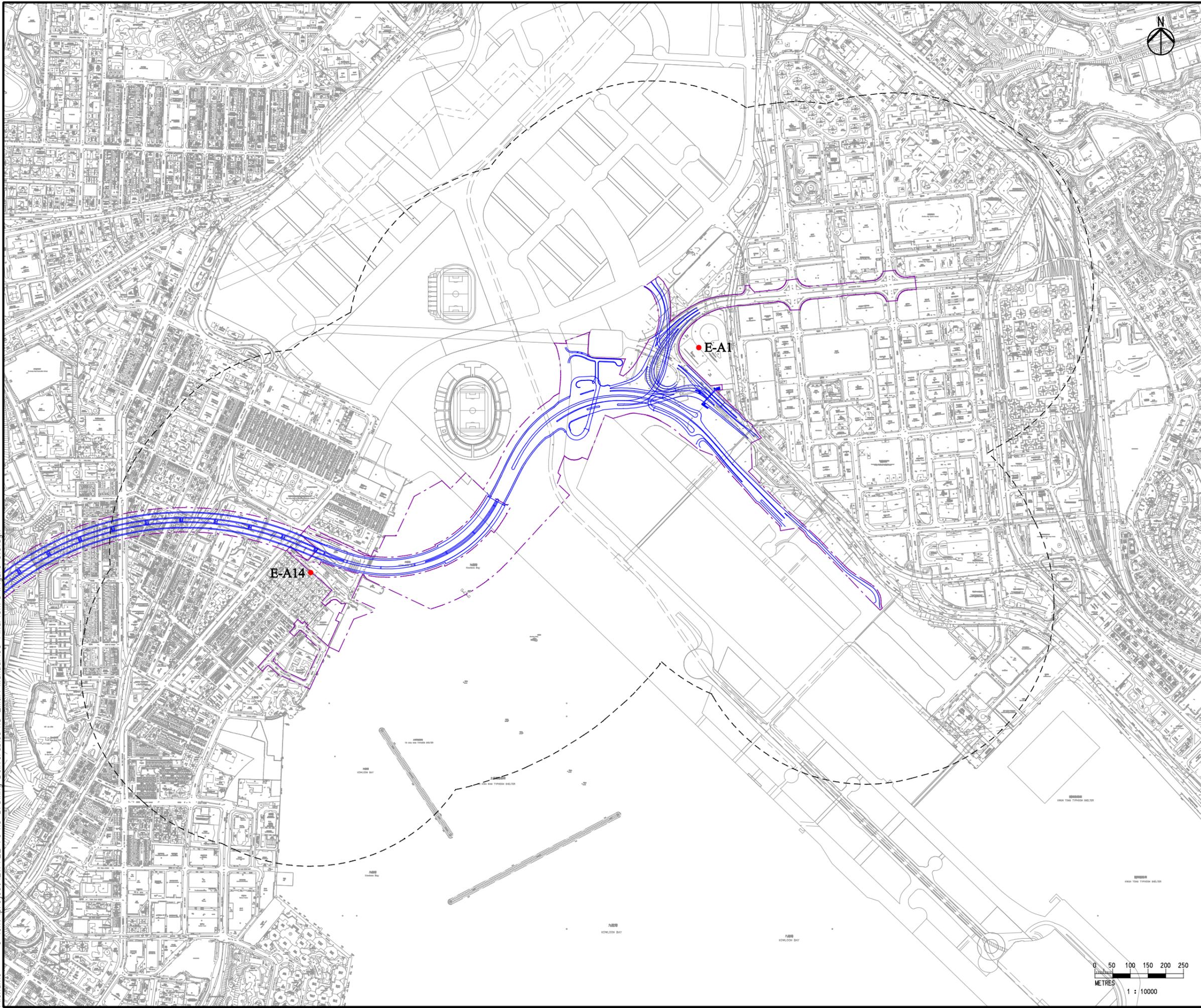
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- Legend**
- Construction Dust Monitoring Station
  - CKR Alignment
  - ▭ CKR Works Limit
  - - - 500m Study Boundary

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A	FIRST ISSUE	GL	12/11
B	SECOND ISSUE	GL	01/12
C	THIRD ISSUE	GL	09/12
D	FOURTH ISSUE	GL	12/12



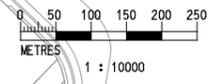
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**Central Kowloon Route - Design and Construction**

Drawing title  
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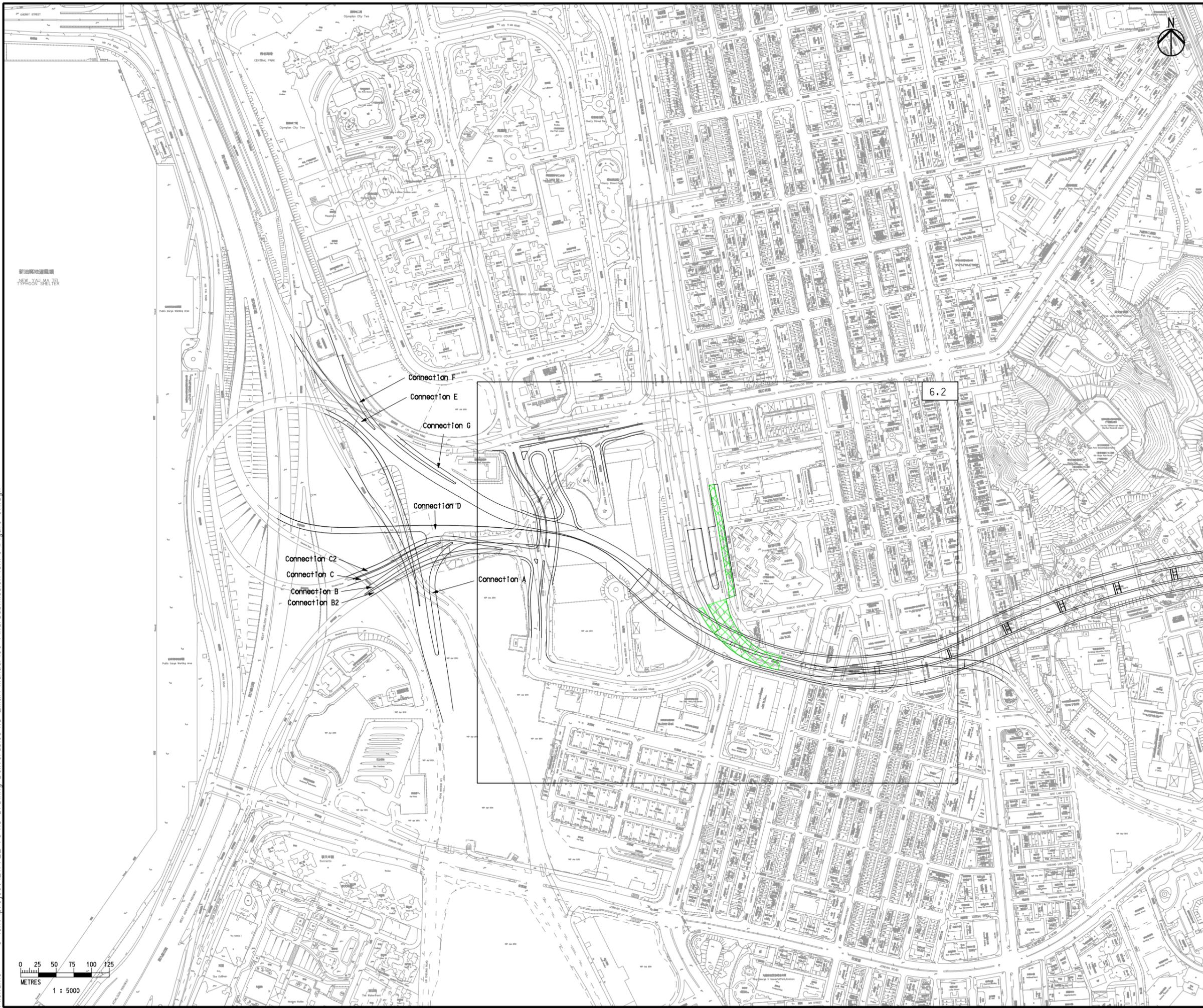
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- Legend
- CKR Alignment
  - Low Noise Road Surfacing

E	FIFTH ISSUE	GL	01/13
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C	THIRD ISSUE	GL	09/12
B	SECOND ISSUE	GL	06/12
A	FIRST ISSUE	GL	02/12
Rev	Description	By	Date

Consultant  
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Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route -  
 Design and Construction**

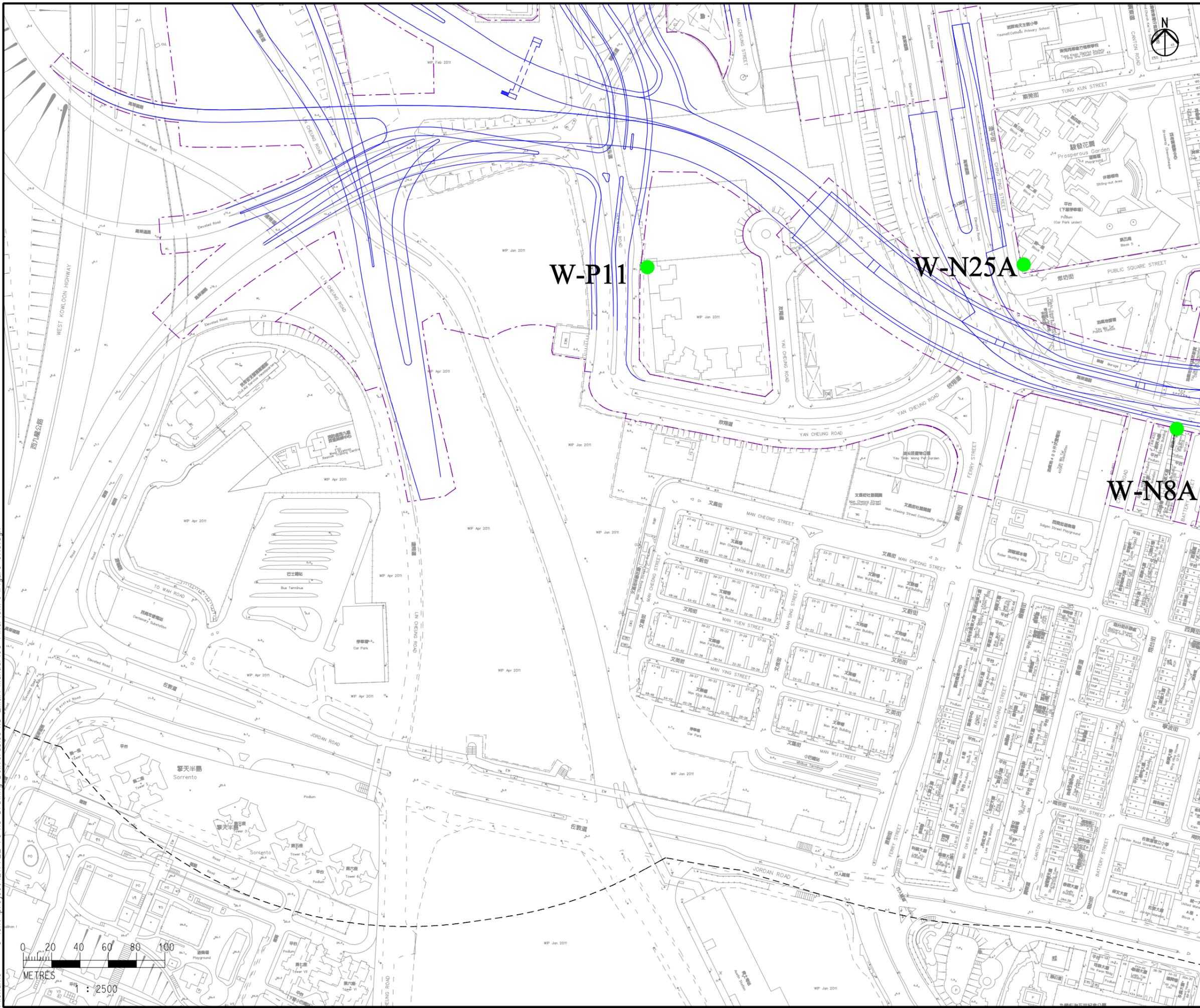
Drawing title  
**Location of Proposed  
 Noise Mitigation Measures  
 for Road Traffic Noise  
 (West Portion)  
 (Sheet 1 of 5)**

Drawing no. <b>Figure 6.1</b>		Rev. <b>E</b>	
Drawn GL	Date 01/13	Checked FC	Approved ST
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- Legend**
- CKR Alignment
  - - - Works Limit
  - - - 300m Assessment Area
  - Monitoring Station (Construction Phase)
  - Monitoring Station (Construction Phase & Operational Phase)

E	FIFTH ISSUE	GL	12/12
D	FOURTH ISSUE	GL	09/12
C	THIRD ISSUE	GL	06/12
B	SECOND ISSUE	GL	03/12
A	FIRST ISSUE	GL	12/11
Rev	Description	By	Date

Consultant  
**ARUP** **Mott MacDonald**

Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route - Design and Construction**

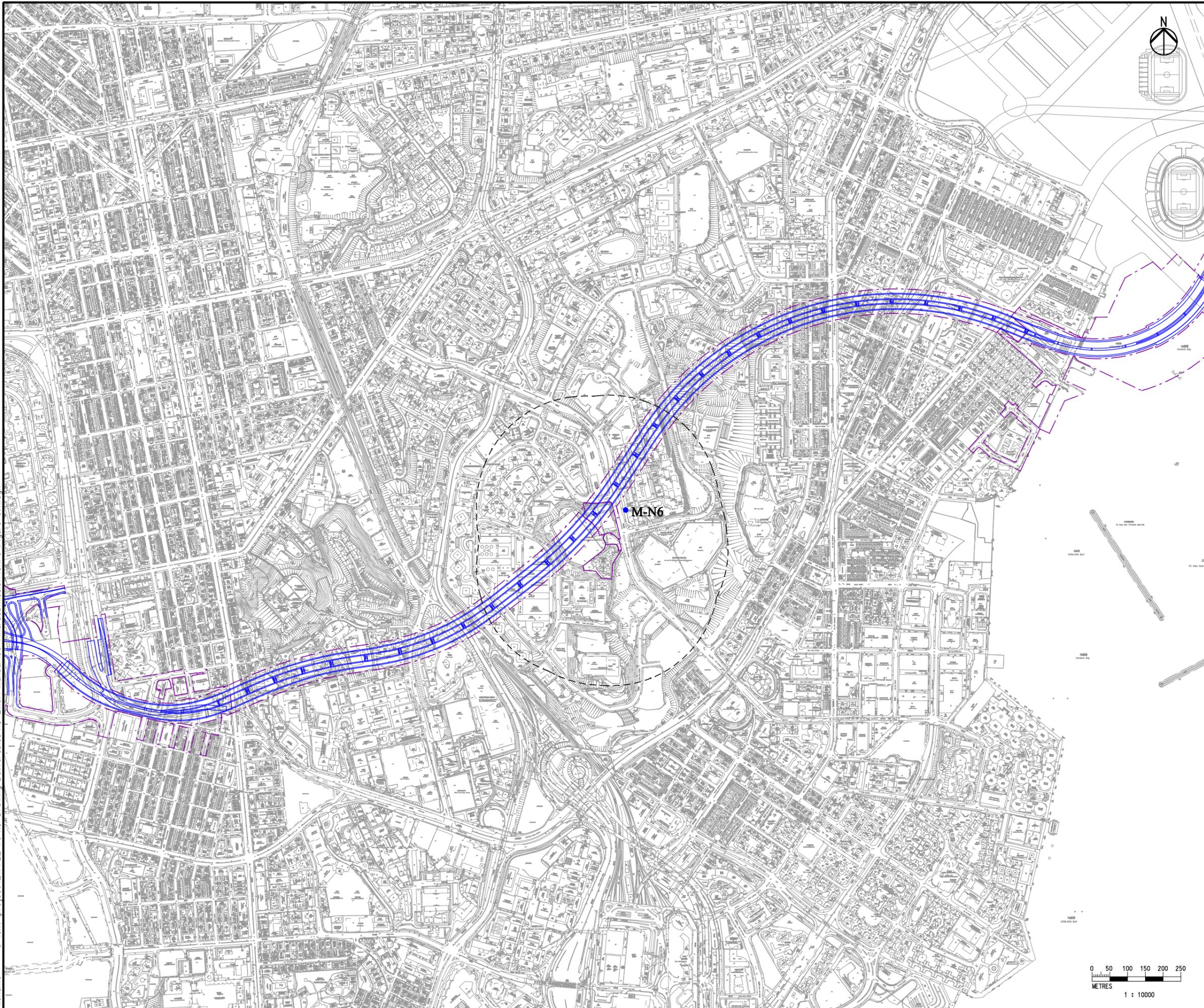
Drawing title  
**Location of Noise Monitoring Stations (West Portion) (Sheet 2 of 2)**

Drawing no. <b>Figure 6.10</b>		Rev. <b>E</b>	
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- Legend**
- Operational Noise Monitoring Station
  - CKR Alignment
  - - - CKR Works Limit
  - - - 300m Study Boundary

E	FIFTH ISSUE	GL	01/13
D	FOURTH ISSUE	GL	12/12
C	THIRD ISSUE	GL	09/12
B	SECOND ISSUE	GL	01/12
A	FIRST ISSUE	GL	12/11
Rev	Description	By	Date



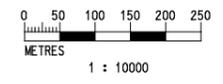
Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route -  
 Design and Construction**

Drawing title  
**Location of Noise  
 Monitoring Stations  
 (Central Portion)**

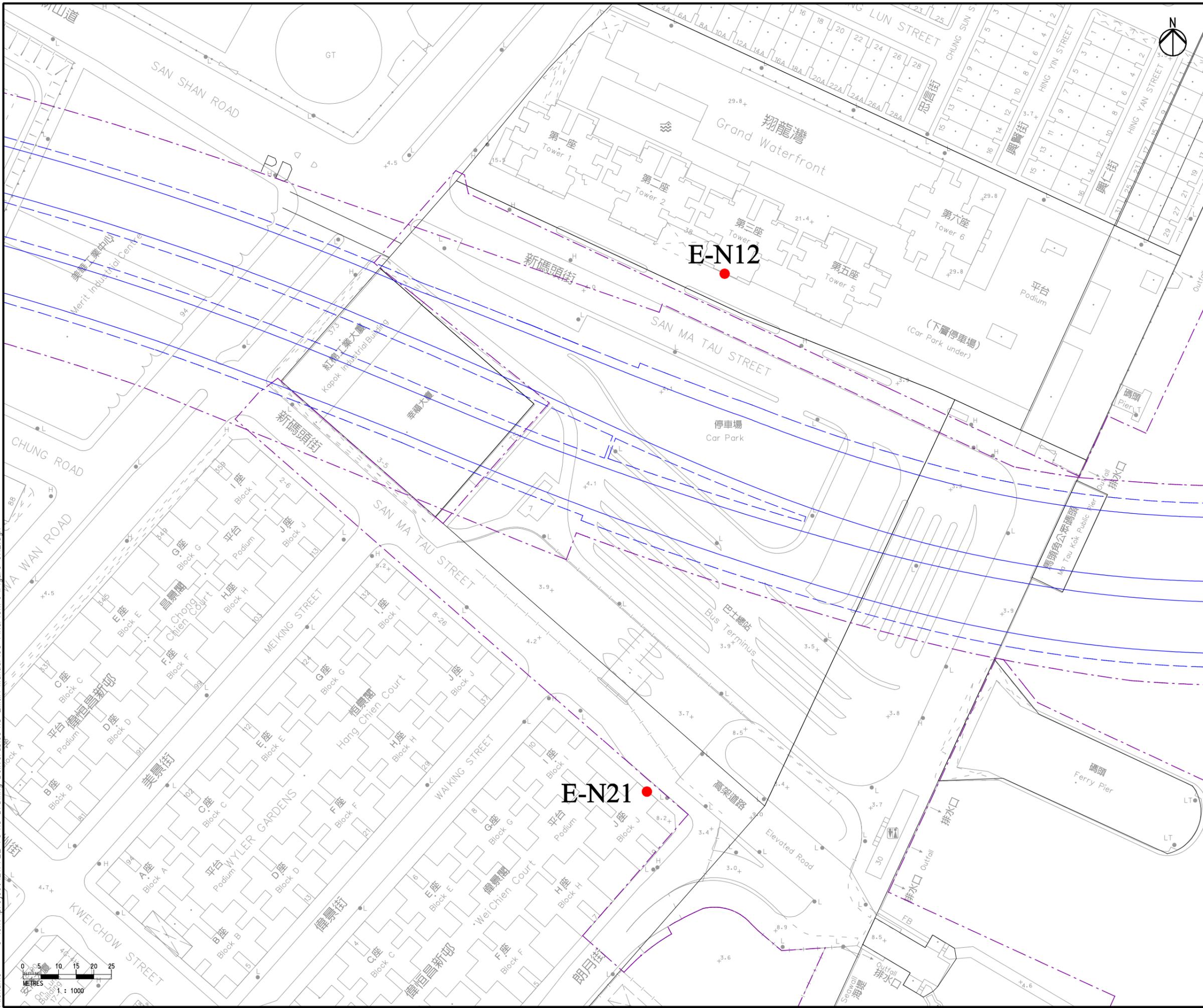
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- Legend**
- — — CKR Alignment
  - - - - - Works Limit
  - - - - - 300m Assessment Area
  - Monitoring Station (Construction Phase)

D	FOURTH ISSUE	GL	12/12
C	THIRD ISSUE	GL	09/12
B	SECOND ISSUE	GL	06/12
A	FIRST ISSUE	GL	02/12
Rev	Description	By	Date

Consultant

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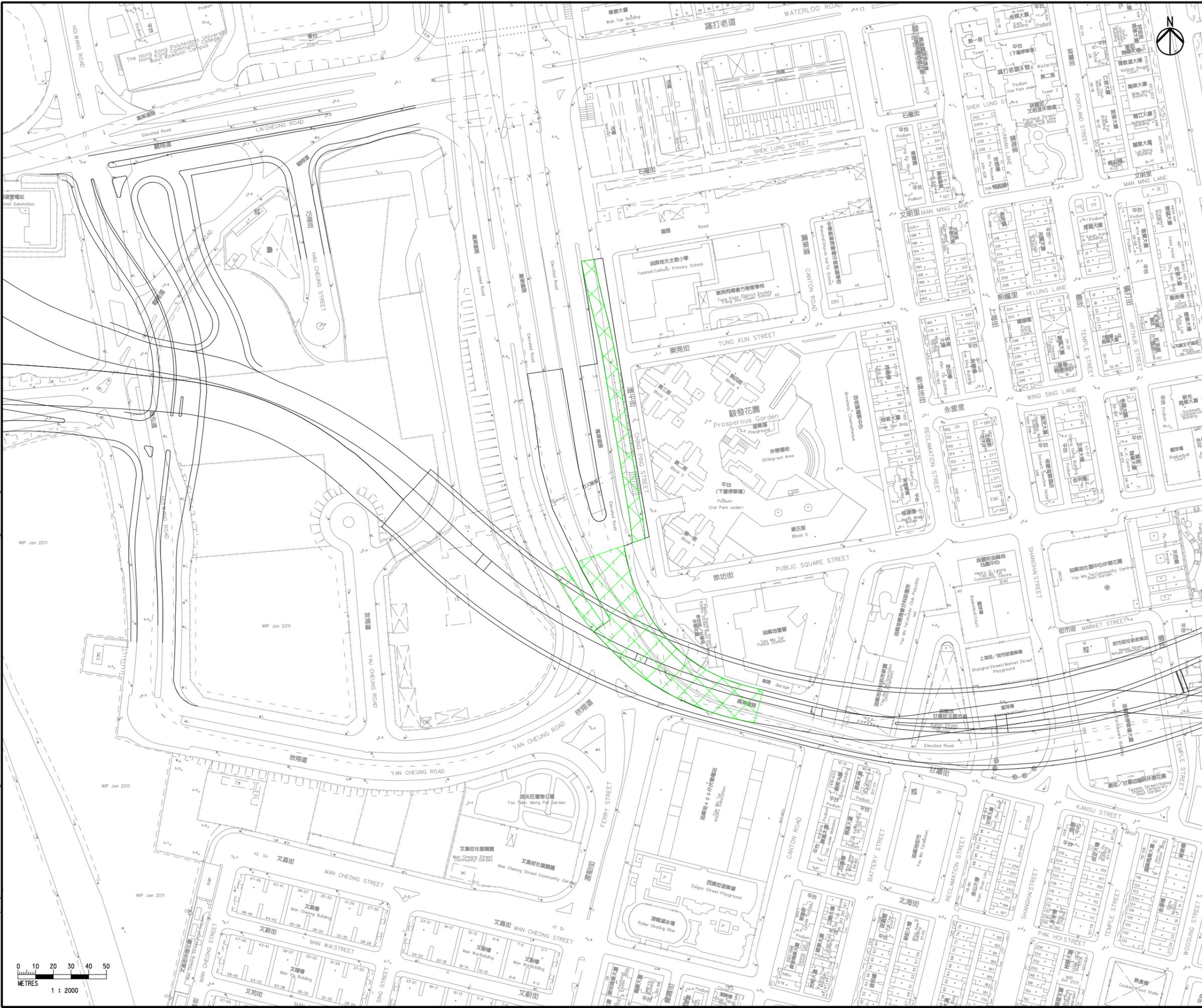
Project title  
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**Central Kowloon Route - Design and Construction**

Drawing title  
**Location of Noise Monitoring Stations (East Portion)**

Drawing no. <b>Figure 6.12</b>		Rev. <b>D</b>	
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Scale 1:1000 ON A3		Status <b>PRELIMINARY</b>	

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Legend

- CKR Alignment
- Low Noise Road Surfacing

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Rev	Description	By	Date

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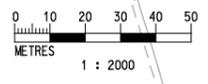
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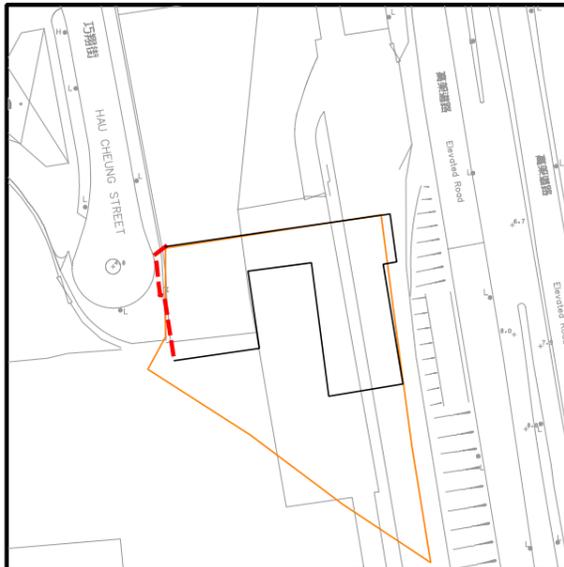
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**Location of Proposed Noise Mitigation Measures for Road Traffic Noise (West Portion) (Sheet 2 of 5)**

Drawing no. <b>Figure 6.2</b>		Rev. <b>E</b>	
Drawn GL	Date 01/13	Checked FC	Approved ST
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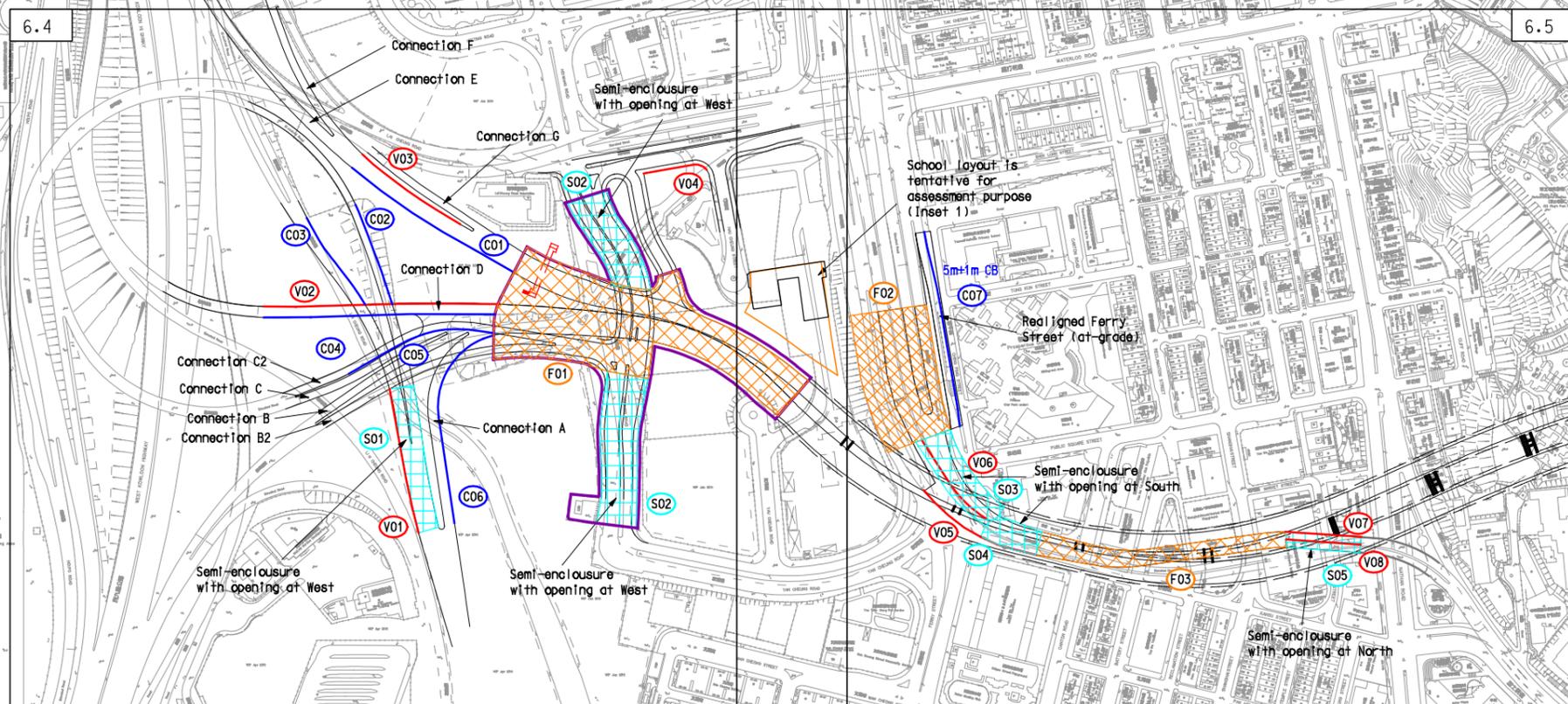
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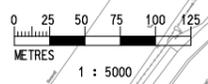


Inset 1: Avoid any sensitive facade with openable window facing Central Kowloon Route



- Legend
- CKR Alignment
  - Planned G/IC Zone
  - Landscape Deck
  - Full-enclosure
  - Semi-enclosure
  - Vertical Barrier
  - Cantilevered Barrier
  - Avoid any sensitive facade with openable window facing Central Kowloon Route

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A	FIRST ISSUE	GL	12/11
Rev	Description	By	Date

Consultant

Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route - Design and Construction**

Drawing title  
**Location of Proposed Noise Mitigation Measures for Road Traffic Noise (West Portion) (Sheet 3 of 5)**

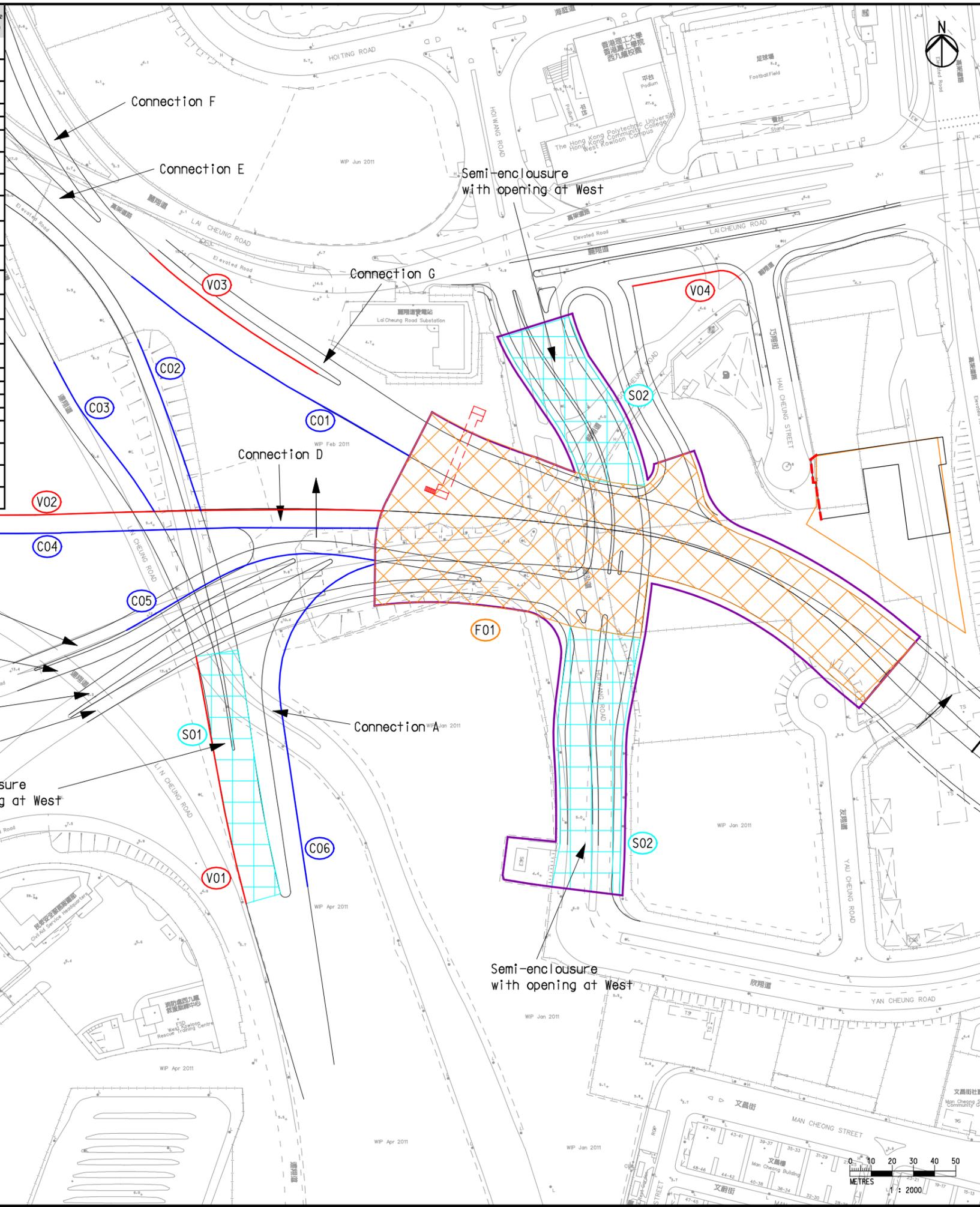
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Noise Mitigation Measures ID	Location	Type of Noise Mitigation Measures [1]	Height above road level (m)	Approximate mPD	Approximate Length (m)
F01	West portal of CKR	Full enclosure including landscape deck	9	5.9 – 22.5	250
F02	Gascoigne Road Flyover (Ferry Street section)	Full enclosure	10	22	110
F03	Gascoigne Road Flyover (Kansu Street section) (NB+SB)	Full enclosure	7	19.5 – 21	200
S01	Lin Cheung Road	Semi-enclosure with opening at west	10	11.5 – 12.6	120
S02	Re-aligned Hoi Wang Road	Semi-enclosure with opening at west	10	10.5 – 17.7	270
S03	Gascoigne Road Flyover (Ferry Street section) (SB)	Semi-enclosure with opening at south	7	19.8 – 20.1	85
S04	Gascoigne Road Flyover (Kansu Street section) (NB+SB)	Semi-enclosure with opening at south	7	18.1 – 19.5	45
S05	Gascoigne Road Flyover (Kansu Street section) (NB+SB)	Semi-enclosure with opening at north	7	21	60
C01	Connection E	5m high with 3m cantilever at 45° cantilevered barrier	7.1	12.8 – 16.1	155
C02	Lin Cheung Road	5m high with 3m cantilever at 45° cantilevered barrier	7.1	12.6 – 17.1	85
C03	Lin Cheung Road	5m high with 3m cantilever at 45° cantilevered barrier	7.1	11.8 – 12.7	85
C04	Connection D	5m high with 3m cantilever at 45° cantilevered barrier	7.1	14.1 – 20.6	190
C05	Connection C2	5m high with 3m cantilever at 45° cantilevered barrier	7.1	22.8 – 24.9	120
C06	Connection A	5m high with 3m cantilever at 45° cantilevered barrier	7.1	12.9 – 13.9	170
C07	Ferry Street Road (At-grade)	5m high with 1m cantilever at 45° cantilevered barrier	5.7	9.5 – 9.6	160
V01	Lin Cheung Road	4m vertical barrier	4	7.9 – 9.7	120
V02	Connection D	3.8m vertical barrier	3.8	10.8 – 17.3	190
V03	Connection E	5.8m vertical barrier	5.8	11.7 – 14.6	100
V04	Widening of Lai Cheung Road	4m vertical barrier	4	8.5 – 8.6	50
V05	Gascoigne Road Flyover (Ferry Street section) (SB)	3.3m vertical barrier	3.3	15.3 – 16.3	110
V06	Gascoigne Road Flyover (Ferry Street section) (central divider)	3.8m vertical barrier	3.8	15 – 15.8	100
V07	Gascoigne Road Flyover (Kansu Street section) (SB)	4.3m vertical barrier	4.3	19.3	60
V08	Gascoigne Road Flyover (Kansu Street section) (central divider)	2.8m vertical barrier	2.8	17.8	60



Legend

- CKR Alignment
- Planned G/IC Zone
- Landscape Deck
- Full-enclosure
- Semi-enclosure
- Vertical Barrier
- Cantilevered Barrier
- Avoid any sensitive facade with openable window facing Central Kowloon Route

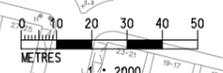
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C	THIRD ISSUE	GL	09/12
B	SECOND ISSUE	GL	06/12
A	FIRST ISSUE	GL	12/11
Rev	Description	By	Date



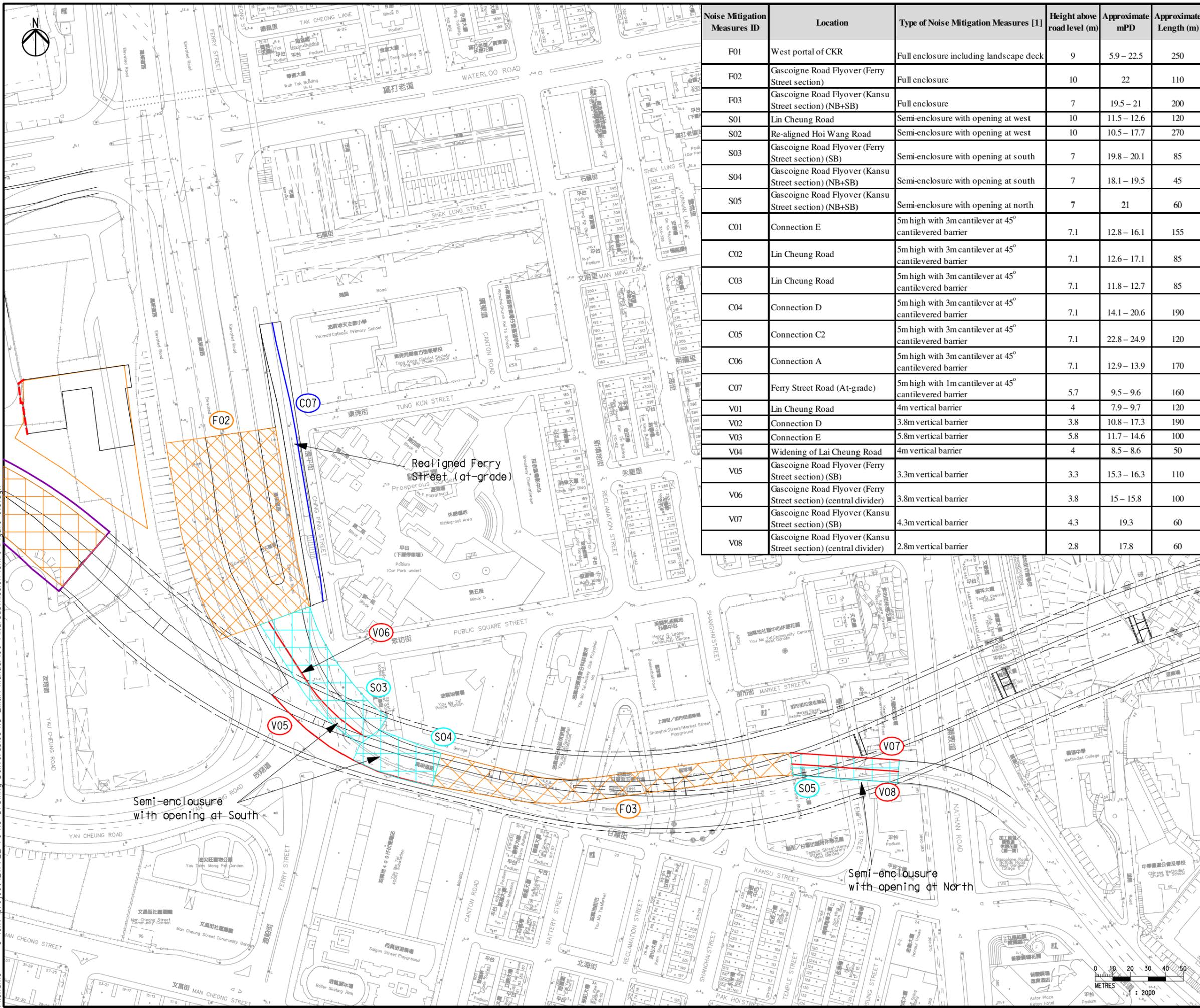
Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route - Design and Construction**

Drawing title  
**Location of Proposed Noise Mitigation Measures for Road Traffic Noise (West Portion) (Sheet 4 of 5)**

Drawing no. <b>Figure 6.4</b>		Rev. <b>D</b>	
Drawn GL	Date 12/12	Checked FC	Approved ST
Scale 1:2000 ON A3	Status <b>PRELIMINARY</b>		



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Noise Mitigation Measures ID	Location	Type of Noise Mitigation Measures [1]	Height above road level (m)	Approximate mPD	Approximate Length (m)
F01	West portal of CKR	Full enclosure including landscape deck	9	5.9 – 22.5	250
F02	Gascoigne Road Flyover (Ferry Street section)	Full enclosure	10	22	110
F03	Gascoigne Road Flyover (Kansu Street section) (NB+SB)	Full enclosure	7	19.5 – 21	200
S01	Lin Cheung Road	Semi-enclosure with opening at west	10	11.5 – 12.6	120
S02	Re-aligned Hoi Wang Road	Semi-enclosure with opening at west	10	10.5 – 17.7	270
S03	Gascoigne Road Flyover (Ferry Street section) (SB)	Semi-enclosure with opening at south	7	19.8 – 20.1	85
S04	Gascoigne Road Flyover (Kansu Street section) (NB+SB)	Semi-enclosure with opening at south	7	18.1 – 19.5	45
S05	Gascoigne Road Flyover (Kansu Street section) (NB+SB)	Semi-enclosure with opening at north	7	21	60
C01	Connection E	5m high with 3m cantilever at 45° cantilevered barrier	7.1	12.8 – 16.1	155
C02	Lin Cheung Road	5m high with 3m cantilever at 45° cantilevered barrier	7.1	12.6 – 17.1	85
C03	Lin Cheung Road	5m high with 3m cantilever at 45° cantilevered barrier	7.1	11.8 – 12.7	85
C04	Connection D	5m high with 3m cantilever at 45° cantilevered barrier	7.1	14.1 – 20.6	190
C05	Connection C2	5m high with 3m cantilever at 45° cantilevered barrier	7.1	22.8 – 24.9	120
C06	Connection A	5m high with 3m cantilever at 45° cantilevered barrier	7.1	12.9 – 13.9	170
C07	Ferry Street Road (At-grade)	5m high with 1m cantilever at 45° cantilevered barrier	5.7	9.5 – 9.6	160
V01	Lin Cheung Road	4m vertical barrier	4	7.9 – 9.7	120
V02	Connection D	3.8m vertical barrier	3.8	10.8 – 17.3	190
V03	Connection E	5.8m vertical barrier	5.8	11.7 – 14.6	100
V04	Widening of Lai Cheung Road	4m vertical barrier	4	8.5 – 8.6	50
V05	Gascoigne Road Flyover (Ferry Street section) (SB)	3.3m vertical barrier	3.3	15.3 – 16.3	110
V06	Gascoigne Road Flyover (Ferry Street section) (central divider)	3.8m vertical barrier	3.8	15 – 15.8	100
V07	Gascoigne Road Flyover (Kansu Street section) (SB)	4.3m vertical barrier	4.3	19.3	60
V08	Gascoigne Road Flyover (Kansu Street section) (central divider)	2.8m vertical barrier	2.8	17.8	60

**Legend**

- CKR Alignment
- Planned G/IC Zone
- Landscape Deck
- Full-enclosure
- Semi-enclosure
- Vertical Barrier
- Cantilevered Barrier
- Avoid any sensitive facade with openable window facing Central Kowloon Route

E	FIFTH ISSUE	GL	01/13
D	FOURTH ISSUE	GL	12/12
C	THIRD ISSUE	GL	09/12
B	SECOND ISSUE	GL	06/12
A	FIRST ISSUE	GL	12/11
Rev	Description	By	Date

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Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route - Design and Construction**

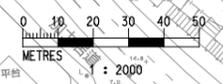
Drawing title  
**Location of Proposed Noise Mitigation Measures for Road Traffic Noise (West Portion) (Sheet 5 of 5)**

Drawing no.  
**Figure 6.5** Rev. **E**

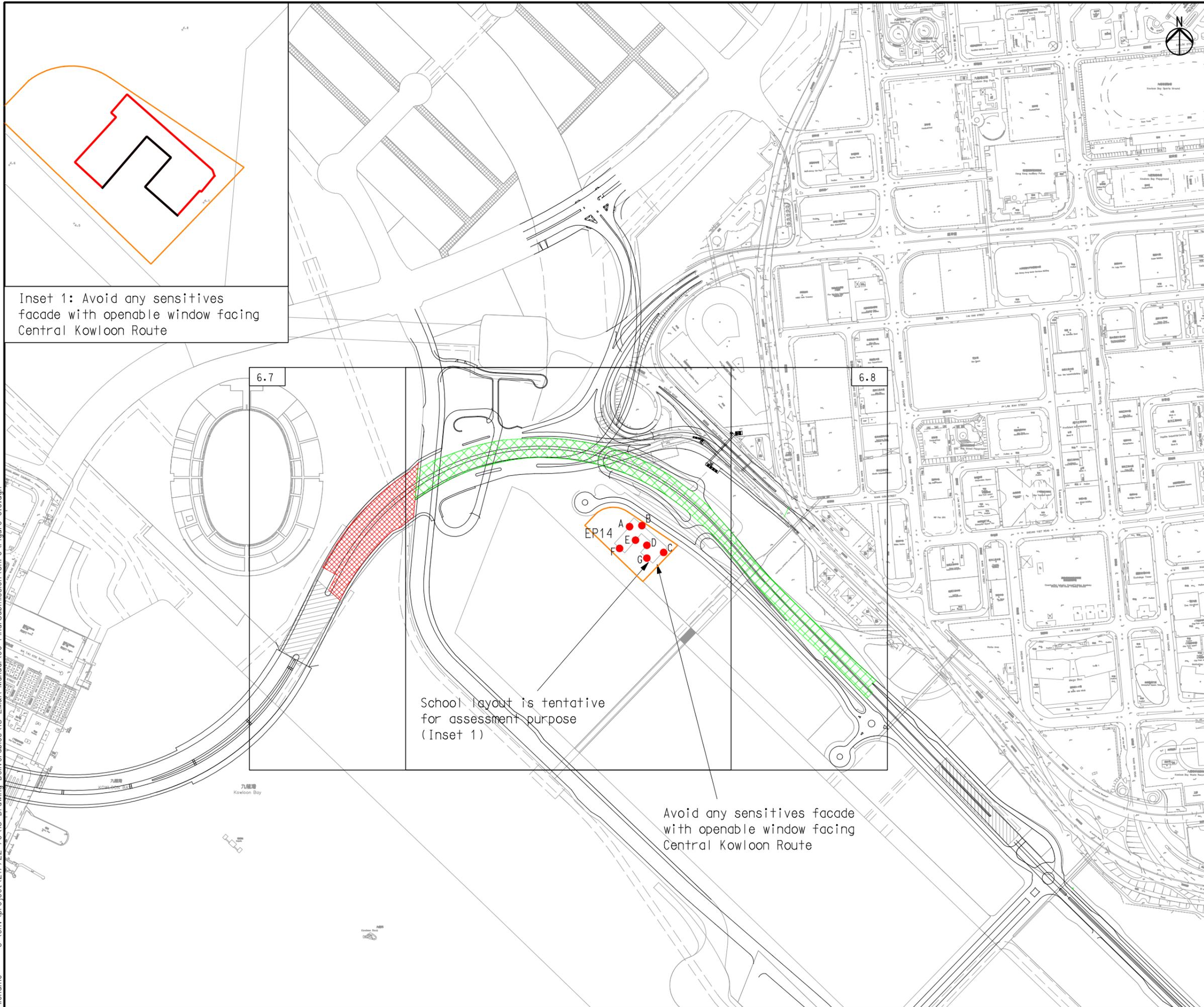
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GL	01/13	FC	ST
Scale	1:2000 ON A3		Status
			PRELIMINARY

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Inset 1: Avoid any sensitive facade with openable window facing Central Kowloon Route

School layout is tentative for assessment purpose (Inset 1)

Avoid any sensitive facade with openable window facing Central Kowloon Route

- Legend
- CKR Alignment
  - Planned Site 3B1
  - Low Noise Road Surfacing
  - Landscape Deck
  - Avoid any sensitive facade with openable window facing Central Kowloon Route

E	FIFTH ISSUE	GL	12/12
D	FOURTH ISSUE	GL	09/12
C	THIRD ISSUE	GL	06/12
B	SECOND ISSUE	GL	03/12
A	FIRST ISSUE	GL	12/11
Rev	Description	By	Date

Consultant

Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route - Design and Construction**

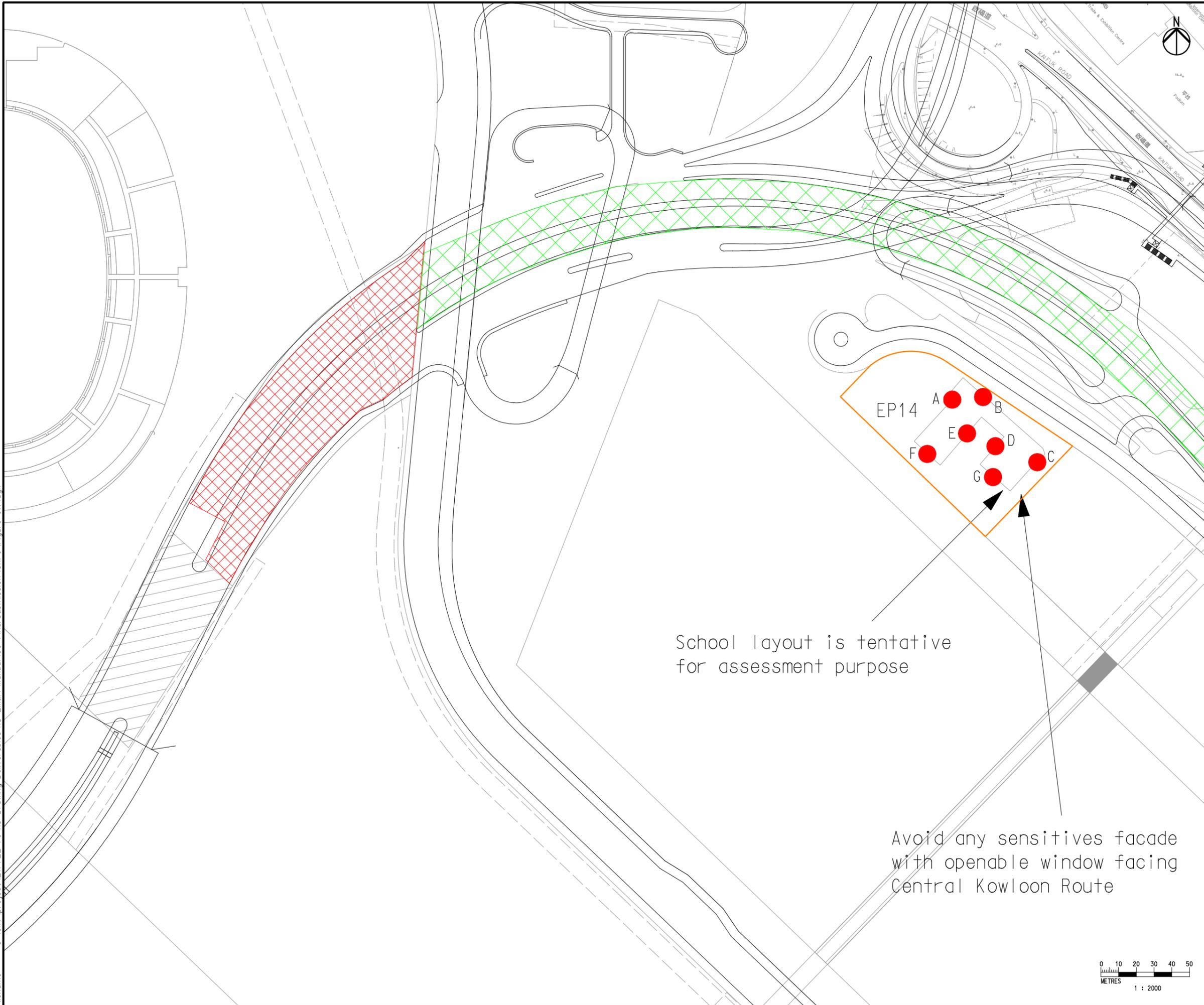
Drawing title  
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Drawing no. <b>Figure 6.6</b>		Rev. <b>E</b>	
Drawn GL	Date 12/12	Checked FC	Approved ST
Scale 1:5000 ON A3	Status <b>PRELIMINARY</b>		

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- Legend
- CKR Alignment
  - Planned Site 3B1
  - Low Noise Road Surfacing
  - Landscape Deck
  - Avoid any sensitives facade with openable window facing Central Kowloon Route

School layout is tentative for assessment purpose

Avoid any sensitives facade with openable window facing Central Kowloon Route

Rev	Description	By	Date
A	FIRST ISSUE		GL 12/11
B	SECOND ISSUE		GL 03/12
C	THIRD ISSUE		GL 06/12
D	FOURTH ISSUE		GL 09/12
E	FIFTH ISSUE		GL 12/12

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Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route - Design and Construction**

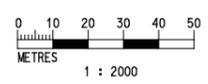
Drawing title  
**Location of Proposed Noise Mitigation Measures for Road Traffic Noise (East Portion) (Sheet 2 of 3)**

Drawing no. **Figure 6.7** Rev. **E**

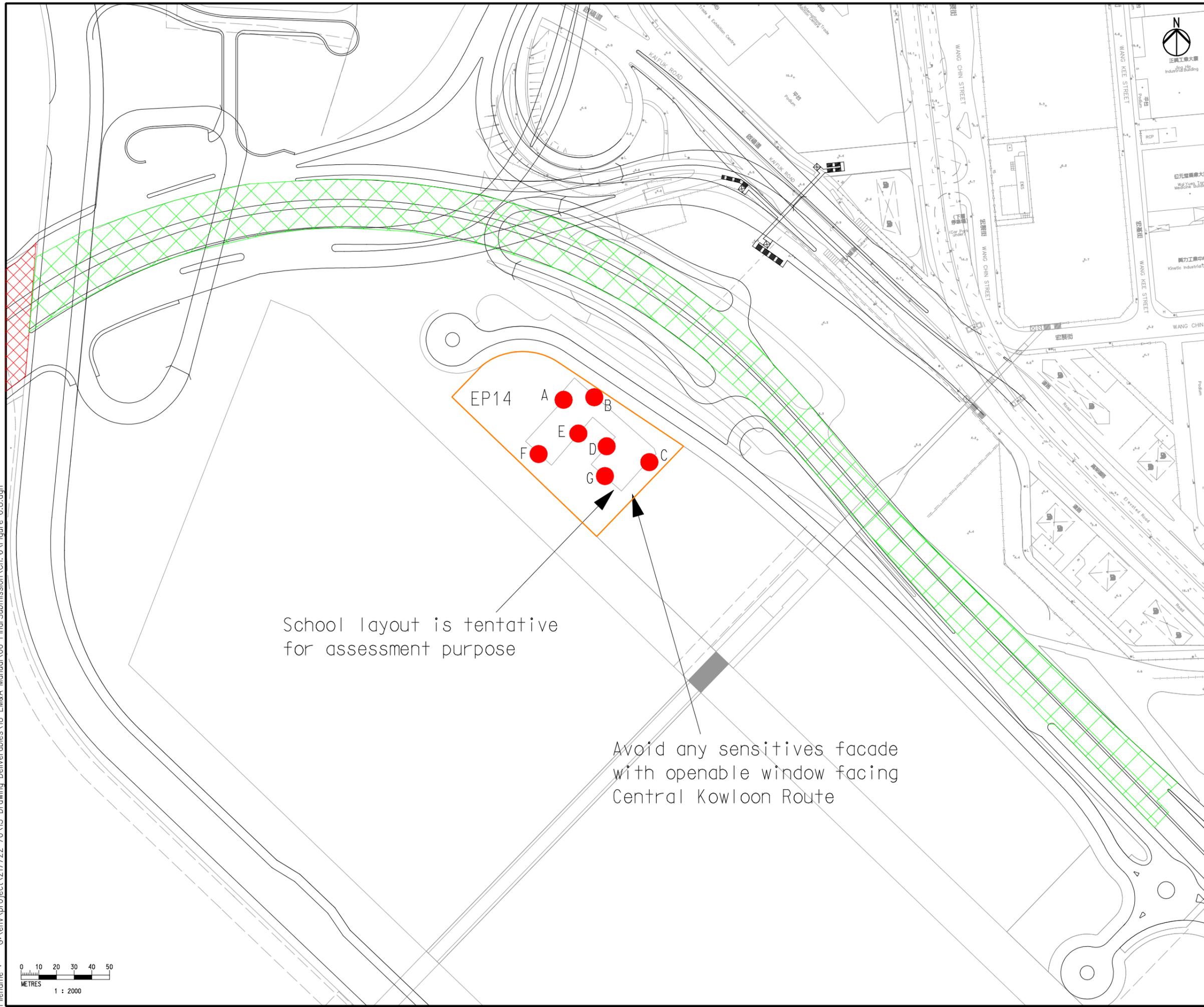
Drawn	Date	Checked	Approved
GL	12/12	FC	ST
Scale	1:2000 ON A3	Status	PRELIMINARY

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- Legend**
- CKR Alignment
  - Planned Site 3B1
  - Low Noise Road Surfacing
  - Landscape Deck
  - Avoid any sensitive facade with openable window facing Central Kowloon Route

School layout is tentative for assessment purpose

Avoid any sensitive facade with openable window facing Central Kowloon Route

Rev	Description	By	Date
E	FIFTH ISSUE	GL	12/12
D	FOURTH ISSUE	GL	09/12
C	THIRD ISSUE	GL	06/12
B	SECOND ISSUE	GL	03/12
A	FIRST ISSUE	GL	12/11

Consultant

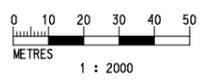
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**Central Kowloon Route - Design and Construction**

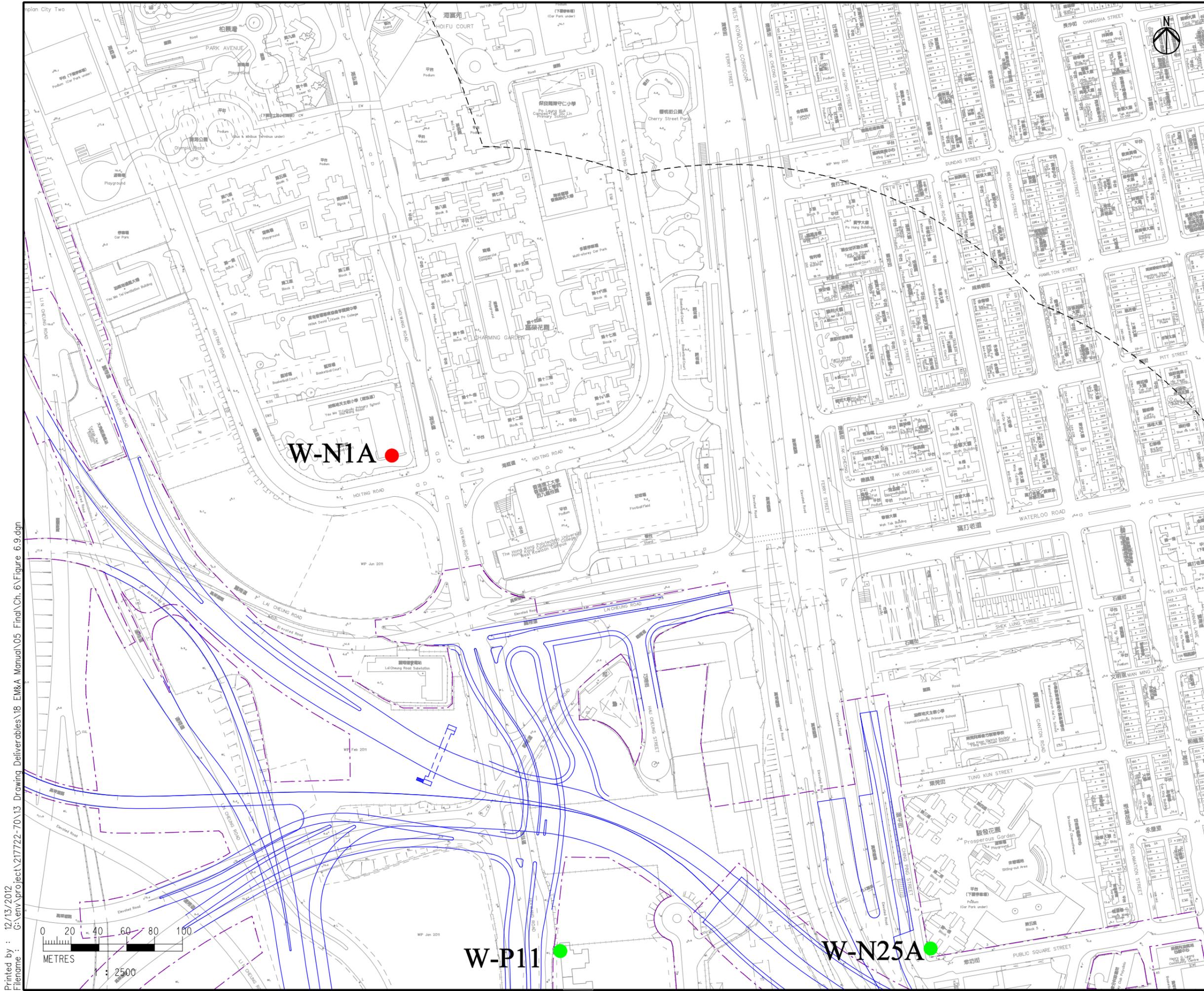
Drawing title  
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Drawing no. <b>Figure 6.8</b>		Rev. <b>E</b>	
Drawn GL	Date 12/12	Checked FC	Approved ST
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- Legend**
- CKR Alignment
  - - - Works Limit
  - - - 300m Assessment Area
  - Monitoring Station (Construction Phase)
  - Monitoring Station (Construction Phase & Operational Phase)

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D	FOURTH ISSUE	GL	09/12
C	THIRD ISSUE	GL	06/12
B	SECOND ISSUE	GL	03/12
A	FIRST ISSUE	GL	12/11
Rev	Description	By	Date

Consultant  
**ARUP**

Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route - Design and Construction**

Drawing title  
 Location of Noise Monitoring Stations (West Portion) (Sheet 1 of 2)

Drawing no. Figure 6.9		Rev. E	
Drawn GL	Date 12/12	Checked FC	Approved ST
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## **Appendix A**

### **Construction Programme**

**Project :** Central Kowloon Route

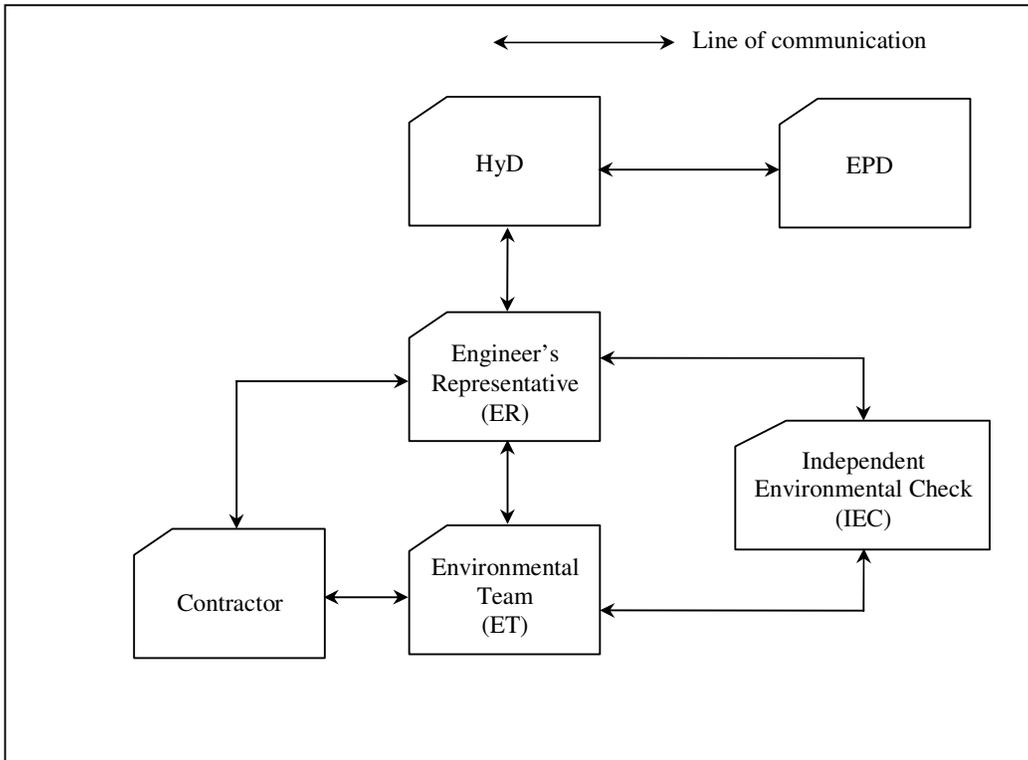
**Title :** Tentative Construction Programme

Activities	2015												2016												2017												2018												2019												2020											
	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
<b>Central Kowloon Route</b>	[Blue bar]																																																																							
Commencement of the Works	[Blue bar]																																																																							
West Portion	[Blue bar]																																																																							
Central Portion	[Blue bar]																																																																							
East Portion	[Blue bar]																																																																							
TCSS Works (project-wide)	[Blue bar]																																																																							
Testing and Commissioning	[Blue bar]																																																																							
Completion of the Works	[Blue bar]																																																																							

## **Appendix B**

### **Project Organization for Environmental Works**

# Project Organization for Environmental Works



## Appendix C

### Environmental Mitigation Implementation Schedule

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

Note: Chapters 1 to 3 of the EIA report present the background information of the Project, identified concurrent projects, objectives and scope for various environmental aspects, and description on alternative options and construction description. Chapters 4 to 12 of the EIA report present the EIA findings and mitigation measures are described below with cross-reference to the EIA report. Chapters 13 to 15 describe the environmental monitoring requirements and conclusion.

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
<b>Construction Dust Impact</b>							
S4.3.10	D1	The contractor shall follow the procedures and requirements given in the Air Pollution Control (Construction Dust) Regulation	Minimize dust impact at the nearby sensitive receivers	Contractor	All construction sites	Construction stage	<ul style="list-style-type: none"> <li>• APCO</li> <li>• To control the dust impact to meet HKAQO and TM-EIA criteria</li> </ul>
S4.3.10	D2	<ul style="list-style-type: none"> <li>• Mitigation measures in form of regular watering under a good site practice should be adopted. Watering once per hour on exposed worksites and haul road should be conducted to achieve dust removal efficiencies of 91.7%. While the above watering frequencies are to be followed, the extent of watering may vary depending on actual site conditions but should be sufficient to maintain an equivalent intensity of no less than 1.3 L/m<sup>2</sup> to achieve the dust removal efficiency</li> </ul>	Minimize dust impact at the nearby sensitive receivers	Contractor	All construction sites	Construction stage	<ul style="list-style-type: none"> <li>• APCO</li> <li>• To control the dust impact to meet HKAQO and TM-EIA criteria</li> </ul>
S4.3.10	D3	<ul style="list-style-type: none"> <li>• Proper watering of exposed spoil should be undertaken throughout the construction phase:</li> <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> </ul>	Minimize dust impact at the nearby sensitive receivers	Contractor	All construction sites	Construction stage	<ul style="list-style-type: none"> <li>• APCO</li> <li>• To control the dust impact to meet HKAQO and TM-EIA criteria</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<ul style="list-style-type: none"> <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> <li>• When there are open excavation and reinstatement works, hoarding of not less than 2.4m high should be provided and properly maintained 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;</li> <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</li> </ul>					

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<p>floor level of the building, or a canopy should be provided from the first floor level up to the highest level of the scaffolding;</p> <ul style="list-style-type: none"> <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 pulverised fuel ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides;</li> <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>					
S4.3.10	D4	<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 (including installation of 3-sided screen with top cover);</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> <p>For the unloading of spoil from trucks at barging point, installation of</p>	Minimize dust impact at the nearby sensitive receivers	Contractor	Kwai Chung Barging Point	Construction stage	<ul style="list-style-type: none"> <li>• Air Pollution Control (Construction Dust) Regulation</li> <li>• To control the dust impact to meet HKAQO and TM-EIA criteria</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		3-sided screen with top cover and the provision of water sprays at the discharge point would be provided for an assumed 50% dust suppression.					
S4.3.10	D5	Implement regular dust monitoring under EM&A programme during the construction stage.	Monitoring of dust impact	Contractor	Selected representative dust monitoring station	Construction stage	<ul style="list-style-type: none"> <li>• TM-EIA</li> </ul>
<b>Operational Air Quality Impact</b>							
S4.4.5.2	D7	<p>Air purification system (APS) should be adopted to remove the pollutant concentrations before releasing to atmosphere via the three ventilation buildings.</p> <p>In order to maintain the performance of the APS, air pollutant sensors would be adopted in the TVS/APS to monitor the pollutant concentration levels continuously at the inlet and outlet of the system.</p> <p>In case that the pollutant removal efficiencies were detected below the committed 80% for both particulate and NO<sub>2</sub>, as a contingency plan, immediate measures would be implemented to increase the overall contact time between the air pollutant and the APS to secure the pollutant removal rate.</p>	Minimize air pollutant concentrations from the tunnel at the nearby sensitive receivers	Highways Department / Contractor	Tunnel Section	Prior to operational stage / operational stage	<ul style="list-style-type: none"> <li>• APCO</li> </ul> <p>To control the pollutants concentration to meet HKAQO and TM-EIA criteria</p>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
<b>Construction Noise (Airborne)</b>							
S5.4.1	N1	Implement the following good site practices: <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 office and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.</li> </ul>	Control construction airborne noise	Contractor	All construction sites	Construction stage	• Annex 5, TM-EIAO
S5.4.1	N2	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	• Annex 5, TM-EIAO
S5.4.1	N3	Install movable noise barriers (typical design is wooden framed barrier with a small-cantilevered on a skid footing with 25mm thick internal sound absorptive lining), acoustic mat or full enclosure, screen the noisy plants including air compressors, generators and handheld breakers etc..	Screen the noisy plant items to be used at all construction sites	Contractor	All construction sites where practicable	Construction stage	• Annex 5, TM-EIAO

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
S5.4.1	N4	Use “Quiet plants”	Reduce the noise levels of plant items	Contractor	All construction sites where practicable	Construction stage	• Annex 5, TM-EIAO
S5.4.1	N5	Loading/unloading activities should be carried out inside the full enclosure of mucking out points	Reduce the noise levels of loading/unloading activities	Contractor	Mucking out locations	Construction stage	• Annex 5, TM-EIAO
S5.4.1	N6	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	• Annex 5, TM-EIAO
S5.4.1	N7	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	• TM-EIAO
S5.5.2	N8	Install temporary noise barriers along the works area at temporary Kowloon City Ferry Pier Public Transport Interchange	Reduce temporary PTI noise	Contractor	Kowloon City Ferry Pier	Different construction stages	• HKPSG
<b>Operational Noise (Airborne)</b>							
S5.5.1	N9	Provide noise barrier before operation of the proposed project and locations of barriers are stated as following: <ul style="list-style-type: none"> <li>• Approx. 250m of full enclosure including landscape deck at a height 9m above road level at West Portal of CKR (F01);</li> <li>• Approx. 110 of full enclosure at a height 10m above road level at Gascoigne Road Flyover (Ferry Street section) (F02);</li> <li>• Approx. 200m of full enclosure at a height 7m at Gascoigne Road</li> </ul>	Reduce operation airborne noise from road traffic	Contractor	Refer to Figure 6.1 – 6.8	Prior to operation of the Project	• TM-EIAO

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<p>Flyover (Kansu Street section) (NB+SB) (F03);</p> <ul style="list-style-type: none"> <li>• Approx. 120m of semi-enclosure with opening at west at a height 8m at Lin Cheung Road (S01);</li> <li>• Approx. 270m of semi-enclosure with opening at west at a height 8m above road level at Re-aligned Hoi Wang Road (S02);</li> <li>• Approx. 85m of semi-enclosure with opening at south at a height 7m above road level at Gascoigne Road Flyover (Ferry Street section) (SB) (S03);</li> <li>• Approx. 45m of semi-enclosure with opening at south at a height 7m above road level at Gascoigne Road Flyover (Ferry Street section) (NB+SB) (S04);</li> <li>• Approx. 60m of semi-enclosure with opening at north at a height 6m above road level at Gascoigne Road Flyover (Kansu Street section) (SB) (S05);</li> <li>• Approx. 155m of cantilevered barrier at a height 5m with 3m cantilevered at Connection E (C01);</li> <li>• Approx. 85m of cantilevered barrier at a height 5m with 3m cantilevered at Lin Cheung Road (C02);</li> <li>• Approx. 85m of cantilevered barrier at a height 5m with 3m cantilevered at Ferry Street (at-grade) (C03);</li> <li>• Approx. 190m of cantilevered barrier at a height 5m with 3m cantilevered at Connection E (C04);</li> <li>• Approx. 120m of cantilevered barrier at a height 5m with 3m cantilevered at Connection E (C05);</li> <li>• Approx. 170m of cantilevered barrier at a height 5m with 3m cantilevered at Connection A (C06);</li> <li>• Approx. 160m of cantilevered barrier at a height 5m with 1m cantilevered at Ferry Street (at-grade) (C07);</li> </ul>					

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<ul style="list-style-type: none"> <li>• Approx. 120m of vertical barrier at a height 4m above road level at Lin Cheung Road (V01);</li> <li>• Approx. 190m of vertical barrier at a height 3.8m above road level at Connection D (V02);</li> <li>• Approx. 100m of vertical barrier at a height 5.8m above road level at Connection E (V03);</li> <li>• Approx. 50m of vertical barrier at a height 4m above road level at widening of Lai Cheung Road (V04);</li> <li>• Approx. 110m of vertical barrier at a height of 3.3m above road level at Gascoigne Road Flyover (Ferry Street section) (V05);</li> <li>• Approx. 100m of vertical barrier at a height of 3.8m above road level at Gascoigne Road Flyover (Ferry Street section) (central divider) (V06);</li> <li>• Approx. 60m of vertical barrier at a height 4.3m above road level at Gascoigne Road Flyover (Kansu Street section) (SB) (V07); and</li> <li>• Approx. 60m of vertical barrier at a height of 2.8m above road level at Gascoigne Road Flyover (Kansu Street section) (central divider) (V08).</li> </ul>					
S5.5.2	N10	Provide landscape deck at Kowloon City Ferry Pier Public Transport Interchange	Reduce PTI noise	Contractor	Kowloon City Ferry Pier	Prior to operation of the Project	• HKPSG
S5.5.2	N11	<ul style="list-style-type: none"> <li>• The detailed design should incorporate the following good practices in order to minimize the nuisance on the nearby NSRs.</li> <li>• Louvers should be orientated away from adjacent NSRs, preferably onto main roads which are less sensitive.</li> <li>• Direct noise mitigation measures including silencers, acoustic louvers and acoustic enclosures should be allowed for in the design for the ventilation building.</li> </ul>	Control operational airborne noise due to the operation of fixed plant	Engineer	Ventilation Building	Design stage	• Noise Control Ordinance

### Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<ul style="list-style-type: none"> <li>• The façade for these plant areas/ventilation shafts should have adequate sound insulation properties to minimise the noise emanating through the building fabric.</li> </ul>					

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
<b>Water Quality (Construction Phase)</b>							
S6.9.1.1	W1	<p>In accordance with the Practice Note for Professional Persons on Construction Site Drainage, Environmental Protection Department, 1994 (ProPECC PN1/94), construction phase mitigation measures shall include the following:</p> <p><u>Construction Runoff</u></p> <ul style="list-style-type: none"> <li>• At the start of site establishment (including the barging facilities), perimeter cut-off drains to direct off-site water around the site should be constructed with internal drainage works and erosion and sedimentation control facilities implemented. Channels (both temporary and permanent drainage pipes and culverts), earth bunds or sand bag barriers should be provided on site to direct stormwater to silt removal facilities. The design of the temporary on-site drainage system will be undertaken by the contractor prior to the commencement of construction.</li> <li>• The dikes or embankments for flood protection should be implemented around the boundaries of earthwork areas. Temporary ditches should be provided to facilitate the runoff discharge into an appropriate watercourse, through a site/sediment trap. The sediment/silt traps should be incorporated in the permanent drainage channels to enhance deposition rates.</li> <li>• The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94, which states that the retention time for silt/sand traps should be 5 minutes under maximum flow conditions. Sizes may vary depending upon the flow rate, but for a flow rate of 0.1 m<sup>3</sup>/s a sedimentation basin of 30m<sup>3</sup> would be required and for a flow rate of 0.5 m<sup>3</sup>/s the basin would be 150 m<sup>3</sup>. The detailed design of the sand/silt traps shall be undertaken by the contractor prior to the commencement of construction.</li> </ul>	To minimize water quality impact from construction site runoff and general construction activities	Contractor	All construction sites where practicable	Construction stage	<ul style="list-style-type: none"> <li>• Water Pollution Control Ordinance</li> <li>• ProPECC PN1/94</li> <li>• TM-EIAO</li> <li>• TM-DSS</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<ul style="list-style-type: none"> <li>• All exposed earth areas should be completed and vegetated as soon as possible after earthworks have been completed, or alternatively, within 14 days of the cessation of earthworks where practicable. Exposed slope surfaces should be covered by tarpaulin or other means.</li> <li>• The overall slope of the site should be kept to a minimum to reduce the erosive potential of surface water flows, and all traffic areas and access roads protected by coarse stone ballast. An additional advantage accruing from the use of crushed stone is the positive traction gained during prolonged periods of inclement weather and the reduction of surface sheet flows.</li> <li>• All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly following rainstorms. Deposited silt and grit should be removed regularly and disposed of by spreading evenly over stable, vegetated areas.</li> <li>• Measures should be taken to minimise the ingress of site drainage into excavations. If the excavation of trenches in wet periods is necessary, they should be dug and backfilled in short sections wherever practicable. Water pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.</li> <li>• Open stockpiles of construction materials (for example, aggregates, sand and fill material) of more than 50m<sup>3</sup> should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.</li> <li>• Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the drainage</li> </ul>					

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<p>system and storm runoff being directed into foul sewers.</p> <ul style="list-style-type: none"> <li>• Precautions be taken at any time of year when rainstorms are likely, actions to be taken when a rainstorm is imminent or forecasted, and actions to be taken during or after rainstorms are summarised in Appendix A2 of ProPECC PN 1/94. Particular attention should be paid to the control of silty surface runoff during storm events, especially for areas located near steep slopes.</li> <li>• All vehicles and plant should be cleaned before leaving a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. An adequately designed and sited wheel washing facilities should be provided at every construction site exit where practicable. Wash-water should have sand and silt settled out and removed at least on a weekly basis to ensure the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-wash bay to the public road should be paved with sufficient backfall toward the wheel-wash bay to prevent vehicle tracking of soil and silty water to public roads and drains.</li> <li>• Oil interceptors should be provided in the drainage system downstream of any oil/fuel pollution sources. The oil interceptors should be emptied and cleaned regularly to prevent the release of oil and grease into the storm water drainage system after accidental spillage. A bypass should be provided for the oil interceptors to prevent flushing during heavy rain.</li> <li>• Construction solid waste, debris and rubbish on site should be collected, handled and disposed of properly to avoid water quality impacts.</li> <li>• All fuel tanks and storage areas should be provided with locks and sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank to prevent spilled fuel oils from reaching water sensitive receivers nearby.</li> </ul>					

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<ul style="list-style-type: none"> <li>Adopt best management practices</li> <li>All the earth works involving should be conducted sequentially to limit the amount of construction runoff generated from exposed areas during the wet season (April to September) as far as practicable.</li> </ul>					
S6.9.1.2	W2	<p><u>Tunnelling Works and Underground Works</u></p> <ul style="list-style-type: none"> <li>Cut-&amp;-cover tunnelling work should be conducted sequentially to limit the amount of construction runoff generated from exposed areas during the wet season (April to September) as far as practicable.</li> <li>Uncontaminated discharge should pass through sedimentation tanks prior to off-site discharge</li> <li>The wastewater with a high concentration of SS should be treated (e.g. by sedimentation tanks with sufficient retention time) before discharge. Oil interceptors would also be required to remove the oil, lubricants and grease from the wastewater.</li> <li>Direct discharge of the bentonite slurry (as a result of D-wall and bored tunnelling construction) is not allowed. It should be reconditioned and reused wherever practicable. Temporary storage locations (typically a properly closed warehouse) should be provided on site for any unused bentonite that needs to be transported away after all the related construction activities are completed. The requirements in ProPECC PN 1/94 should be adhered to in the handling and disposal of bentonite slurries.</li> </ul>	To minimize construction water quality impact from tunneling works	Contractor	All tunneling portion	Construction stage	<ul style="list-style-type: none"> <li>Water Pollution Control Ordinance</li> <li>ProPECC PN 1/94</li> <li>TM-DSS</li> <li>TM-EIAO</li> </ul>
S6.9.1.3	W3	<p><u>Sewage Effluent</u></p> <ul style="list-style-type: none"> <li>Portable chemical toilets and sewage holding tanks are recommended for handling the construction sewage generated by the workforce. A licensed contractor should be employed to provide appropriate and adequate portable toilets and be</li> </ul>	To minimize water quality from sewage effluent	Contractor	All construction sites where practicable	Construction stage	<ul style="list-style-type: none"> <li>Water Pollution Control Ordinance</li> <li>TM-DSS</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		responsible for appropriate disposal and maintenance.					
S6.9.1.5	W4	<p><u>Groundwater from Potential Contaminated Area:</u></p> <ul style="list-style-type: none"> <li>• No direct discharge of groundwater from contaminated areas should be adopted.</li> <li>• A discharge license under the WPCO through the Regional Office of EPD for groundwater discharge should be applied. Prior to the excavation works within these potentially contaminated areas, the groundwater quality should be reviewed during the process of discharge license application. The compliance to the Technical Memorandum on Standards for Effluents Discharged into Drainage on Sewerage Systems, Inland and Coastal Waters (TM-DSS) and the existence of prohibited substance should be confirmed. If the review results indicated that the groundwater to be generated from the excavation works would be contaminated, the contaminated groundwater should be either properly treated in compliance with the requirements of the TM-DSS or properly recharged into the ground.</li> <li>• If wastewater treatment is deployed, the wastewater treatment unit shall deploy suitable treatment process (e.g. oil interceptor / activated carbon) to reduce the pollution level to an acceptable standard and remove any prohibited substances (e.g. TPH) to undetectable range. All treated effluent from wastewater treatment plant shall meet the requirements as stated in TM-DSS and should be discharged into the foul sewers.</li> <li>• If groundwater recharging wells are deployed, recharging wells should be installed as appropriate for recharging the contaminated groundwater back into the ground. The recharging wells should be selected at places where the groundwater quality will not be affected by the recharge operation as indicated in the Section 2.3 of TM-DSS. The baseline groundwater quality shall be determined prior to the selection of the recharge wells, and submit a working plan (including the laboratory analytical results</li> </ul>	To minimize groundwater quality impact from contaminated area	Contractor	Excavation areas where contamination is found.	Construction stage	<ul style="list-style-type: none"> <li>• Water Pollution Control Ordinance</li> <li>• TM-DSS</li> <li>• TM-EIAO</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		showing the quality of groundwater at the proposed recharge location(s) as well as the pollutant levels of groundwater to be recharged) to EPD for agreement. Pollution levels of groundwater to be recharged shall not be higher than pollutant levels of ambient groundwater at the recharge well. Prior to recharge, any prohibited substances such as TPH products should be removed as necessary by installing the petrol interceptor.					
S6.7.2.1	W5	<p><u>Temporary Reclamation</u></p> <ul style="list-style-type: none"> <li>• During temporary reclamation, regular litter / rubbish clearance and avoidance of illegal discharges within the embayed marine water should be undertaken.</li> <li>• During temporary reclamation, the perimeter silt curtain should be deployed.</li> </ul>	To minimize water quality impact from temporary reclamation	Contractor	Temporary Reclamation	Construction stage	<ul style="list-style-type: none"> <li>• Water Pollution Control Ordinance</li> <li>• TM-DSS</li> <li>• TM-EIAO</li> </ul>
S6.9.1.6	W6	<p><u>Accidental spillage</u></p> <p>In order to prevent accidental spillage of chemicals, the following is recommended:</p> <ul style="list-style-type: none"> <li>• All the tanks, containers, storage area should be bunded and the locations should be locked as far as possible from the sensitive watercourse and stormwater drains.</li> <li>• The Contractor should register as a chemical waste producer if chemical wastes would be generated. Storage of chemical waste arising from the construction activities should be stored with suitable labels and warnings.</li> </ul> <p>Disposal of chemical wastes should be conducted in compliance with the requirements as stated in the Waste disposal (Chemical Waste) (General) Regulation.</p>	To minimize water quality impact from accidental spillage	Contractor	All construction sites where practicable	Construction stage	<ul style="list-style-type: none"> <li>• Water Pollution Control Ordinance</li> <li>• ProPECC PN1/94</li> <li>• TM-EIAO</li> <li>• TM-DSS</li> </ul>
S6.9.2.2	W7	<p><u>Dredging Works</u></p> <p>The following good practice shall apply for the dredging works:</p>	To minimize sediment suspension during dredging	Contractor	Kai Tak Barging Point during	Dredging period	<ul style="list-style-type: none"> <li>• Water Pollution Control Ordinance</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<ul style="list-style-type: none"> <li>• Install efficient silt curtains, i.e. at least 75% SS reduction, at the point of seawall dredging to control the dispersion of SS;</li> <li>• Implement water quality monitoring to ensure effective control of water pollution and recommend additional mitigation measures required;</li> <li>• The decent speed of grabs should be controlled to minimize the seabed impact and to reduce the volume of over-dredging;</li> <li>• All vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash;</li> <li>• The dredging rates by closed grab dredgers for temporary marine channel outside pipepile wall shall be less than 1,500 m<sup>3</sup>/day and 125 m<sup>3</sup>/hour (without concurrent dredging with T2 in dry season only) or 750 m<sup>3</sup>/day and 62.5 m<sup>3</sup>/hour for other conditions respectively.</li> <li>• Dredging works shall be only for the provision marine channel. No dredging work is required for temporary reclamation; and</li> <li>• The workfront of temporary reclamation shall be surrounded by cofferdams and the associated excavation and backfilling works for temporary reclamation shall have no contact with seawater.</li> </ul>			dredging works		<ul style="list-style-type: none"> <li>• TM-EIAO</li> </ul>
S6.9.2.2	W8	<p>While WSR 2 (Planned Kai Tak Cooling Water Intake). is a planned receiver, the project proponent shall liaise with the project proponent of District Cooling System (DCS) for Kai Tak Development on the implementation programme prior to wet season dredging. In case the DCS would be operated during the dredging period of CKR, additional silt screen to the cooling water intake shall be provided to WSR 2. The following specific mitigation measures shall apply for the dredging works:</p> <ul style="list-style-type: none"> <li>• In dry season, the dredging rate shall be less than 1500m<sup>3</sup>/day if</li> </ul>	To minimize sediment suspension during dredging if the District Cooling System for Kai Tak Development would be operated in the same period	Contractor	Kai Tak Barging Point during dredging works	Dredging period	<ul style="list-style-type: none"> <li>• Water Pollution Control Ordinance</li> <li>• TM-EIAO</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<p>no concurrent projects.</p> <ul style="list-style-type: none"> <li>• In all other scenario, the dredging rate shall be less than 750m<sup>3</sup>/day</li> <li>• Dredging works shall be only for the provision marine channel. No dredging work is required for temporary reclamation.</li> <li>• The workfront of temporary reclamation shall be surrounded by cofferdams and the associated excavation and backfilling works for temporary reclamation shall have no contact with seawater.</li> <li>• In case the DCS would be operated during the dredging period of CKR, silt screen shall be provided for WSR2.</li> </ul>					
S6.9.2	W9	<p><u>Handling of Dredged Sediment / Barging Operation</u></p> <ul style="list-style-type: none"> <li>• All barges should be fitted with tight bottom seals to prevent leakage of materials during transport;</li> <li>• Barges or hoppers should not be filled to a level that will cause overflow of materials or polluted water during loading or transportation;</li> <li>• All vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash; and</li> <li>• Loading of barges and hoppers should be controlled to prevent splashing of material into the surrounding water.</li> <li>• Mitigation measures for land-based activities as outlined above should be applied to minimise water quality impacts from site runoff and open stockpile spoils at the proposed barging facilities where appropriate.</li> </ul>	To minimize and mitigate the water disturbance during dredged sediment handling/barging operation	Contractor	All land-based site and proposed Kwai Chung barging point	Construction stage	<ul style="list-style-type: none"> <li>• Water Pollution Control Ordinance</li> <li>• TM-EIAO</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
S6.9	W10	Implement a marine water quality monitoring programme	Monitor marine water quality prior to and during dredging period	Contractor	At identified monitoring location	Prior to and during dredging period	<ul style="list-style-type: none"> <li>• Water Pollution Control Ordinance</li> <li>• TM-DSS</li> <li>• EIA-TM</li> </ul>
<b>Water Quality (Operational Phase)</b>							
S6.9.3	W11	<p>The following mitigation measures are only required to minimize the road runoff and wastewater discharge from APS during the operational phase, the following mitigation measures during operational phase are recommended:</p> <ul style="list-style-type: none"> <li>• Drainage discharge should pass through oil/grit interceptors/chambers to remove oil, grease and sediment before discharged into the public storm drainage/foul sewerage system;</li> <li>• The silt traps and oil interceptors should be cleaned and maintained regularly;</li> <li>• Oily contents of the oil interceptors should be transferred to an appropriate disposal facility, or to be collected for reuse, if possible;</li> <li>• The wastewater from ESP should be properly treated prior to either discharge to public sewerage systems or collected by licenced contractor as appropriate; and</li> <li>• Depending on the proprietary design and the chemical content of the aqueous solutions discharge from the NO<sub>2</sub> removal process, these solutions should either be collected by licenced chemical waste collectors and sent to Chemical Waste Treatment Facilities at Tsing Yi as required under the Chemical Waste Ordinance, or discharged to public sewerage systems.</li> </ul>	To minimize the road runoff and wastewater discharge from APS during the operational phase	Highways Department / Contractors	Whole alignment	Operational Stage	<ul style="list-style-type: none"> <li>• Water Pollution Control Ordinance</li> <li>• TM-DSS</li> </ul>

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EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
<b>Waste Management (Construction Waste)</b>							
S7.4.1	WM1	<p><u>On-site sorting of C&amp;D material</u></p> <ul style="list-style-type: none"> <li>Geological assessment should be carried out by competent persons on site during excavation to identify materials which are not suitable to use as aggregate in structural concrete (e.g. volcanic rock, Aplite dyke rock, etc). Volcanic rock and Aplite dyke rock should be separated at the source sites as far as practicable and stored at designated stockpile areas preventing them from delivering to crushing facilities. The crushing plant operator should also be reminded to set up measures to prevent unsuitable rock from ended up at concrete batching plants and be turned into concrete for structural use. Details regarding control measures at source site and crushing facilities should be submitted by the Contractors for the Engineer to review and agree. In addition, site records should also be kept for the types of rock materials excavated and the traceability of delivery will be ensured with the implementation of Trip Ticket System and enforced by site supervisory staff as stipulated under DEVB TC(W) No. 6/2010 for tracking of the correct delivery to the rock crushing facilities for processing into aggregates. Alternative disposal option for the reuse of volcanic rock and Aplite Dyke rock, etc should also be explored.</li> </ul>	Separation of unsuitable rock from ending up at concrete batching plants and be turned into concrete for structural use	Contractor	All construction sites	Construction stage	<ul style="list-style-type: none"> <li>DEVB TC(W) No. 6/2010</li> </ul>
S7.5.1	WM2	<p><u>Construction and Demolition Material</u></p> <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</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	<ul style="list-style-type: none"> <li>Land (Miscellaneous Provisions) Ordinance</li> <li>Waste Disposal Ordinance</li> <li>ETWB TCW No.</li> </ul>

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		<p>structures and facilities 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> </ul>					19/2005
S7.5.1	WM3	<p><u>C&amp;D Waste</u></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	<ul style="list-style-type: none"> <li>• Land (Miscellaneous Provisions) Ordinance</li> <li>• Waste Disposal Ordinance</li> <li>• ETWB TCW No. 19/2005</li> </ul>
S7.5.1	WM4	<p><u>Excavated Contaminated Soils</u></p> <ul style="list-style-type: none"> <li>• Details of the mitigation measures on handling of the contaminated soil shall be referred to Section on Land</li> </ul>	The contaminated soil will be excavated for on-site reuse	Contractor	PBH4	Prior to commencement of construction works within the	<ul style="list-style-type: none"> <li>• Practice Guide (PG) for Investigation and Remediation of</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		Contamination below.				contaminated area	Contaminated Land • GN/GM for land contamination
S7.5.1	WM5	<p><u>Land-based and Marine-based Sediment</u></p> <ul style="list-style-type: none"> <li>• All construction plant and equipment shall be designed and maintained to minimize the risk of silt, sediments, contaminants or other pollutants being released into the water column or deposited in the locations other than designated location;</li> <li>• All vessels shall be sized such that adequate draft 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;</li> <li>• Before moving the vessels which are used for transporting dredged material, excess material shall be cleaned from the decks and exposed fittings of vessels and the excess materials shall never be dumped into the sea except at the approved locations;</li> <li>• Adequate freeboard shall be maintained on barges to ensure that decks are not washed by wave action.</li> <li>• The Contractors shall monitor all vessels transporting material to ensure that no dumping outside the approved location takes place. The Contractor shall keep and produce logs and other records to demonstrate compliance and that journeys are consistent with designated locations and copies of such records shall be submitted to the engineers;</li> <li>• The Contractors shall comply with the conditions in the dumping licence.</li> <li>• All bottom dumping vessels (Hopper barges) shall be fitted with tight fittings seals to their bottom openings to prevent leakage of</li> </ul>	To control pollution due to marine sediment	Contractor	Along CKR alignment	Construction Stage	• ETWB TCW No. 34/2002

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<p>material;</p> <ul style="list-style-type: none"> <li>• The material shall be placed into the disposal pit by bottom dumping;</li> <li>• Contaminated marine mud shall be transported by spit barge of not less than 750m<sup>3</sup> capacity and capable of rapid opening and discharge at the disposal site;</li> <li>• Discharge shall be undertaken rapidly and the hoppers shall be closed immediately. Material adhering to the sides of the hopper shall not be washed out of the hopper and the hopper shall remain closed until the barge returns to the disposal site.</li> <li>• For Type 3 special disposal treatment, sealing of contaminant with geosynthetic containment before dropping into designated mud pit would be a possible arrangement. A geosynthetic containment method is a method whereby the sediments are sealed in geosynthetic containers and, the containers would be dropped into the designated contaminated mud pit where they would be covered by further mud disposal and later by the mud pit capping at the disposal site, thereby fulfilling the requirements for fully confined mud disposal.</li> </ul>					
S7.5.1	WM6	<p><u>Chemical Waste</u></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</li> </ul>	Control the chemical waste and ensure proper storage, handling and disposal.	Contractor	All construction sites	Construction stage	<ul style="list-style-type: none"> <li>• Waste Disposal (Chemical Waste) (General) Regulation</li> <li>• Code of Practice on the Packaging, Labelling and Storage of Chemical Waste</li> </ul>

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EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<p>regulation.</p> <ul style="list-style-type: none"> <li>The storage area for chemical wastes should be clearly labelled 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>					
S7.5.1	WM7	<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</li> </ul>	Minimize production of the general refuse and avoid odour, pest and litter impacts	Contractor	All construction sites	Construction stage	<ul style="list-style-type: none"> <li>Waste Disposal Ordinance</li> </ul>

### Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		local collection scheme should be considered by the Contractor.					
<b>Waste Management (Operational Waste)</b>							
S7.5.2	WM8	<p><u>General Refuse</u></p> <p>A reputable waste collector should be employed to remove general refuse and industrial wastes generated from the administrative building and ventilation buildings on a daily basis to minimize odour, pest and litter impacts.</p>	Minimize production of the general refuse and avoid odour, pest and litter impacts	Highways Department / Contractor	Administrative building and ventilation buildings	Operational stage	• Waste Disposal Ordinance
S7.5.2	WM9	<p><u>Chemical Waste</u></p> <p>The requirements given in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes should be followed in handling of these chemical wastes. A trip-ticket system should be operated in accordance with the Waste Disposal (Chemical Waste) (General) Regulation to monitor all movements of chemical wastes which will be collected by a licensed collector to a licensed facility for final treatment and disposal.</p>	Minimize production of the chemical waste	Highways Department / Contractor	Administrative building and ventilation buildings	Operational stage	• Waste Disposal Ordinance

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EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
<b>Land Contamination</b>							
S8.10, S8.12 & Appendix 8.4	LC1	<p><u>Remaining SI Works</u></p> <p>The potential for land contamination issues at EBH1, EBH2, and EBH3 will be confirmed by site investigation after site possession and utility diversion by the construction contractor. Following the completion of the remaining SI works, the Project Proponent would prepare and submit a Second Supplementary CAR/RAP to EPD to present the findings of the SI works and to recommend specific remediation measures, if required. Upon completion of the remediation works, if any, a Remediation Report (RR) would be prepared and submitted to EPD for agreement prior to commencement of the construction works.</p>	Investigation of the potential land contamination issues at EBH1, EBH2 and EBH3 which cannot be completed at the EIA stage due to underground utility and site access constraints.	Contractor	EBH1, EBH2 and EBH3	Prior to commencement of construction works at the Kowloon City Ferry Pier Public Transport Interchange (PTI) (for EBH1 & EBH2) and the works area adjacent to the To Kwa Wan Vehicle Examination Centre (for EBH3)	<ul style="list-style-type: none"> <li>• Practice Guide (PG) for Investigation and Remediation of Contaminated Land</li> <li>• Guidance Notes for Contaminated Land Assessment and Remediation</li> <li>• Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management</li> </ul>
S8.9 & Appendix 8.4	LC2	<p><u>Excavation of the Contaminated Soil</u></p> <ul style="list-style-type: none"> <li>• Prior to commencement of the excavation works at the contamination zone, the zone should be clearly marked out on site and the surface levels recorded. Excavation of contaminated material should be undertaken using dedicated earth-moving plant.</li> <li>• The excavated contaminated soils would be stockpiled at designated area on site and covered by sheet to prevent dispersion of contamination during stockpiling.</li> <li>• The Contractor should pay attention to the selection of suitable groundwater lowering schemes and discharge points if the groundwater table is higher than the contaminated soils during excavation. The Contractor should also obtain a valid Water Pollution Control Ordinance (WPCO) discharge licence from EPD where applicable.</li> </ul>	The contaminated soil will be excavated for on-site reuse	Contractor	PBH4	Prior to commencement of construction works within the contaminated area	

**Environmental Mitigation Implementation Schedule – Central Kowloon Route**

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved						
S8.9 & Appendix 8.4	LC3	<ul style="list-style-type: none"> <li>Following completion of the excavation to the specified depth, at least one sample from the base of the excavation and four samples evenly distributed along the boundary of the excavation shall be taken for a closure assessment testing. The acceptance criterion is shown below:</li> </ul> <table border="1" data-bbox="344 579 1016 743"> <thead> <tr> <th data-bbox="344 579 568 644">Locations</th> <th data-bbox="568 579 801 644">Testing requirement</th> <th data-bbox="801 579 1016 644">Acceptance Criteria</th> </tr> </thead> <tbody> <tr> <td data-bbox="344 644 568 743">PBH4</td> <td data-bbox="568 644 801 743">PCBs</td> <td data-bbox="801 644 1016 743">RBRGs (Public Park)</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>If the results of analysis below the RBRGs (Public Park), no further excavation will be required.</li> </ul> <p>If the analysis indicates presence of contamination (i.e. non-compliance of the acceptance criteria), further excavation shall be carried out in 0.5m increment vertically and/or horizontally depending on the location(s) of the sample(s) which has exceeded the acceptance criteria. Further sampling shall also be conducted for compliance testing. The process of excavation, sampling and compliance testing should continue until all contaminated materials are removed and should be supervised by a Land Contamination Specialist.</p>	Locations	Testing requirement	Acceptance Criteria	PBH4	PCBs	RBRGs (Public Park)					
Locations	Testing requirement	Acceptance Criteria											
PBH4	PCBs	RBRGs (Public Park)											

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Appendix 8.4	LC4	<ul style="list-style-type: none"> <li>• A Remediation Report (RR) to demonstrate adequate clean-up shall be prepared and submitted to EPD for endorsement prior to the commencement of any construction/development works within the sites. No construction/development works shall be carried out prior to the endorsement of the RR by EPD.</li> </ul>					

**Environmental Mitigation Implementation Schedule – Central Kowloon Route**

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
<b>Hazard to Life</b>							
S9.18	H1	Blasting activities regarding transport and use of explosives should be supervised and audited by competent site staff to ensure full compliance with the blasting permit conditions.	To ensure that the risks from the proposed explosives handling and transport would be acceptable	Contractor	Works areas at which explosives would be used	Construction phase	•Dangerous Goods Ordinance
S9.6, para.4	H2	Detonators shall not be transported in the same vehicle with other Category 1 Dangerous Goods.	To reduce the risk of explosion during the transport of cartridged emulsion	Contractor	-	Construction phase	•Dangerous Goods Ordinance
S9.6, para.8	H3	The explosives delivery trucks should be approved by Mines Division and should meet the regulatory requirements for transport of explosives.	To comply with the requirements for approval of an explosives delivery vehicle required under the License or Permit conditions	Contractor	-	Construction phase	•Dangerous Goods Ordinance
S9.10, para.7 and S9.18	H4	Blast doors should be provided for tunnels and blast cover should be provided for shaft at HMT, and kept closed during blasting,  Provision of blast doors or heavy duty blast curtains should be implemented at the shafts, adits and other suitable locations to prevent flyrock and control the air overpressure.	To ensure safe use of explosives	Contractor	Tunnels and shafts	Construction phase	-
S9.18	H5	Only the required quantity of explosives for a particular blast should be transported to avoid the return.	To reduce the risk during explosives transport	Contractor	Works areas at which explosives would be	Construction phase	-

### Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
					used		
S9.18	H6	Maximum instantaneous charge (MIC) should be within the MIC as specified for the given section.	To ensure safe use of explosives	Contractor	Along tunnel alignment	Construction phase	-
S9.18	H7	The approved truck dedicated for transport of explosives should comply with the "Guidance Note on Requirements for Approval of an Explosives Delivery Vehicle" issued by CEDD Mines Division. The truck should be periodically inspected and properly maintained in good operation conditions. The fuel carried in the fuel tank should be minimized to reduce the duration of fire. Adequate fire-fighting equipment shall be provided, inspected and replaced periodically (e.g. fire extinguishers).	To reduce the risk during explosives transport	Contractor	Works areas at which explosives would be used	Construction phase	•Dangerous Goods Ordinance
S9.18	H8	The driver and his assistant should be physically healthy, experienced and have good safe driving records. The driver should hold a proper driving license for the approved transport truck. Dedicated training programme and regular road safety briefing sessions / workshops should be provided to enhance their safe driving attitude and practice. Smoking should be strictly prohibited.	To reduce the risk during explosives transport	Contractor	Works areas at which explosives would be used	Construction phase	-
S9.18	H9	Emergency response plans in case of road accident should be prepared and implemented. The driver and his assistant should be familiar with the emergency procedures including evacuation, and proper communication / fire-fighting equipment should be provided to the driver and his assistant.	To reduce the risk during explosives transport	Contractor	Works areas at which explosives would be used	Construction phase	-
S9.18	H10	Close liaison and communication among Mines Division, contractors for transport of explosives, and working staff of the tunnel blasting should be established. In case of any change of work schedule leading to cancellation or variation of explosives required, relevant parties should be informed in time to avoid unused explosives at the work sites.	To reduce the risk during explosives transport	Contractor	Works areas at which explosives would be used	Construction phase	-

### Environmental Mitigation Implementation Schedule – Central Kowloon Route

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S9.18	H11	Close liaison and communication with Fire Services Department should be established to reduce the accidental detonation escalated from a fire. The contractors for transport of explosives should use the preferred transport routes as far as practicable.	To reduce the risk during explosives transport	Contractor	Works areas at which explosives would be used	Construction phase	-
S9.18	H12	Contingency plan should be prepared for transport of explosives under severe weather conditions such as rainstorms and thunderstorms.	To reduce the risk during explosives transport	Contractor	Works areas at which explosives would be used	Construction phase	-
S9.18	H13	For explosive transport, all packages of explosives on the truck should be properly stored in the truck compartment as required. Packaging of the explosives should remain intact (i.e. damage free) until they are transferred to the blasting site.	To reduce the risk during explosives transport	Contractor	Works areas at which explosives would be used	Construction phase	-
S9.18	H14	Availability of a parking space should be ensured before commencement of transport of explosives. Location for loading and unloading of explosives should be as close as possible to the shaft or the adit. No hot work should be performed in the vicinity during the time of loading and unloading.	To reduce the risk during explosives transport	Contractor	Works areas at which explosives would be used	Construction phase	-
S9.18	H15	Good communication and coordination should be performed for safe blasting of different chainage locations on the same day.	To ensure safe use of explosives	Contractor	Along tunnel alignment	Construction phase	-
S9.18	H16	Evacuation and secure refugee areas should be implemented / provided to the working staff.	To ensure safe use of explosives	Contractor	Along tunnel alignment	Construction phase	-

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S9.18	H17	Healthy competent licensed shotfirers and blasting engineers should be employed to conduct the blasting work.	To ensure safe use of explosives	Contractor	Along tunnel alignment	Construction phase	-
S9.18	H18	Proper control measures should be enforced during explosive transport within the tunnel and charging the blast holes, such as speed limit for the truck, no hot work in the vicinity, etc.	To ensure safe use of explosives	Contractor	Along tunnel alignment	Construction phase	-
S9.18	H19	Ground vibrations of the blasting operation should be monitored and MICs should be adjusted according to the actual geotechnical features to ensure blasting vibrations within the specified PPV limit.	To ensure safe use of explosives	Contractor	Along tunnel alignment	Construction phase	-
S9.18	H20	For tunnel blasting near gas facilities, requirement of the “Gas Production and Supply Code of Practice - Avoiding Danger from Gas Pipes” should be respected. Close liaison and coordination with HKCG should be established to provide sufficient notice of the planned blasting activities in an appropriate format within a reasonable time period prior to blasting. Emergency response procedures should be prepared and implemented in case of gas leaks.	To ensure safe use of explosives	Contractor	Along tunnel alignment	Construction phase	<ul style="list-style-type: none"> <li>• Gas Production and Supply Code of Practice - Avoiding Danger from Gas Pipes</li> </ul>
S9.18	H21	For tunnel blasting near MTRC railway tunnels, close liaison and coordination with MTRC should be established to provide sufficient notice of the planned blasting activities in an appropriate format within a reasonable time period prior to blasting. Emergency response procedures should be prepared and implemented in case of any damage to the railway facilities.	To ensure safe use of explosives	Contractor	Along tunnel alignment	Construction phase	-
S9.18	H22	It is recommended to explore to minimize the use of the cartridged emulsion explosives and maximize the use of bulk emulsion explosive as far as practicable.	To reduce the risk during explosives transport	Contractor	Works areas at which explosives would be used	Construction phase	-

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S9.18	H23	The use of bulk emulsion where the maximum instant charge (MIC) envisaged for a particular blast is above 0.5kg. This prevents the occurrence of excessive vibrations due to potential bulk emulsion dosing inaccuracy in the case of low MIC. It is recommended to explore the bulk emulsion dosing technology so as to maximize the use of bulk emulsion explosive as far as practicable.	To ensure safe use of explosives	Contractor	Along tunnel alignment	Construction phase	-
S9.18	H24	It is recommended to explore to use smaller explosive charges such as 'cast boosters' or 'mini-cast booster' instead of cartridged emulsion as primers for bulk emulsion. This is option reduces the quantity of explosives required for transportation for the sections where bulk emulsion will be used.	To reduce the risk during explosives transport	Contractor	Works areas at which explosives would be used	Construction phase	-
S9.18	H25	Instrumentation and monitoring plan should be submitted to all relevant stakeholders for agreement prior to the commencement of the tunnel blasting works. Such plan should be implemented during construction of CKR tunnels.	To ensure safe use of explosives	Contractor	Along tunnel alignment	Construction phase	-
S9.18	H26	Contingency plan should be submitted to all relevant stakeholders for agreement prior to the commencement of the tunnel blasting works.	To ensure safe use of explosives	Contractor	Along tunnel alignment	Construction phase	-

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<b>Landscape &amp; Visual</b>							
S10.10.1 Table 10.11	LV1	<ul style="list-style-type: none"> <li>• Detailed Design - Landscape</li> </ul> <p>All works shall be carefully designed to minimize impacts on existing landscape resources and visually sensitive receivers, particularly those of high value or high sensitivity. For this purpose, the extent of the works area will be minimised and existing trees within the works area shall be avoided where practicable.</p> <p>Designs which ensure the construction time frame is kept to a practical minimum should also be considered.</p>	Minimize landscape impact	Contractor	Prior to construction	Design Phase	-
S10.10.1 Table 10.11	LV2	<ul style="list-style-type: none"> <li>• <u>Detailed Design - Visual</u></li> </ul> <p>Tunnel portals and all structures above ground including noise barriers shall be sensitively designed to ensure the element with colour, texture and tonal quality being compatible to the existing urban context.</p> <p>The 'natural terrain' idea will be applied to the design of ventilation and administration buildings.</p> <p>For noise barriers/ enclosures, the colour of the structural frames and the frame of the glazing panels shall give a natural look and match with the colour of the adjacent buildings in the area.</p> <p>Designs which ensure the construction time frame is kept to a practical minimum should also be considered.</p>	Minimize visual impact	Contractor	Prior to construction	Design Phase	<p>ETWB TCW No. 36/2004,</p> <p>ACABAS - submission is required to ACABAS for approval of any bridges and associated structures within the public highway system.</p> <p>ETWB TCW No. 8/2005 - submission is required to ArchSD for approval of the design of ventilation and administration buildings.</p>

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S10.10.1 Table 10.11	LV3	<ul style="list-style-type: none"> <li>• <u>Good Site Management</u></li> </ul> <p>Large temporary stockpiles of excavated material shall be covered with unobtrusive sheeting to prevent dust and dirt spreading to adjacent landscape areas and vegetation, and to create a neat and tidy visual appearance.</p> <p>Construction plant and building material shall be orderly and carefully stored in order to create a neat and tidy visual appearance.</p>	Minimize visual impact	Contractor	Within Project Site	Construction Phase	-
S10.10.1 Table 10.11	LV4	<ul style="list-style-type: none"> <li>• <u>Screen Hoarding</u></li> </ul> <p>Decorative screen hoarding should be erected to screen the public from the construction area. It should be designed to be compatible with the existing urban context.</p>	Minimize visual impact	Contractor	Within Project Site	Construction Phase	-
S10.10.1 Table 10.11	LV5	<ul style="list-style-type: none"> <li>• <u>Lighting Control during Construction</u></li> </ul> <p>All lighting in the construction site shall be carefully controlled to minimize light pollution and night-time glare to nearby residencies and GIC. The contractor shall consider other security measures, which shall minimize the visual impacts.</p>	Minimize visual impact	Contractor	Within Project Site	Construction Phase	-
S10.10.1 Table 10.11	LV6	<ul style="list-style-type: none"> <li>• <u>Erosion Control</u></li> </ul> <p>The potential for soil erosion shall be reduced by minimizing the extent of vegetation disturbance on site and by providing a protective cover over newly exposed soil.</p>	Minimize landscape impact	Contractor	Within Project Site	Construction Phase	-

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S10.10.1 Table 10.11	LV7	<ul style="list-style-type: none"> <li><u>Tree Protection &amp; Preservation</u></li> </ul> <p>Carefully protected during construction. Tree protection measures will be detailed at the Tree Removal Application stage and plans submitted to the relevant Government Department for approval in due course in accordance with ETWB TC no. 3/2006.</p>	Minimize landscape and visual impact	Contractor	Within Project Site	Design and Construction Phase	<p>'Guidelines for Tree Risk Management and Assessment Arrangement on an Area Basis and on a Tree Basis', issued January 2011, Greening, Landscape and Tree Management (GLTM) Section, DevB</p> <p>Latest recommended horticultural practices from GLTM Section, DevB</p>
S10.10.1 Table 10.11	LV8	<ul style="list-style-type: none"> <li><u>Tree Transplantation</u></li> </ul> <p>For trees unavoidably affected by the Project that have to be removed, where practical transplantation will be chosen as the top priority method of removal. If this is not possible or practical compensatory planting will be provided for trees unavoidably felled (See LV10). For trees unavoidably affected by the Project works that are transplanted, transplantation must be carried out in accordance with ETWBTC 2/2004 and 3/2006.</p>	Minimize landscape and visual impact	Contractor	Within Project Site and designated off-site locations	Prior to Construction Phase	<p>ETWB TCW 3/2006</p> <p>Latest recommended horticultural practices from Greening, Landscape and Tree Management (GLTM) Section, DevB</p> <p>ETWB TCW 2/2004</p>

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EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
S10.10.1  Table 10.11	LV9	<ul style="list-style-type: none"> <li>• <u>Compensatory Planting</u></li> </ul> <p>For trees unavoidably affected by the Project that have to be removed, where practical transplantation will be chosen as the top priority method of removal but if this is not possible or practical compensatory planting will be provided for trees unavoidably felled. All felled trees shall be compensated for by planting trees to the satisfaction of relevant Government departments. Required numbers and locations of compensatory trees shall be determined and agreed separately with Government during the Tree Felling Application process under ETWBTC 3/2006.</p> <p>Compensatory tree planting may be incorporated into public open spaces and along roadside amenity areas affected by the construction works and therefore be part of the bigger wider planting plans. Onsite compensation planting is preferred but if necessary, additional receptor sites outside the Works Area shall be agreed separately with Government during the Tree Felling Application process.</p>	Minimize landscape and visual impact	Contractor	Within Project Site and designated off-site locations	Construction Phase	ETWB TCW 3/2006  Latest recommended horticultural practices from Greening, Landscape and Tree Management (GLTM) Section, DevB  ETWB TCW 2/2004
S10.10.1  Table 10.11	LV10	<ul style="list-style-type: none"> <li>• <u>Screen Planting</u></li> </ul> <p>Tall screen/buffer trees, shrubs and climbers should be planted, in so far as is possible, to soften and screen proposed structures such as roads and central strip, vertical edges and buildings and to enhance streetscape greening effect where appropriate. Indiscriminate use of trees for screening must be avoided and the principle of 'right tree for the right place' must be followed. This detail will be provided at the Detailed Design stage. This measure may additionally form part of the compensatory planting and will improve and create a pleasant pedestrian environment.</p>	Minimize visual impact and also enhance landscape.	Contractor	Within Project Site	Construction Phase	Guidelines on Greening of Noise Barriers, issued April 2012, GLTMS, DevB  ETWB TCW 2/2004

### Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
S10.10.1 Table 10.11	LV11	<ul style="list-style-type: none"> <li>• <u>Green Roof</u></li> </ul> <p>Roof greening will be established on ventilation and administration buildings to reduce exposure to untreated concrete surfaces and particularly mitigate visual impact to VSRs at high levels.</p>	Minimize landscape and visual impact	Contractor	Within Project Site	Construction Phase	-
S10.10.1 Table 10.11	LV12	<ul style="list-style-type: none"> <li>• <u>Reinstatement</u></li> </ul> <p>All works areas, excavated areas and disturbed areas for tunnel construction and temporary road diversion or any other proposed works shall be reinstated to former conditions or better, with reasonable landscape treatment and to the satisfaction of the relevant Government departments. (Specific mitigation for disturbance to public open space is detailed separately under LV14)</p>	Minimize landscape impact	Contractor	Within Project Site	Construction Phase	-

**Environmental Mitigation Implementation Schedule – Central Kowloon Route**

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved																																
S10.10.1  Table 10.11	LV13	<ul style="list-style-type: none"> <li><u>Reprovising of Public Open Space</u></li> </ul> <p>All areas of public open space affected by the Project will be re-provisioned either at the same location following the completion of temporary works, or at a separate site, as agreed with relevant Government departments. Open space should be re-provisioned in an enhanced manner.</p> <p>The total area of open space affected and re-provided/ reinstated is summarised in the table below.</p> <table border="1" data-bbox="376 619 1003 1107"> <thead> <tr> <th>Landscape Resource Affected</th> <th>Approx. Existing Area</th> <th>Approx. Area taken during Construction</th> <th>Approx. Area to be re-provision / reinstated</th> </tr> </thead> <tbody> <tr> <td>Public Square Street Playground</td> <td>995 m<sup>2</sup></td> <td>995 m<sup>2</sup></td> <td>995 m<sup>2</sup></td> </tr> <tr> <td>Shanghai Street/Market Street Playground</td> <td>1,400 m<sup>2</sup></td> <td>1,400 m<sup>2</sup></td> <td>1,400 m<sup>2</sup></td> </tr> <tr> <td>Bazaar</td> <td>310 m<sup>2</sup></td> <td>310 m<sup>2</sup></td> <td>310 m<sup>2</sup></td> </tr> <tr> <td>Temple Street / Kansu Street Temporary Rest Garden (Currently zoned as G/IC)</td> <td>365 m<sup>2</sup></td> <td>365 m<sup>2</sup></td> <td>365 m<sup>2</sup></td> </tr> <tr> <td>Jade Hawker Bazaar</td> <td>1,395 m<sup>2</sup></td> <td>1,395 m<sup>2</sup></td> <td>1,395 m<sup>2</sup></td> </tr> <tr> <td>Proposed open space at the original Yau Ma Tei Specialist Clinic Extension site</td> <td>--</td> <td>--</td> <td>710 m<sup>2</sup></td> </tr> <tr> <td>Proposed Yau Ma Tei Landscape Deck</td> <td>--</td> <td>--</td> <td>31,000 m<sup>2</sup></td> </tr> </tbody> </table>	Landscape Resource Affected	Approx. Existing Area	Approx. Area taken during Construction	Approx. Area to be re-provision / reinstated	Public Square Street Playground	995 m <sup>2</sup>	995 m <sup>2</sup>	995 m <sup>2</sup>	Shanghai Street/Market Street Playground	1,400 m <sup>2</sup>	1,400 m <sup>2</sup>	1,400 m <sup>2</sup>	Bazaar	310 m <sup>2</sup>	310 m <sup>2</sup>	310 m <sup>2</sup>	Temple Street / Kansu Street Temporary Rest Garden (Currently zoned as G/IC)	365 m <sup>2</sup>	365 m <sup>2</sup>	365 m <sup>2</sup>	Jade Hawker Bazaar	1,395 m <sup>2</sup>	1,395 m <sup>2</sup>	1,395 m <sup>2</sup>	Proposed open space at the original Yau Ma Tei Specialist Clinic Extension site	--	--	710 m <sup>2</sup>	Proposed Yau Ma Tei Landscape Deck	--	--	31,000 m <sup>2</sup>	Minimize landscape impact	Contractor	Within Project Site	Construction Phase	Open space should be re-provided in an enhanced manner.
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S10.10.1  Table 10.11	LV14	<ul style="list-style-type: none"> <li><u>Landscape enhancement</u></li> </ul> <p>Implement a comprehensive landscape plan to maximize the greening opportunity and create a unique landscape for the project to blend in with the surrounding, including in re-provisioned areas. In particular:</p> <ul style="list-style-type: none"> <li>- landscape enhancement of re-provisioned Public Transport Interchange;</li> <li>- landscape deck on tunnel portals;</li> </ul>	Minimize landscape and visual impact	Contractor	Along tunnel alignment	Construction phase	Purpose-built maintenance access without temporary traffic arrangement must be provided.																																

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<ul style="list-style-type: none"> <li>- viaduct planters for trailer planting,</li> <li>- vertical greening of piers and walls with climbers or trailer planting;</li> <li>- roadside planting i.e. planting along central dividers and on road islands e.g. in the middle of roundabouts.</li> </ul> <p>(Roadside planting i.e. at the road edge and not in the central divider or road island, and vertical greening may be considered part of Screen Planting).</p> <p>Purpose-built maintenance access without temporary traffic arrangement must be provided and detailed design of landscape decks and planting, including details of maintenance access locations, will be sent to maintenance and management parties for endorsement and ensures these mitigation measures are feasible.</p>					
S10.10.1 Table 10.11	LV15	<ul style="list-style-type: none"> <li>• <u>Lighting Control during Operation</u></li> </ul> <p>Roadside lighting and that at the ventilation and administration buildings should be controlled so as to minimize the visual impacts at night. For the enclosed noise barriers, lighting will be provided by two rows of continuous fluorescent lights mounted along the ceiling of the noise enclosure so drivers see continuous lines on the ceiling.</p>	Minimize visual impact	Contractor	Within Project Site	Operation Phase	-

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
<b><i>Cultural Heritage Impact (Construction and Operational Phase)</i></b>							
S11.4.4	CH1	<ul style="list-style-type: none"> <li>The contractor should be alerted during the construction on the possibility of locating archaeological remains and as a precautionary measure, AMO shall be informed immediately in case of discovery of antiquities or supposed antiquities in the subject sites.</li> </ul>	To preserve any cultural heritage items which may be removed and damaged by the excavation.	Contractor	During construction works for cut and cover tunnels	During the construction phase	<ul style="list-style-type: none"> <li>AMO's requirements</li> </ul>
S11.6 para 3	CH2	<ul style="list-style-type: none"> <li>The dredging contractor should be alerted during the construction on the possibility of locating archaeological remains, such as cannon and AMO shall be informed immediately in case of discovery of antiquities or supposed antiquities in the subject areas.</li> </ul>	To preserve any cultural heritage items which may be removed and damaged by the dredging.	Contractor	During construction of underwater tunnel (north of To Kwa Wan Typhoon Shelter)	During the construction phase	<ul style="list-style-type: none"> <li>AMO's requirements</li> </ul>
S12.6.1	CH3	<ul style="list-style-type: none"> <li>Protective covering should be provided for the buildings in the form of plastic sheeting;</li> <li>Buffer zones should be provided between the construction works and the external walls of the buildings and should be as large as site restrictions allow and be marked out by temporary fencing or hoarding;</li> <li>An underpinning scheme is required to transfer the existing column loadings to a deeper rock stratum. The supporting system includes cutting the existing ground floor slab to expose the existing pile caps and then construct transfer beams at both sides of the pile caps. The transfer beams will tie up with the existing caps. Loadings of the transfer beams will be transferred to the rock socket piles installed at the two ends of the beams;</li> <li>The AAA settlement and tilting limit should be 6/8/10 mm and</li> </ul>	Protect the building from damage from construction works	Contractor	Yau Ma Tei Police Station (New Wing) (CKR-01)	Prior to commencement of and during the construction phase	<ul style="list-style-type: none"> <li>Guidelines for Cultural Heritage Impact Assessment</li> <li>EIAO-TM Annex 10 and Annex 19</li> <li>AMO Proposed Vibration Limits</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		<p>1/2000, 1/1500 and 1/1000;</p> <ul style="list-style-type: none"> <li>Monitoring of vibration levels will be undertaken during the construction phase and the Alert, Alarm and Action (AAA) vibration limit will be set at 5/6/7.5 mm/s. The monitoring proposal should be sent to AMO for comment;</li> <li>Regular site inspections and monitoring works will be carried out by the contractor and the monitoring results will be submitted to the resident site staff of HyD to ensure compliance.</li> </ul>					
S12.6.1	CH4	<ul style="list-style-type: none"> <li>Adopting diaphragm wall construction method;</li> <li>Grout curtain should be provided in front of the building;</li> <li>Recharging system should be installed as a contingency measure to mitigate the fluctuation of water table;</li> <li>the AAA settlement and tilting limit should be 6/8/10 mm and 1/2000, 1/1500 and 1/1000;</li> <li>Monitoring of vibration levels will be undertaken during the construction phase and the Alert, Alarm and Action (AAA) vibration limit will be set at 5/6/7.5 mm/s. The monitoring proposal should be sent to AMO for comment;</li> <li>Regular site inspections and monitoring works will be carried out by the contractor and the monitoring results will be submitted to the resident site staff of HyD to ensure compliance.</li> </ul>	Protect the building from damage from construction works	Contractor	Yau Ma Tei Police Station (Old Wing) (CKR-01)	Prior to commencement of and during the construction phase	<ul style="list-style-type: none"> <li>Guidelines for Cultural Heritage Impact Assessment</li> <li>EIAO-TM Annex 10 and Annex 19</li> <li>AMO Proposed Vibration Limits</li> </ul>
S12.6.1, Table 12.2	CH5	<ul style="list-style-type: none"> <li>The Alert, Alarm and Action (AAA) vibration limit will be set at 3/4/5 mm/s and a condition survey shall be carried out by the project proponent prior to the construction phase to confirm this assessment</li> <li>Vibration monitoring of the structure shall be employed during the construction phase to ensure that the level is not exceeded. . The monitoring proposal should be sent to AMO for comment.</li> </ul>	Protect the building from damage from construction works	Contractor	Tin Hau Temple (CKR-02)	Prior to commencement of and during the construction phase	<ul style="list-style-type: none"> <li>Guidelines for Cultural Heritage Impact Assessment</li> <li>EIAO-TM Annex 10 and Annex 19</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
							<ul style="list-style-type: none"> <li>• AMO Proposed Vibration Limits</li> </ul>
S12.6.1, Table 12.2	CH6	<ul style="list-style-type: none"> <li>• The Alert, Alarm and Action (AAA) vibration limit will be set at 5/6/7.5mm/s.</li> <li>• Vibration monitoring of the structure shall be employed during the construction phase to ensure that the level is not exceeded and as such appropriate vibration monitoring on the building should be complied with as appropriate. The monitoring proposal should be sent to AMO for comment.</li> </ul>	Protect the building from damage from construction works	Contractor	Kowloon Methodist Church (CKR-10)	During the construction phase	<ul style="list-style-type: none"> <li>• Guidelines for Cultural Heritage Impact Assessment</li> <li>• EIAO-TM Annex 10 and Annex 19</li> <li>• AMO Proposed Vibration Limits</li> </ul>
S12.6.1, Table 12.2	Ch7	<ul style="list-style-type: none"> <li>• The Alert, Alarm and Action (AAA) vibration limit will be set at 5/6/7.5 mm/s.</li> <li>• Vibration monitoring of the structure shall be employed during the construction phase to ensure that the level is not exceeded, and as such appropriate vibration monitoring on the building should be complied with as appropriate. The monitoring proposal should be sent to AMO for comment.</li> </ul>	Protect the building from damage from construction works	Contractor	Ma Tau Kok Animal Quarantine Depot (CKR-12)	During the construction phase	<ul style="list-style-type: none"> <li>• Guidelines for Cultural Heritage Impact Assessment</li> <li>• EIAO-TM Annex 10 and Annex 19</li> <li>• AMO Proposed Vibration Limits</li> </ul>
S12.6.1, Table 12.2	CH8	<ul style="list-style-type: none"> <li>• A monitoring system for settlement, vibration and tilting will be determined and implemented pending determination of the future grading. A monitoring proposal will be submitted to AMO before</li> </ul>	Protect the structure from damage from construction works	Contractor	Kowloon City Ferry Pier (CKR-13)	During the construction phase	<ul style="list-style-type: none"> <li>• Guidelines for Cultural Heritage Impact</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
		commencement of work if a historic building grade is accorded.					Assessment <ul style="list-style-type: none"> <li>• EIAO-TM Annex 10 and Annex 19</li> <li>• AMO Proposed Vibration Limits</li> </ul>
S12.6.1, Table 12.2	CH9	<ul style="list-style-type: none"> <li>• No mitigation is required at present. If the public pier is granted Grade 1, Grade 2 or Grade 3 status, the mitigation will be revised to adhere to the requirements for protective measures for Graded Historic Buildings</li> </ul>	To be determined	Contractor	Ma Tau Kok Public Pier (CKR-16)	During the construction phase	<ul style="list-style-type: none"> <li>• Guidelines for Cultural Heritage Impact Assessment</li> <li>• EIAO-TM Annex 10 and Annex 19</li> </ul>
S12.6.1, Table 12.2	CH10	<ul style="list-style-type: none"> <li>• A monitoring system for settlement, vibration and tilting will be determined and implemented pending determination of the future grading. A monitoring proposal will be submitted to AMO before commencement of work if a historic building grade is accorded.</li> </ul>	Protect the structure from damage from construction works	Contractor	The Kowloon City Vehicular Ferry Pier (CKR-17)	During the construction phase	<ul style="list-style-type: none"> <li>• Guidelines for Cultural Heritage Impact Assessment</li> <li>• EIAO-TM Annex 10 and Annex 19</li> <li>• AMO Proposed Vibration Limits</li> </ul>
S12.6.1, Table 12.2	CH11	<ul style="list-style-type: none"> <li>• A condition survey for the tunnel network should be undertaken by the project proponent to determine the present condition of the air raid tunnels and to recommend protective measures to ensure that the tunnels are not damaged by the construction works. and as such appropriate vibration monitoring on the building should be complied with as appropriate. The monitoring proposal should be sent to AMO for comment.</li> </ul>	Protect the tunnel network from damage from construction works	Contractor	Air raid precaution tunnels of the K1 Network (CKR-14)	Prior to commencement of and during the construction phase	<ul style="list-style-type: none"> <li>• Guidelines for Cultural Heritage Impact Assessment</li> <li>• EIAO-TM Annex 10 and Annex 19</li> </ul>

**Environmental Mitigation Implementation Schedule – Central Kowloon Route**

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
							<ul style="list-style-type: none"> <li>• AMO Proposed Vibration Limits</li> </ul>

## Environmental Mitigation Implementation Schedule – Central Kowloon Route

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Implementation Agent	Location / Timing	Implementation Stage	Requirements and / or standards to be achieved
<b>EM&amp;A Project</b>							
S13.2	EM1	An Independent Environmental Checker needs to be employed as per the EM&A Manual.	Control EM&A Performance	Highways Department	All construction sites	Construction stage	<ul style="list-style-type: none"> <li>• EIAO Guidance Note No.4/2010</li> <li>• TM-EIAO</li> </ul>
S13.2 – 13.4	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	Highways Department / Contractor	All construction sites	Construction stage	<ul style="list-style-type: none"> <li>• EIAO Guidance Note No.4/2010</li> <li>• TM-EIAO</li> </ul>

## Appendix D

### Sample Data Sheet for Monitoring

### 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 :

## Road Traffic Noise Monitoring - Field Data Sheet

### A General

Project			
Monitoring Station ID.			
Monitoring station (floor level)		(	/ F)
Date			
Time (hh:mm)	From:	To:	( minutes)
Microphone position	Facade / Free Field / Others (Please specify):		

### B Weather Condition

Wind speed (ms <sup>-1</sup> )		Wind direction	
Temperature (°C)		Humidity (%)	

### C Equipment

Instrument	Model	Serial no.
Sound level meter		
Sound level calibrator		

### D Calibration

Before measurement [dB(A)]		After measurement [dB(A)]	
----------------------------	--	---------------------------	--

### E Measurement Data

Time	Noise level (30min) [dB(A)]				Traffic count				Average speed (kph)			
					Project Road [1]		Existing Road		Project Road [1]		Existing Road	
	L <sub>eq</sub>	L <sub>10</sub>	L <sub>90</sub>	L <sub>max</sub>	LV	HV	LV	HV	LV	HV	LV	HV

Note: LV - Light vehicle; HV – Heavy vehicle

[1]: Project Road should refer to Figure 5.4 and Figure 5.5 of the EIA Report.

### F Observation

Other noise source(s) during measurement	
Remarks	

### G Personnel

	Name	Signature	Date
Recorded by			
Checked by			

## **Appendix E**

### **Performance Review Proposal for Stone Column Installation**

# Performance Review for Stone Column Installation

## 1 Introduction

Stone column is required within the reclamation to accelerate the settlement and improve the strength of the marine deposit inside the cellular seawall and foundations of sloping seawall. The performance reviews will be carried out by the Environmental Team (ET).

Before the commencement of the monitoring works, this Performance Review Proposal shall be reviewed and updated by ET, taking account of the Contractor's proposed actual locations of his initial period of installation.

The proposed monitoring details are presented in the following sections.

## 2 Monitoring Equipment

### 2.1 Dissolved Oxygen and Temperature Measuring Equipment

Dissolved oxygen (DO) measurements should be salinity compensated. DO and temperature measuring equipment shall be provided as follows:

- a. The instrument shall be a portable, weatherproof dissolved oxygen measuring instrument completed with cable & sensor and use a DC power source. It shall be capable of measuring:
  - a dissolved oxygen level in the range of 0-20 mg/l and 0-200% saturation; and
  - a temperature of 0-45 degree Celsius.
- b. It shall have a membrane electrode with automatic temperature compensation complete with a cable (e.g. YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument). Sufficient stocks of spare electrodes and cables shall be available for replacement where necessary.
- c. Should salinity compensation not be integrated in the DO equipment, onsite / in-situ salinity shall be measured to calibrate the DO equipment prior to each DO measurement.

### 2.2 Turbidity Measurement Instrument

The instrument shall be a portable, weatherproof turbidity-measuring instrument complete with comprehensive operation manual. The equipment shall use a DC power source. It shall have a photoelectric sensor capable of measuring turbidity between 0-1000 NTU (e.g. Hach model 2100P or an approved similar instrument).

### 2.3 Suspended Solids

The equipment for measuring suspended solids shall be provided as follows:

- a. A water sampler comprising a transparent PVC cylinder with a capacity of not less than 2 litres and which can be effectively sealed with latex cups at both ends. The sampler shall 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 (e.g. Kahlsico Water Sampler or an approved similar instrument).

- b. Water samples for suspended solids measurement shall be stored in high density polythene bottles, packed in ice (cooled to 4°C without being frozen) and delivered to the testing laboratory within 24 hour of collection.

## 2.4 Water Depth

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

## 2.5 Salinity

A portable salinometer capable of measuring salinity in the range of 0-40 PSC (practical salinity scale) shall be provided for measuring salinity and, if necessary, setting salinity compensation on the Dissolved Oxygen Meter.

## 2.6 pH Measuring Equipment

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 (eg. Orion Model 250A or an approved similar instrument).

## 2.7 Location of the Monitoring Sites

A hand-held or boat-fixed type differential Global Positioning System (dGPS) or other equivalent instrument of similar accuracy shall be provided and used during monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

## 2.8 Current Velocity and Direction

A Valeport 108 MKIII current meter, or the approved equivalent, shall be provided for in-situ measurement of current velocity and direction. Real-time data shall be provided for settling out the monitoring stations.

# 3 Calibration of Equipment

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All on site / in-situ monitoring instrument shall be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use, and subsequently re-calibrated regularly, as per the manufacturer specification, the standard methods or the recommendation of the accredited calibration laboratory throughout all stages of the water quality monitoring. Responses of sensors and electrodes shall be checked with certified standard solutions before each use. Wet bulb calibration for the DO meter shall be carried out before measurement at each monitoring location.

For the on-site calibration of field equipment, the BS 1427:1993, "Guide to Field and on-site test methods for the analysis of waters" shall be observed.

# 4 Back-up Equipment and Vessels

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Sufficient stocks of spare parts shall be maintained for replacements when necessary. Back-up monitoring equipment shall also be available so that monitoring can proceed uninterrupted even when some equipment is under maintenance, calibration, etc.

The Water Quality Monitoring will involve a large number of monitoring stations and measurements should be conducted within the prescribed tidal conditions 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 monitoring team shall also consider the use of unattended automatic sampling/monitoring devices at fixed stations where monitoring are required throughout the period. The use of such unattended automatic devices, however, shall be subject to the approval from IEC and EPD.

## 5 Measurement and Analysis

### 5.1 Baseline Monitoring

The baseline monitoring data from the existing EM&A programme will be adopted. Should these data be not available before the Performance Review, the ET will propose additional baseline monitoring and obtained approval from IEC and EPD.

### 5.2 Impact Monitoring

#### 5.2.1 In-situ Measurement

During monitoring, duplicate measurements of DO concentration (mg/l), DO saturation (%), turbidity, pH, salinity and water samples shall be taken at each station at three depths, namely, 1m below the sea surface, mid-depth and 1 m above the seabed. Where water depth is less than 6 m the mid-depth station may be omitted. If water depth is less than 3 m, only the surface samples shall be monitored, to avoid natural resuspension of sediments from confounding the results. In-situ measurements shall be made during both the descent and ascent of the sensor. On site measurements shall be made on sub-sample of water samples collected for laboratory suspended solid measurement.

If the difference between the first and second measurement of DO or turbidity parameters at any one depth is greater than 25%, the measurements shall be repeated until an acceptable match is made. If no match is achieved, the equipment shall be checked for accurate calibration or malfunction.

Duplicated water samples for laboratory analysis of SS shall be collected on separate descent (or ascent, but not both direction), but samples for different depth can be collected on the descent (or ascent) if multi-samplers is used. Water samples of different depth shall be collected and analysed separately in the baseline water quality monitoring.

#### 5.2.2 Water Sampling

Analysis of total suspended solids (SS) will be carried out in a HOKLAS or other international accredited laboratory. Water samples of at least 500mL shall be collected at the monitoring stations for carrying out the laboratory SS determination. The SS determination work should start within 24 hours after collection of the water samples. The analyses should follow the standard methods as described in APHA Standard Methods for the Examination of Water and Wastewater, 19th Edition, with a reporting limit of not more than 2.0 mg/L.

The limits of detection for the in-situ and laboratory measurements that shall be obtained are shown in **Table 1**.

**Table 1 Detection Limits and Precision for Water Quality Determinands**

Determinand	Limit of Detection	Description Precision
Dissolved Oxygen	0.1 mg/L	1%
Salinity	0.01 ppt	1%
Temperature	0.1 degree Celsius	1%
pH	0.01 units	1%
Turbidity (NTU)	0.1 NTU	1%
Suspended Solids	2 mg/L (minimum acceptable accredited reporting limit)	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 the IEC and EPD.

### 5.3 Measurement Location

The water quality monitoring stations will depend on the current direction as measured by the on-site current direction measurement and are presented in **Figure 1**. A total of 11 monitoring stations will be measured, including 2 control stations, 4 near-field stations, 4 far-field stations, and 1 hydrodynamic station.

The monitoring parameters will include both hydrodynamic data and water quality data and the details of monitoring parameters are presented in **Table 2**.

**Table 2 Monitoring Parameters**

Stations	Description	Parameter
H1	Hydrodynamic Station	Current velocities, Current directions
C1	Control Station	DO, temperature, turbidity, pH, salinity and SS
C2	Control Station	DO, temperature, turbidity, pH, salinity and SS
N1	Near Field Station	DO, temperature, turbidity, pH, salinity and SS
N2	Near Field Station	DO, temperature, turbidity, pH, salinity and SS
N3	Near Field Station	DO, temperature, turbidity, pH, salinity and SS
N4	Near Field Station	DO, temperature, turbidity, pH, salinity and SS
F1	Far Field Station	DO, temperature, turbidity, pH, salinity and SS
F2	Far Field Station	DO, temperature, turbidity, pH, salinity and SS
F3	Far Field Station	DO, temperature, turbidity, pH, salinity and SS
F4	Far Field Station	DO, temperature, turbidity, pH, salinity and SS

### 5.4 Measurement Details

The stone column installation is the initial stage of the reclamation. There should be no concurrent marine activities throughout the Performance Review. The process includes penetration, installation and completion. The duration will be about 1 hour per stone column. Water quality monitoring should be carried out during installation stage.

During the monitoring, the silt curtain will be applied to simulate the actual situation. The silt curtain is for stone column operation and the second layer silt curtain to simulate the perimeter silt curtain is not proposed due to the limited space in Kowloon Bay for a conservative approach. The monitoring details are listed in **Table 3**.

**Table 3 Monitoring Details for Stone Column Installation**

	Description
Monitoring Parameters	Hydrodynamics: Current velocities, Current directions Water Quality: DO, temperature, turbidity, pH, salinity and SS
Tidal Condition	Monitored at both tides, 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, Replicate

	Description
	measurement/sample
Number of Stone Column for Testing	2, one for mid-flood measurement and one for mid-ebb measurement. If exceedances observed, additional testing maybe required in according to the Event and Action Plan.)
Monitoring Frequencies	15 minutes intervals
Monitoring Duration	During installation and completion process. After stone column is installed, 4 additional monitoring (at 15 minutes intervals) are required.

## 6 Result Interpretation

The monitoring will be carried out around the works area. According to S6.7.2.3 of EIA-CKR, the dilution factor to the nearest WSR is 183. This dilution factor will be applied to estimate the water quality impact at the sensitive receivers.

The Action / Limit Level at far field stations and sensitive receivers are defined in **Table 4**. The ET will determine the absolute values of criteria and submit to EPD for approval.

**Table 4 Action / Limit Level at Far Field Stations and Sensitive Receivers**

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

Regardless of the measured performance of stone column installation, the Event and Action Plan shall be based on the monitoring results at the designated monitoring stations. All the stone column installation during construction phase should not be carried out unless the execution of Event and Action Plan during the Performance Review. The Event and Action Plan is presented in **Table 5**.

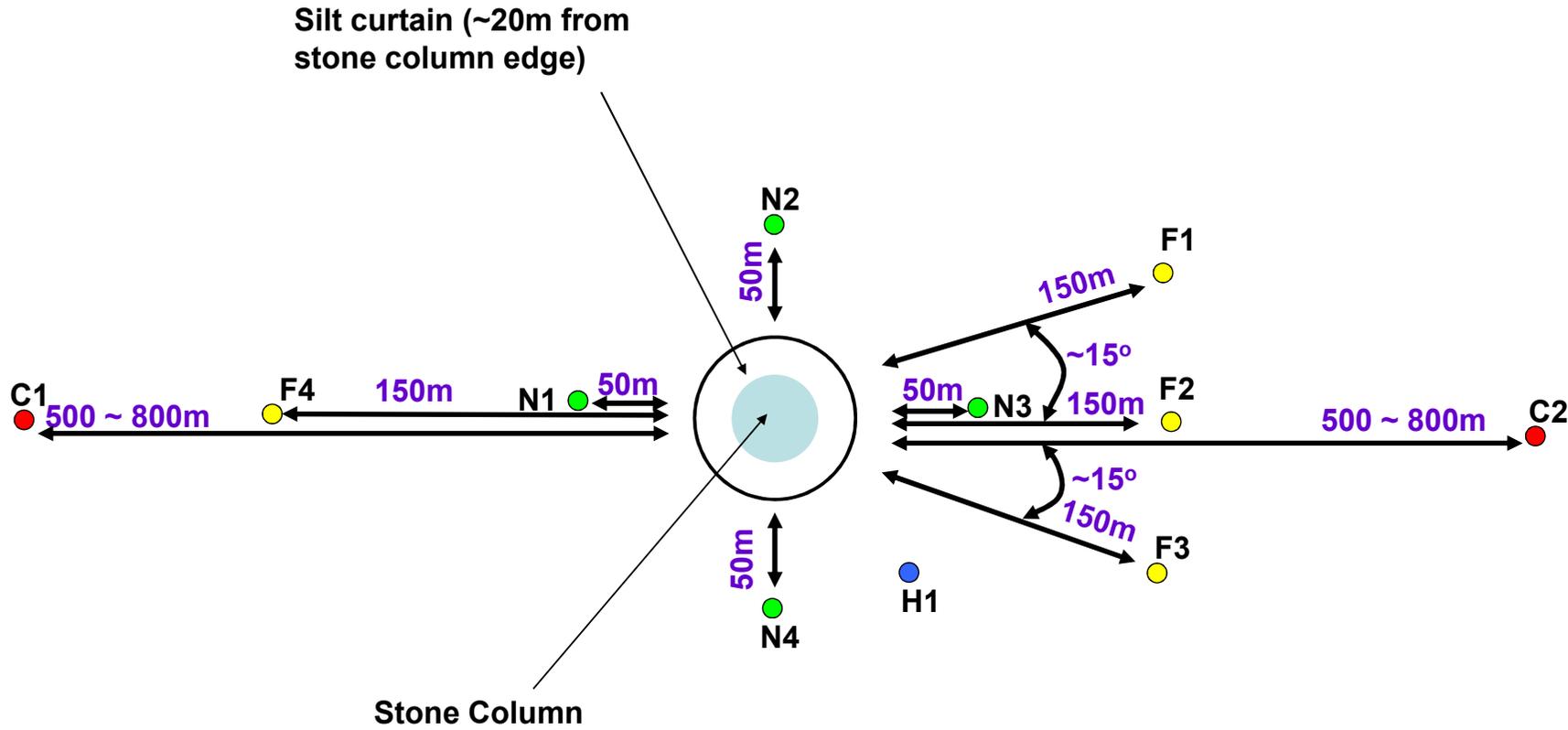
**Table 5 Event and Action Plan for Water Quality**

Event	ET	IEC/ER	Contractor
Action level being exceeded by one or more sampling.	Identify source(s) of impact; Inform contractor and ER;  Check monitoring data, all plant, equipment and Contractor's working methods;  Review and discuss the effectiveness on the proposed	Confirm receipt of notification of non-compliance in writing; Notify Contractor.  Discuss with ET on the proposed mitigation measures;  Ensure mitigation measures are properly implemented;	Inform the ER and confirm notification of the non-compliance in writing;  Rectify unacceptable practice;  Amend working methods if appropriate;  Check all plant and equipment

Event	ET	IEC/ER	Contractor
	mitigation measures.	Assess the effectiveness of the implemented mitigation measures.	and consider changes of working methods; Submit proposal of additional mitigation measures to ER and ET;  Implement the agreed mitigation measures.
Limit level being exceeded by one or more sampling day	Identify source(s) of impact; Inform Contractor, ER and EPD;  Check monitoring data, all plant, equipment and Contractor's working methods;  Liaise with EPD if necessary to repeat measurement during stone column installation and completion process to confirm the findings;  Review and discuss the effectiveness on the proposed mitigation measures.	Make agreement on the mitigation measures to be implemented;  Discuss with ET on the proposed mitigation measures;  Ensure mitigation measures are properly implemented;  Consider and instruct, if necessary, the Contractor to slow down or review all or part of the stone column installation during construction stage.	Take immediate action to avoid further exceedance;  Submit proposal of mitigation measures to ER and discuss with ET and ER;  Implement the agreed mitigation measures;  Resubmit proposals of mitigation measures if problem still not under control;  As directed by the ER, to slow down slow down or review all or part of the stone column installation during construction stage.  Arrange repeat measurement with ET if necessary.

Based on the monitoring results, the monitoring team will submit the Performance Review Report demonstrating the environmental acceptance of stone column installation.

Current Direction



- Near Field Stations
- Far Field Stations
- Control Stations
- Hydrodynamic Station

A		FIRST ISSUE	
Rev	Description	By	Date
Consultant			
ARUP		Mott MacDonald	
Project title			
Agreement No. CE 43/2010 (HY)			
Central Kowloon Route - Design and Construction			
Drawing title			
Performance Review for Stone Column Installation			
Drawing "Figure 1"		Rev.	
Drawn	Date	Checked	Approved
Scale		Status	
		PRELIMINARY	

Remarks: A 2<sup>nd</sup> layer of silt curtain to simulate the perimeter silt curtain is not proposed due to limited space in Kowloon Bay and this would be a conservative approach.

## Appendix F

### Sample Template for Interim Notification

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 :

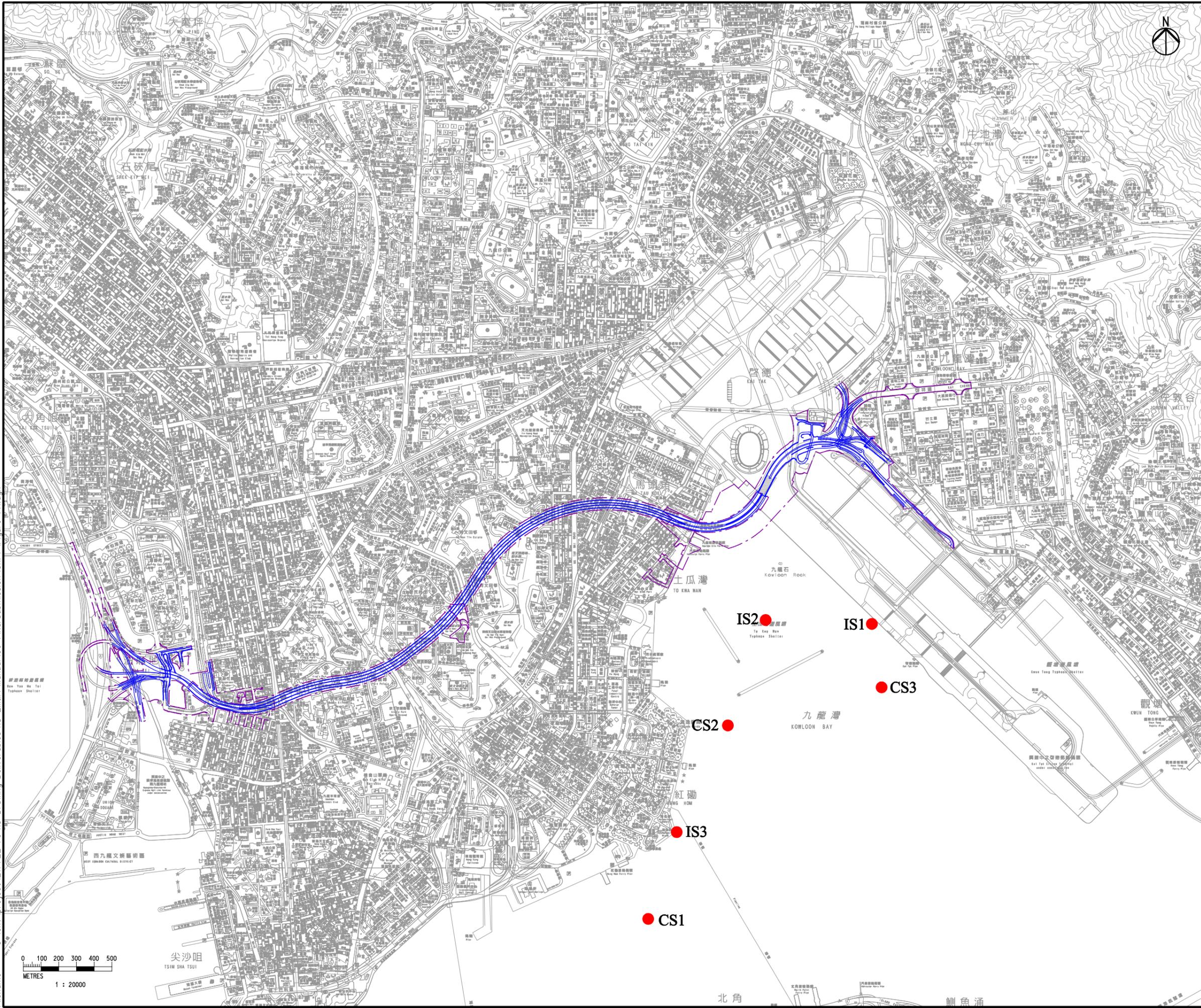
Date :

## Appendix G

### Proactive Environmental Protection Proforma



Printed by : 1/28/2013  
 Filename : G:\env\project\217722-70\13 Drawing Deliverables\18 EM&A Manual\06 FinalSubmission\Ch. 7\Figure 7.1.dgn



**Legend**

- CKR Alignment
- - - Works Limit
- Water Quality Monitoring Stations for Baseline and Construction Phase Monitoring

E	FIFTH ISSUE	GL	01/13
D	FOURTH ISSUE	GL	12/12
C	THIRD ISSUE	GL	10/12
B	SECOND ISSUE	GL	09/12
A	FIRST ISSUE	KM	06/12
Rev	Description	By	Date

Consultant

**ARUP** **Mott MacDonald**

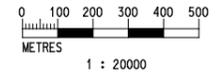
Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route - Design and Construction**

Drawing title  
**Location of Water Monitoring Stations for Baseline and Construction Phase Monitoring**

Drawing no. <b>Figure 7.1</b>		Rev. <b>E</b>	
Drawn GL	Date 01/13	Checked FC	Approved ST
Scale 1:20000 ON A3		Status <b>PRELIMINARY</b>	

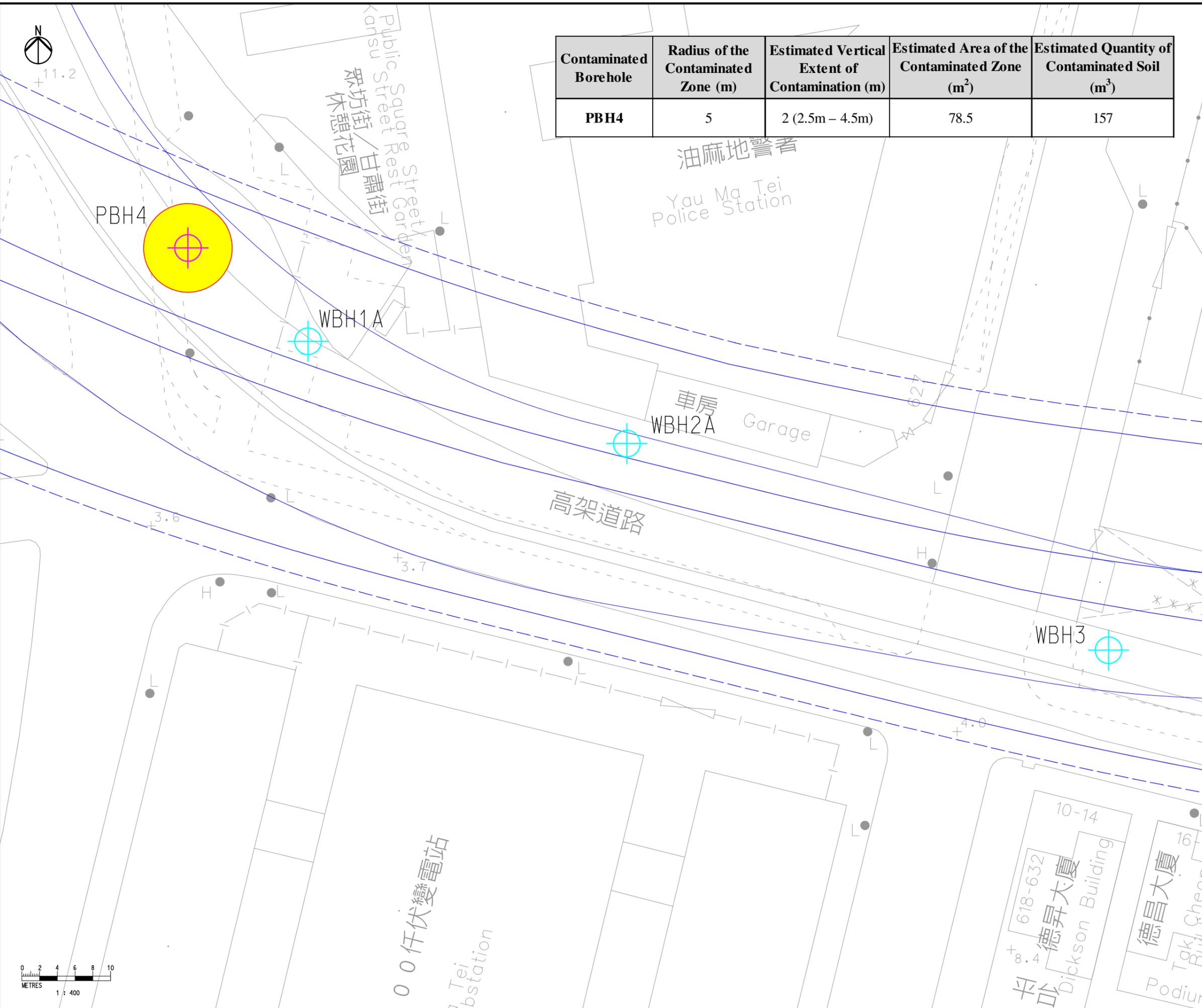
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**HIGHWAYS DEPARTMENT**  
**主要工程管理處**  
**MAJOR WORKS PROJECT MANAGEMENT OFFICE**



Contaminated Borehole	Radius of the Contaminated Zone (m)	Estimated Vertical Extent of Contamination (m)	Estimated Area of the Contaminated Zone (m <sup>2</sup> )	Estimated Quantity of Contaminated Soil (m <sup>3</sup> )
PBH4	5	2 (2.5m – 4.5m)	78.5	157

- Legend**
- PBH1 Borehole locations of the SI Works Conducted in 2009 with RBRGs Exceedance
  - WBH1 Borehole locations of the SI Works Conducted in 2011 & 2012 (Confirmatory Investigation)
  - Estimated Contaminated Zone



Rev	Description	By	Date
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D	FOURTH ISSUE	GL	12/12

Consultant

Project title  
**Agreement No. CE 43/2010 (HY)**  
**Central Kowloon Route - Design and Construction**

Drawing title  
**Estimated Contamination Zone at PBH4**

Drawing no. <b>Figure 9.1</b>		Rev. <b>D</b>	
Drawn GL	Date 12/12	Checked FC	Approved ST
Scale 1:400 ON A3		Status PRELIMINARY	

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