

Consultancy Agreement No. NEX/2213

# Environmental Impact Assessment (EIA) Study for Shatin to Central Link – Hung Hom to Admiralty Section

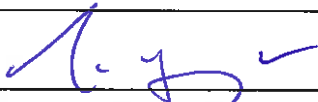



**MTR Corporation Limited**

Consultancy Agreement No. NEX/2213

**Environmental Impact Assessment  
(EIA) Study for Shatin to Central Link –  
Hung Hom to Admiralty Section****Final Environmental Monitoring and Audit  
Manual**

November 2011

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## 1. INTRODUCTION

### Project Description

- 1.1 The Shatin to Central Link (SCL) is strategically important for connecting the existing railway lines into an integrated rail network. The SCL comprises 17 kilometres of rail line that will connect several existing railway lines, creating two distinct east-west and north-south railway corridors. It will also provide interchange opportunities with six of its ten stations (Tai Wai, Diamond Hill, Homantin, Hung Hom, Exhibition and Admiralty).
- 1.2 The SCL would include the realignment for the existing East Rail Line Tracks from Mong Kok East Station (MKK) to the new Hung Hom Station (HUH) (namely “SCL – Mong Kok East to Hung Hom Section” [SCL (MKK-HUH)] and the extension of the Ma on Shan Line from Tai Wai Station to HUH (namely “SCL – Tai Wai to Hung Hom Section” [SCL (TAW-HUH)]). It would also cover the section from HUH across the harbour to the Causeway Bay Typhoon Shelter (CBTS), Exhibition Station (EXH) and Admiralty Station (ADM) [SCL (HUH – ADM)] (hereinafter referred to as “the Project”). An overview of the SCL alignment is presented in **Figure No. NEX2213/C/331/ENS/M50/001**.
- 1.3 The Project comprises the following key elements:
- An approximately 6km extension of the East Rail Line including a rail harbour crossing from Hung Hom across the harbour to Admiralty on Hong Kong Island;
  - A new Exhibition Station (EXH) located near the Hong Kong Convention and Exhibition Centre (HKCEC);
  - An integrated Admiralty Station (ADM) for the existing urban lines, the future SCL and South Island Line (East) (SIL(E));
  - Ventilation buildings, vent shafts, smoke extraction facilities and other associated works of the Project; and
  - Demolition of the existing Kowloon Freight Building at south of HUH to facilitate the construction of the Project.
- 1.4 Apart from the above key elements, barging facilities, supporting works areas and access roads will be required to support the construction of the Project. Locations of the works areas for the Project are illustrated in **Figure Nos. NEX2213/C/331/ENS/M50/021 to 025**. **Appendix D** provides the tentative construction programme of the SCL (HUH-ADM). It should be noted that the tentative construction programme will be subject to actual site conditions.

### Purpose of the Manual

- 1.5 The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the set-up of an EM&A programme to check on compliance with the Environmental Impact Assessment (EIA) study recommendations of the Project, to assess the effectiveness of the recommended mitigation measures, and to identify any further need for additional mitigation measures or remedial actions.
- 1.6 This EM&A Manual aims to provide systematic procedures for monitoring, auditing and minimizing environmental impacts associated with the activities of the Project. It outlines the monitoring and audit programme for the Project.
- 1.7 Hong Kong environmental regulations have served as environmental standards and guidelines in the preparation of this Manual. In addition, the EM&A Manual has been prepared in accordance with the requirements stipulated in Annex 21 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM).
- 1.8 This Manual contains the following information:
- Responsibilities of the Contractor, the Engineer or Engineer’s Representative (ER), the

Environmental Team (ET), and the Independent Environmental Checker (IEC) with respect to the environmental monitoring and audit requirements during the course of the Project;

- Project organisation for the Project;
- Requirements with respect to the construction programme schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- Details of the methodologies to be adopted, including all field 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;
- Requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures; and
- Requirements for reviewing the EIA predictions and the effectiveness of the mitigation measures / environmental management systems and the EM&A programme.

1.9 This EM&A Manual is a dynamic document that should be reviewed regularly and updated as necessary during the construction and operation of the Project including those updates noted in the EIA.

### **Project Organisation**

1.10 The roles and responsibilities of the various parties involved in the EM&A process and the organisational structure of the organisations responsible for implementing the EM&A programme are outlined below. The proposed project organisation and lines of communication with respect to environmental protection works are shown in **Figure No. NEX2213/C/331/ENS/M62/001**.

#### Engineer or Engineer's Representative (ER)

1.11 The Engineer is responsible for overseeing the construction works and for ensuring that the works are undertaken by the Contractor in accordance with the specification and contractual requirements. The duties and responsibilities of the Engineer with respect to EM&A may include:

- 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 environmental impacts in accordance with the Event and Action Plans;
- Participate in joint site inspections and audits undertaken by the ET; and
- Adhere to the procedures for carrying out complaint investigations.

#### The Contractor

1.12 The Contractor should report to the ER. The duties and responsibilities of the Contractor are:

- Implement the EIA recommendations and requirements;
- Provide assistance to the ET in carrying out relevant environmental monitoring;
- 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 environmental impacts where Action and Limit levels are exceeded until the events are resolved; and
- Adhere to the procedures for carrying out environmental complaint investigation in accordance with **Section 13** of this Manual.

#### Environmental Team (ET)

- 1.13 The ET should conduct the EM&A programme and ensure the Contractor's compliance with the Project's environmental performance requirements during construction. The ET should be an independent party from the Contractor.
- 1.14 The ET should be led and managed by the ET leader. The ET leader should possess at least 7 years of experience in EM&A. The ET should monitor the mitigation measures implemented by the Contractor on a regular basis to ensure the compliance with the intended aims of the measures. The duties and responsibilities of the ET are:
- Monitor the various environmental parameters as required in the EM&A Manual;
  - Carry out site inspections to investigate and audit the Contractor's site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and anticipate environmental issues for proactive and practicable action before problems arise;
  - Analyse the EM&A data, review the success of EM&A programme to confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions, and to identify any adverse environmental impacts arising and report EM&A results to the IEC, and the ER;
  - Liaison with IEC on all environmental performance matters, and timely submission of all relevant EM&A proforma for IEC's approval;
  - Prepare reports on the environmental monitoring data and the site environmental conditions;
  - Review the proposals of remedial measure from the Contractor in the case of exceedances of Action and Limit levels, in accordance with the Event and Action Plans;
  - Advice to the Contractor on environmental improvement, awareness, enhancement matters, etc., on site;
  - Timely submission of the EM&A report to the Project Proponent and the EPD; and
  - Adhere to the procedures for carrying out environmental complaint investigation in accordance with **Section 13** of this Manual.

#### Independent Environmental Checker (IEC)

- 1.15 The IEC should advise the ER on environmental issues related to the Project. The IEC should possess at least 7 years of experience in EM&A. The duties and responsibilities of the IEC are:
- Review and audit in an independent, objective and professional manner in all aspects of the EM&A programme;
  - Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers;
  - Audit the EIA recommendations and requirements against the status of implementation of environmental protection measures on site;
  - Review the effectiveness of environmental mitigation measures and project environmental performance;
  - On as-needed basis, verify and certify the environmental acceptability of the Environmental



Permit (EP) holder's construction methodology (both temporary and permanent works), relevant design plans and submissions under the EP;

- Carry out random sample check and audit on monitoring data and sampling procedures, etc;
- Conduct random site inspection;
- Verify the investigation results of environmental complaint cases and the effectiveness of corrective measures;
- Verify EM&A report that has been certified by the ET leader; and
- Provide feedback on the audit results to the ET or the EP holder according to Event and Action Plans in the EM&A Manual.

- 1.16 Given that the Project would involve in multiple contracts and would be constructed currently with other projects such as CWB and WDII, an Environmental Protection Office (ENPO) or equivalent to coordinate and oversee the cumulative construction projects in the Study Area would be established in liaison with other parties.

#### **Structure of the EM&A Manual**

- 1.17 Following this introductory section, the remainder of the Manual is set out as follows:

- Section 2 – Details auditing requirement for cultural heritage;
- Section 3 – Details auditing requirement for ecology;
- Section 4 – Details auditing requirement for fisheries;
- Section 5 – Details auditing requirement for landscape and visual impact;
- Section 6 – Sets out EM&A requirement for construction dust;
- Section 7 – Sets out EM&A requirement for airborne noise;
- Section 8 – Sets out EM&A requirement for ground-borne noise;
- Section 9 – Sets out EM&A requirement for water quality;
- Section 10 – Details auditing requirement for waste management;
- Section 11 – Details auditing requirement for land contamination;
- Section 12 – Details auditing requirement for hazard to life;
- Section 13 – Describes scope and frequency of environmental site audits and sets out the general requirements of the EM&A programme;
- Section 14 – Details the EM&A reporting requirements; and

## 2. CULTURAL HERITAGE

### Introduction

- 2.1 Cultural heritage resources within Study Area have been identified and reviewed through site visits and literature review. Given sufficient setback distance between Kellett Island Site of Archaeological Interest and the Project works areas, and lack of archaeological potential site identified within works areas, no adverse impact on terrestrial archaeological remains is envisaged during construction phase. Therefore, mitigation measures for terrestrial archaeology would not be needed.
- 2.2 Based on the findings of literature review and previous Marine Archaeological Investigation (MAI) studies, the seabed within proposed marine works area has already been disturbed by past reclamation and regular dredging works, and thus the marine archaeological potential within proposed marine works area is not envisaged. The impact on marine archaeology is not anticipated.
- 2.3 Considering sufficient buffer distances between built heritages and proposed works area, there would be insignificant visual and vibration impact during construction and operation phases provided that appropriate mitigation measures are implemented.

### Mitigation Measures

#### **Construction Phase**

##### Marine and Terrestrial Archaeology

- 2.4 No mitigation measures would be required during construction phase.

##### Built Heritage and Historical Landscape

- 2.5 The use of sensibly designed screen hoardings for mitigating landscape and visual impacts as proposed in Section 7 of the EIA Report would also be recommended for reducing the potential visual impact on identified heritage buildings to acceptable levels. Details of the mitigation measures are presented in **Appendix A**.
- 2.6 The only declared monument/site of cultural heritage within the assessment area, Flagstaff House, is located about 210m away from the nearest SCL tunnel. Given the considerable separation distance, no adverse vibration impact on the declared monument/site of cultural heritage is envisaged. Vibration monitoring on other built heritages identified in the assessment will be agreed with Antiquities and Monuments Office (AMO)/ Buildings Department (BD)/ Geotechnical Engineering Office (GEO) and implemented under the requirement of the Buildings Ordinance and/or Blasting Permit as appropriate.

#### **Operation Phase**

##### Marine and Terrestrial Archaeology

- 2.7 As there would be no archaeological impact due to operation of the project, no mitigation measures are required.

##### Built Heritage and Cultural Landscape

- 2.8 With sympathetic design incorporated in the permanent aboveground structures as proposed in Section 7 of the EIA Report, no adverse visual impact is anticipated. No further mitigation measures would be required.

### **Audit Requirements**

- 2.9 Audit requirements for landscape and visual impacts as described in **Section 5** of this Manual would as well be applicable for the protection of heritage resources.

### **3. ECOLOGY**

#### **Introduction**

- 3.1 The ecological impact assessment conducted for this Study concluded that impacts from the Project were mainly associated with the temporary loss of marine habitats due to dredging and temporary reclamation works in the Victoria Harbour. In terms of ecological importance, the assessment indicated that the affected habitats were of low ecological importance and no significant adverse impact on marine ecological resources would be expected to occur.
- 3.2 Indirect impacts of change of water quality arising from the Project would be temporary and transient in nature. With the implementation of appropriate water quality mitigation measures, significant adverse indirect impact on marine ecological resources is not anticipated.

#### **Mitigation Measures**

- 3.3 Mitigation measures for water quality control recommended in Section 11 of the EIA Report shall also be recommended to minimize impact on marine ecology. Details of the mitigation measures are presented in **Appendix A**.

#### **Monitoring and Audit Requirements**

- 3.4 No specific ecological monitoring and auditing programme is required. Monitoring and audit requirements for water quality as detailed in **Section 9** of this Manual would be applicable for the protection of the marine ecological resources.

#### **4. FISHERIES IMPACT**

##### **Introduction**

- 4.1 The fisheries impact assessment conducted for this Study concluded that direct impacts from the temporary loss of fishing ground due to the Project were relatively minor due to the generally low importance of the fishing area in the Victoria Harbour to Hong Kong fishery and the low production at this area. In view of the small size and low fisheries importance of the area being temporarily occupied, no unacceptable impact would be expected.
- 4.2 Indirect impacts of change of water quality arising from the Project would be temporary and insignificant based on the predictions from water quality modeling. With the implementation of the recommended water quality control measures, no significant adverse indirect impact on fisheries resources would be expected from the Project.

##### **Mitigation Measures**

- 4.3 Mitigation measures for water quality control recommended in Section 11 of the EIA Report would also serve to protect fisheries resources from indirect impacts. Details of the mitigation measures are presented in **Appendix A**.

##### **Monitoring and Audit Requirements**

- 4.4 No specific fisheries monitoring and auditing programme is required. Monitoring and audit requirements for water quality as detailed in **Section 9** of this Manual would be applicable for the protection of the fisheries resources.

## 5. LANDSCAPE AND VISUAL

### Introduction

- 5.1 The EIA Report has recommended landscape and visual mitigation measures for the construction and operation phases of the Project. This section defines the audit requirements to confirm the recommended landscape and visual impact mitigation measures are effectively implemented.
- 5.2 Site audit on landscape and visual aspects of the Project should be carried out during the construction phase. Specific auditing during the operation phase of the Project is not required, with the mitigation measures recommended in the EIA implemented.

### Mitigation Measures

- 5.3 The landscape and visual mitigation measures should be incorporated in the detailed design. The construction phase and operation phase mitigation measures proposed in the EIA Report are presented in **Appendix A**. Where feasible, the construction phase mitigation measures should be implemented as early as possible in order to minimize the landscape impacts in the construction stage while the mitigation measures for the operation phase should be adopted during the detailed design and be built as part of the construction works so that they are in place on the date of commissioning of the Project.
- 5.4 Any potential conflicts among the proposed mitigation measures, the Project works, and operational requirements should also be identified and resolved as early as practicable. Any changes to the mitigation measures should be incorporated in the detailed design.

### Audit Requirements

- 5.5 Site audits should be undertaken during the construction phase 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.

## 6. CONSTRUCTION DUST

### Introduction

- 6.1 Potential air quality impact arising from the construction works would mainly be related to construction dust from excavation, materials handling, spoil removal, temporary stockpiles and wind erosion, as well as operation barging facilities. As construction dust is the prime concern, monitoring should be carried out to evaluate the dust impact during the construction phase. Total Suspended Particulates (TSP) monitoring and site audits are recommended to confirm that the recommended mitigation measures are properly implemented.
- 6.2 In this section, the requirements, methodology, equipments, monitoring locations and criteria for the monitoring and audit of construction dust impact during the construction phase of the Project are presented.

### Monitoring Parameters and Equipment

- 6.3 The TSP levels should be measured by following the standard method as set out in High Volume Method for Total Suspended Particulates, Part 50 Chapter 1 Appendix B, Title 40 of the Code of Federal Regulations of the USEPA (hereinafter referred to as "HVS method").
- 6.4 Dust laden with air should be drawn through a high volume sampler (HVS) fitted with a conditioned, pre-weighed filter paper, at a controlled rate. After sampling, the filter paper with retained particles is collected and returned to the laboratory for drying in a desiccator followed by accurate weighing. TSP levels are calculated from the ratio of the mass of particulates retained on the filter paper to the total volume of air sampled.
- 6.5 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site, etc, should be recorded down in detail. A sample data sheet is shown in **Appendix B1**.
- 6.6 High volume sampler (HVS) in compliance with the following specifications should be used for carrying out the 1-hour and 24-hour monitoring:
- (i) 0.6 - 1.7 m<sup>3</sup> per minute (20 - 60 standard cubic feet per minute) adjustable flow range;
  - (ii) equipped with a timing / control device with  $\pm 5$  minutes accuracy for 24 hours operation;
  - (iii) installed with elapsed-time meter with  $\pm 2$  minutes accuracy for 24 hours operation;
  - (iv) capable of providing a minimum exposed area of 406 cm<sup>2</sup> (63 in<sup>2</sup>);
  - (v) flow control accuracy:  $\pm 2.5\%$  deviation over 24-hour sampling period;
  - (vi) incorporated with an electronic mass flow rate controller or other equivalent devices;
  - (vii) equipped with a shelter to protect the filter and sampler;
  - (viii) equipped with a flow recorder for continuous monitoring;
  - (ix) provided with a peaked roof inlet;
  - (x) incorporated with a manometer;
  - (xi) able to hold and seal the filter paper to the sampler housing at horizontal position;
  - (xii) easy to change the filter; and
  - (xiii) capable of operating continuously for 24-hour period.
- 6.7 The ET is responsible for the provision of the monitoring equipment and should provide sufficient number of HVS or direct reading dust meter with appropriate calibration kit for carrying out the baseline, regular impacts monitoring and ad-hoc monitoring. The HVSs should be equipped with an electronic

mass flow controller and be calibrated against a traceable standard at regular intervals, in accordance with requirements stated in the manufacturers operating manual and as described below. All the equipment, calibration kit, filter papers, etc, should be clearly labelled. If direct reading dust meters is proposed to be used, the ET Leader should submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable result as that the HVS and may be used for the 1-hour sampling. The instrument should also be calibrated regularly.

- 6.8 Initial calibration of HVSs with mass flow controller should be conducted upon installation and thereafter every six months. The transfer standard shall be traceable to the internationally recognized primary standard and be calibrated annually. The calibration data should be properly documented for future reference by the IEC.
- 6.9 The flow-rate of the sampler before and after the sampling exercise with the filter in position should be verified to be constant and be recorded on the data sheet as shown in **Appendix B1**.
- 6.10 If the ET Leader proposes to use a direct reading dust meter to measure 1-hr TSP levels, he shall submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable result as that the HVS and may be used for the 1-hr sampling. The instrument shall also be calibrated regularly, and the 1-hr sampling shall be determined periodically by HVS to check the validity and accuracy of the results measured by direct reading method.
- 6.11 Wind data monitoring equipment shall also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. The equipment installation location shall be proposed by the ET Leader and agreed with the ER in consultation with the IEC. For installation and operation of wind data monitoring equipment, the following points shall be observed:
- the wind sensors shall be installed on masts at an elevated level 10m above ground so that they are clear of obstructions or turbulence caused by the buildings;
  - the wind data shall be captured by a data logger. The data recorded in the data logger shall be downloaded periodically for analysis at least once a month;
  - the wind data monitoring equipment shall be re-calibrated at least once every six months; and
  - wind direction shall be divided into 16 sectors of 22.5 degrees each.
- 6.12 If the ET Leader proposes alternative dust monitoring equipment / methodology (e.g. direct reading methods) after the approval of this Manual, agreement from the IEC should be sought. The instrument should also be calibrated regularly following the requirements specified by the equipment manufacturers.

#### **Laboratory Measurement / Analysis**

- 6.13 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 shall be HOKLAS accredited or other internationally accredited laboratory.
- 6.14 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 in consultation with the IEC. Measurement performed by the laboratory shall be demonstrated to the satisfaction of the ER and the IEC. IEC shall conduct regular audit to 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 the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.
- 6.15 Filter paper of size 8"x10" shall be labelled before sampling. It shall be a clean filter paper with no pin holes, and shall be conditioned in a humidity controlled chamber for over 24-hr and be pre-weighed before use for the sampling.
- 6.16 After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper is then returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1 mg. The balance



shall be regularly calibrated against a traceable standard.

- 6.17 All the collected samples shall be kept in a good condition for 6 months before disposal.

### Dust Monitoring Stations

- 6.18 The worst potentially affected locations in the vicinity of the construction activities of the Project identified for dust monitoring are listed in **Table 6.1** and shown in **Figure Nos. NEX2213/C/331/ENS/M62/010 – NEX2213/C/331/ENS/M62/011**.

**Table 6.1 Proposed Dust Monitoring Stations**

Identification No.	Air Sensitive Receiver (ASR) ID in EIA Report	Dust Monitoring Station
AM1	HHA9	Harbourfront Horizon <sup>(1)</sup>
AM2	EXA6	Wanchai Sports Ground
AM3	EXA5	Existing Harbour Road Sports Centre (would be demolished in 2015)
AM4	EXA4	Pedestrian Plaza

Note:

- (1) The set up of the dust monitoring station at Harbourfront Horizon and the monitoring would be carried out by Kwun Tong Line Extension project or Shatin to Central Link – Mong Kok East to Hung Hom Section [SCL (MKK-HUH)]. Upon termination of their EM&A programmes, the monitoring works would be taken up by this Project.

- 6.19 The status and locations of air quality sensitive receivers may change after this Manual is issued. In such case, the ET should propose alternative monitoring stations and seek agreement from the IEC and EPD.
- 6.20 When alternative monitoring locations are proposed, the monitoring stations should be chosen based on the following criteria:
- (i) Monitoring at ASRs close to the major site activities which are likely to have air quality impacts;
  - (ii) Monitoring as close as possible to the ASRs as defined in the EIAO-TM; and
  - (iii) Assurance of minimal disturbance to the occupants and working under a safe condition during monitoring.
- 6.21 When positioning the HVSs, the following points should be noted:
- (i) A horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
  - (ii) Two samplers should not be placed less than 2m apart;
  - (iii) 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;
  - (iv) a minimum of 2m separation from walls, parapets and penthouses is required for rooftops samplers;
  - (v) a minimum of 2m separation from any supporting structure, measures horizontally is required;
  - (vi) no furnace or incinerator flue is located nearby the samplers;
  - (vii) airflow around the sampler is unrestricted;
  - (viii) the sampler is more than 20m from the dripline;

- (ix) any wire fence and gate to protect the sampler, should not cause any obstruction during monitoring;
- (x) permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- (xi) a secured supply of electricity is needed to operate the samplers.

- 6.22 In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, the ET Leader shall carry out the monitoring at alternative locations which 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.
- 6.23 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader 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.

### **Baseline Monitoring**

- 6.24 Baseline monitoring should be carried out to determine the ambient 1-hour and 24-hour TSP levels at the monitoring locations prior to the commencement of the Project works. Before commencing the baseline monitoring, the ET should inform the IEC of the baseline monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the baseline monitoring results.
- 6.25 TSP baseline monitoring should be carried out for a continuous period of at least two weeks with the 24-hour and three sets of 1-hour ambient measurements taken daily at each monitoring station. During the baseline monitoring, there should not be any construction or dust generating activities in the vicinity of the monitoring stations. General meteorological conditions (wind speed, direction and precipitation) and notes regarding any significant adjacent dust producing sources should also be recorded throughout the baseline monitoring period. A summary of baseline monitoring is presented in **Table 6.2**.
- 6.26 The baseline monitoring will provide data for the determination of the appropriate Action levels whilst the Limit levels will be set against statutory or otherwise agreed limits.
- 6.27 If the ET Leader considers that significant changes in the ambient conditions have arisen, a repeat of the baseline monitoring may be carried out to update the baseline levels and air quality criteria, after consultation and agreement with the ER, the IEC and the EPD.

### **Impact Monitoring**

- 6.28 The monthly schedule of the compliance and impact monitoring programme should be drawn up by the ET one month prior to the commencement of the scheduled construction period.
- 6.29 For the regular 24-hour TSP impact monitoring, a sampling frequency of at least once in every six days should be strictly observed at the monitoring stations when there are Project-related construction activities being undertaken within a radius of 500m from these monitoring stations. The specific time to start and stop the 24-hr TSP monitoring shall be clearly defined for each location and be strictly followed by the field operator. In case of complaints, 1-hour TSP monitoring should be conducted when the highest dust impacts are likely to occur. The impact monitoring programme is summarised in **Table 6.2**.

**Table 6.2 Summary of Construction Dust Monitoring Programme**

Monitoring Period	Duration	Sampling Parameter	Frequency
Baseline Monitoring	Consecutive days of at least 2 weeks before commencement of major construction works	1 hour TSP	3 times per day
		24-hour TSP	Daily
Impact Monitoring	Throughout the construction phase*	1 hour TSP <sup>#</sup>	3 times in every 6 days when documented and valid complaints was received
		24-hour TSP*	Once in every 6 days

Notes:

\* Impact monitoring should be conducted at the monitoring stations for 24-hour TSP monitoring when there are Project-related construction activities being undertaken within a radius of 500m from these monitoring stations.

<sup>#</sup> Based on the EM&A results of other similar projects, 1-hour TSP would not be a concern. 1-hour TSP monitoring should therefore be conducted only when documented and valid complaint was received.

- 6.30 Before commencement of the monitoring, the ET should inform the IEC of the impact monitoring programme such that the IEC can conduct an on-site audit to ensure the accuracy of the impact monitoring results.

### Compliance Assessment

- 6.31 Action and Limit (A/L) levels that provide an appropriate framework for the interpretation of monitoring results. The air quality monitoring data should be checked against the recommended A/L levels as listed in **Table 6.3**.

**Table 6.3 Proposed Action and Limit Levels for Impact Monitoring**

Parameter	Action Level <sup>(1)</sup>	Limit Level
24-hours TSP	<ul style="list-style-type: none"> <li>For <math>BL \leq 200 \mu\text{g m}^{-3}</math>, <math>AL = (BL * 1.3 + LL)/2</math></li> <li>For <math>BL &gt; 200 \mu\text{g m}^{-3}</math>, <math>AL = LL</math></li> </ul>	$260 \mu\text{g m}^{-3}$
1-hour TSP	<ul style="list-style-type: none"> <li>For <math>BL \leq 384 \mu\text{g m}^{-3}</math>, <math>AL = (BL * 1.3 + LL)/2</math></li> <li>For <math>BL &gt; 384 \mu\text{g m}^{-3}</math>, <math>AL = LL</math></li> </ul>	$500 \mu\text{g m}^{-3}$

Note:

(1) BL = Baseline level, AL = Action level, LL = Limit level.

### Event and Action Plan

- 6.32 The Event and Action Plan prescribes procedures and actions associated with the outcome of the comparison of air quality monitoring data recorded and the agreed A/L levels. In the cases where exceedances of these A/L levels occurs, the ET, the IEC, the ER and the Contractor should strictly observe the relevant actions of the respective Event and Action Plan listed in **Table 6.4**.

**Table 6.4 Event and Action Plan for Construction Dust Monitoring**

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
<b>ACTION LEVEL</b>				
1. Exceedance for one sample	1. Inform the Contractor, IEC and ER; 2. Discuss with the Contractor on the remedial measures required; 3. Repeat measurement to confirm findings; and 4. Increase monitoring frequency.	1. Check monitoring data submitted by the ET; 2. Check Contractor's working method; and 3. Review and advise the ET and ER on the effectiveness of the proposed remedial measures.	1. Confirm receipt of notification of exceedance in writing;.	1. Identify source(s), investigate the causes of exceedance and propose remedial measures; 2. Implement remedial measures; and 3. Amend working methods agreed with the ER as appropriate.
2. Exceedance for two or more consecutive samples	1. Inform the Contractor, IEC and ER; 2. Discuss with the ER and Contractor on the remedial measures required; 3. Repeat measurements to confirm findings; 4. Increase monitoring frequency to daily; 5. If exceedance continues, arrange meeting with the IEC, ER and Contractor; and 6. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by the ET; 2. Check Contractor's working method; and 3. Review and advise the ET and ER on the effectiveness of the proposed remedial measures.	1. Confirm receipt of notification of exceedance in writing; 1. Review and agree on the remedial measures proposed by the Contractor; and 2. Supervise Implementation of remedial measures.	1. Identify source and investigate the causes of exceedance; 2. Submit proposals for remedial measures to the ER with a copy to ET and IEC within three working days of notification; 3. Implement the agreed proposals; and 4. Amend proposal as appropriate.
<b>LIMIT LEVEL</b>				
1. Exceedance for one sample	1. Inform the Contractor, IEC, EPD and ER; 2. Repeat measurement to confirm findings;	1. Check monitoring data submitted by the ET; 2. Check the Contractor's working method;	1. Confirm receipt of notification of exceedance in writing; 2. Review and agree on the	1. Identify source(s) and investigate the causes of exceedance; 2. Take immediate action

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
	<ol style="list-style-type: none"> <li>3. Increase monitoring frequency to daily; and</li> <li>4. Discuss with the ER, IEC and contractor on the remedial measures and assess the effectiveness.</li> </ol>	<ol style="list-style-type: none"> <li>3. Discuss with the ET, ER and Contractor on possible remedial measures; and</li> <li>4. Review and advise the ER and ET on the effectiveness of Contractor's remedial measures. .</li> </ol>	<p>remedial measures proposed by the Contractor; and</p> <ol style="list-style-type: none"> <li>3. Supervise implementation of remedial measures.</li> </ol>	<p>to avoid further exceedance;</p> <ol style="list-style-type: none"> <li>3. Submit proposals for remedial measures to ER with a copy to ET and IEC within three working days of notification;</li> <li>4. Implement the agreed proposals; and</li> <li>5. Amend proposal if appropriate.</li> </ol>
<ol style="list-style-type: none"> <li>2. Exceedance for two or more consecutive samples</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify Contractor, IEC, EPD and ER;</li> <li>2. Repeat measurement to confirm findings;</li> <li>3. Increase monitoring frequency to daily;</li> <li>4. Carry out analysis of the Contractor's working procedures with the ER to determine possible mitigation to be implemented;</li> <li>5. Arrange meeting with the IEC and ER to discuss the remedial measures to be taken;</li> <li>6. Review the effectiveness of the Contractor's remedial measures and keep IEC, EPD and ER informed of the results; and</li> <li>7. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by the ET;</li> <li>2. Check the Contractor's working method;</li> <li>3. Discuss with ET, ER, and Contractor on the potential remedial measures; and</li> <li>4. Review and advise the ER and ET on the effectiveness of Contractor's remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. In consultation with the ET and IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>3. Supervise the implementation of remedial measures; and</li> <li>4. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source(s) and investigate the causes of exceedance;</li> <li>2. Take immediate action to avoid further exceedance;</li> <li>3. Submit proposals for remedial measures to the ER with a copy to the IEC and ET within three working days of notification;</li> <li>4. Implement the agreed proposals;</li> <li>5. Revise and resubmit proposals if problem still not under control; and</li> <li>6. Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

### **Mitigation Measures**

- 6.33 Site-specific dust mitigation measures recommended in the EIA Report include watering on active works areas, exposed areas and paved haul roads, enclosing the unloading process at barging point, good site practices and dust suppression measures stipulated in Air Pollution Control (Construction Dust) Regulation. Details of the mitigation measures are presented in **Appendix A**.

## 7. AIRBORNE NOISE

### Introduction

- 7.1 In this section, the requirements, methodology, equipment, monitoring locations, and protocols for the monitoring and audit of airborne noise impacts during the construction and operation phases of the Project are presented.

### Construction Noise

#### Noise Parameters

- 7.2 The construction noise level should be measured in terms of the A-weighted equivalent continuous sound pressure level ( $L_{eq}$ ).  $L_{eq(30\text{ min})}$  should be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays.
- 7.3 Supplementary information for data auditing and statistical results such as  $L_{10}$  and  $L_{90}$  should also be obtained for reference. A sample data record sheet is shown in **Appendix B2** for reference.

#### Monitoring Equipment and Methodology

- 7.4 As referred to the requirements of 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 should be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement the accuracy of the sound level meter should 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 difference between calibration levels obtained before and after the noise measurement is less than 1.0 dB.
- 7.5 Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding  $5\text{ms}^{-1}$  or wind with gusts exceeding  $10\text{ms}^{-1}$ . The wind speed should be checked with a portable wind speed meter capable of measuring wind speeds in  $\text{ms}^{-1}$ .
- 7.6 The ET is responsible for the provision of the monitoring equipment and should 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 should be clearly labelled.

#### Noise Monitoring Stations

- 7.7 In accordance with the EIA Report, the designated locations for construction noise monitoring are listed in **Table 7.1** and shown in **Figure No. NEX2213/C/331/ENS/M62/020**.

**Table 7.1 Noise Monitoring Stations during Construction Phase**

Identification No.	Noise Sensitive Receiver (NSR) ID in EIA Report	Noise Monitoring Station
NM1	CH2	Hoi Kung Court
NM2	EX1	Causeway Centre, Block A

- 7.8 The status and location of noise sensitive receivers (NSRs) may change after approval of this Manual. In such case, and if changes to the monitoring locations are considered necessary, the ET should propose alternative monitoring stations and seek approval from the ER and agreement from the IEC and EPD on the proposal. If alternative monitoring stations are proposed, these stations should be chosen based on the following criteria:

- Monitoring at NSRs close to the major site activities of the Project that are likely to arise noise impacts;

- Monitoring as close as possible to the NSRs as defined in the EIAO-TM; and
- Assurance of minimal disturbance to the occupants and working under a safe condition during monitoring.

7.9 The monitoring station should normally be at a point 1m from the exterior of the noise sensitive facade and be at a position 1.2m above ground. If there is a problem with access to the normal monitoring position, an alternative position should be chosen, and a correction to the measurement results should be made. For reference, a correction of +3dB(A) should be made to free-field measurements. The ET should 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 should be carried out at the same positions. If changes to the monitoring stations are required upon commencing the baseline monitoring or thereafter, the ET should proposed alternative locations based on the above-mentioned criteria and seek approval from the ER and agreement from the IEC and EPD on the proposal.

### ***Baseline Monitoring***

- 7.10 The ET should carry out baseline noise monitoring prior to the commencement of the construction works. The baseline noise levels should be measured for a continuous period of at least 14 consecutive days at a minimum logging interval of 30 minutes for daytime (between 0700 and 1900 hours of normal weekdays) and 15 minutes (as three consecutive  $L_{eq, (5 \text{ minutes})}$  readings) for evening time (between 1900 and 2300 hours on normal weekdays), general holidays including Sundays (between 0700 and 2300 hours) and night-time (between 2300 and 0700 on all days). The  $L_{eq}$ ,  $L_{10}$  and  $L_{90}$  should be recorded at the specified interval. Before commencing the baseline monitoring, the ET Leader should inform the IEC of the baseline monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the baseline monitoring results.
- 7.11 There should not be any construction activities in the vicinity of the monitoring stations during the baseline monitoring. Any non-project related construction activities in the vicinity of the monitoring stations during the baseline monitoring should be noted and the source and location of such activities should be recorded.
- 7.12 In exceptional cases, when baseline monitoring data obtained are insufficient or questionable, the ET Leader should liaise with the IEC and EPD to agree on an appropriate set of data to be used as the baseline reference.

### ***Impact Monitoring***

- 7.13 Noise monitoring should be carried out at all the designated monitoring stations when there are Project-related construction activities being undertaken within a radius of 300m from the monitoring stations. The monitoring frequency should depend on the scale of the construction activities. An initial guide on the monitoring is to obtain one set of 30-minute measurement at each station between 0700 and 1900 hours on normal weekdays at a frequency of once a week when construction activities are underway.
- 7.14 If a school is located near the construction activities, noise monitoring should be carried out at the monitoring stations for the school during school examination periods. The ET Leader should liaise with the school administration and the Hong Kong Examinations and Assessment Authority to ascertain the exact dates and times of all examinations during the construction phase of the Project.
- 7.15 In the case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in Event and Action Plan in **Table 7.3**, should be carried out. This additional monitoring should be continued until the recorded noise levels show that the non-compliance is rectified or proved to be irrelevant to the Project-related construction activities.

### ***Event and Action Plan***

- 7.16 The Action and Limit levels for construction noise are defined in **Table 7.2**. Should non-compliance of



the noise quality criteria occur actions in accordance with the Event and Action Plan in **Table 7.3** should be taken.

**Table 7.2 Action and Limit Levels for Construction Noise Impact Monitoring**

Time Period	Action Level	Limit Level
0700-1900 hours on normal weekdays	When one documented complaint is received	75 dB(A) for residential premises
		70 dB(A) for schools and 65 dB(A) during examination period

7.17 To account for cases in which ambient noise levels, as identified by baseline monitoring, approach or exceed the stipulated Limit Levels prior to the commencement of construction, a Maximum Acceptable Impact Level, which incorporates the baseline noise levels and the identified construction noise Limit Level, may be defined and agreed with the EPD. The amended level will be greater than 75 dB(A) and will represent the maximum acceptable noise level at a specific monitoring station. Correction factors for the effects of acoustic screening and/or architectural features of NSRs may also be applied as specified in the Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM).

**Table 7.3 Event and Action Plan for Construction Noise Monitoring**

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
<b>Action Level</b>	<ol style="list-style-type: none"> <li>1. Notify the Contractor, IEC and ER;</li> <li>2. Discuss with the ER and Contractor on the remedial measures required; and</li> <li>3. Increase monitoring frequency to check mitigation effectiveness.</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the investigation results submitted by the Contractor; and</li> <li>2. Review and advise the ET and ER on the effectiveness of the remedial measures proposed by the Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of complaint in writing;</li> <li>2. Review and agree on the remedial measures proposed by the Contractor; and</li> <li>3. Supervise implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Investigate the complaint and propose remedial measures;</li> <li>2. Report the results of investigation to the IEC, ET and ER;</li> <li>3. Submit noise mitigation proposals to the ER with copy to the IEC and ET within three working days of notification; and</li> <li>4. Implement noise mitigation proposals.</li> </ol>
<b>Limit Level</b>	<ol style="list-style-type: none"> <li>1. Notify the Contractor, IEC, EPD and ER;</li> <li>2. Repeat measurement to confirm findings;</li> <li>3. Increase monitoring frequency;</li> <li>4. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>5. Arrange meeting with the IEC and ER to discuss the remedial measures to be taken;</li> <li>6. Review the effectiveness of Contractor's remedial measures and keep IEC, EPD and ER informed of the results; and</li> <li>7. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by the ET;</li> <li>2. Check the Contractor's working method;</li> <li>3. Discuss with the ER, ET and Contractor on the potential remedial measures; and</li> <li>4. Review and advise the ET and ER on the effectiveness of the remedial measures proposed by the Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. In consultation with the ET and IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>3. Supervise the implementation of remedial measures; and</li> <li>4. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source and investigate the causes of exceedance;</li> <li>2. Take immediate action to avoid further exceedance;</li> <li>3. Submit proposals for remedial measures to the ER with copy to the IEC and ET within three working days of notification;</li> <li>4. Implement the agreed proposals;</li> <li>5. Revise and resubmit proposals if problem still not under control; and</li> <li>6. Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

### **Operation Noise – Fixed Plant**

- 7.18 The maximum permissible sound power levels of the identified fixed noise sources of the Project were predicted in the EIA Report. To ensure that the noise impact associated with the fixed plant operations would comply with the noise standards stipulated in the EIAO-TM and Noise Control Ordinance (NCO), the specified sound power levels should be implemented and refined by the Contractor as appropriate.
- 7.19 No specific monitoring for the fixed plant operation is deemed necessary.

### **Mitigation Measures**

#### ***Construction Phase***

- 7.20 The EIA Report indicates that construction activities would cause airborne noise exceedances at a few NSRs, and therefore, appropriate noise mitigation measures and good site practices are recommended. The Contractor should be responsible for the design and implementation of these measures. The implementation schedule for the recommended mitigation measures is presented in **Appendix A**.
- 7.21 In the event of exceedances or complaints, the Contractor should review the effectiveness of these mitigation measures and propose, design and implement alternative or additional measures as appropriate. The Contractor should liaise with the ET on alternative or additional remedial measures, if appropriate, and the proposal of the measures should be submitted to the ER for approval. The Contractor should implement the agreed remedial measures properly.

#### ***Operation Phase***

- 7.22 The mitigation measures as recommended in the EIA Report for the fixed plant noise arising from the operation of the Project is presented in **Appendix A**. These measures should be reviewed and refined by the ER and ET if there are any major design changes during the detailed design phase such that the recommended measures are adequate for alleviating the potential operation noise impacts.

## 8. GROUND-BORNE NOISE

### Introduction

- 8.1 In this section, the requirements for the monitoring and audit of ground-borne noise impacts during the construction and operation phases of the Project are presented.

### Construction Ground-borne Noise

- 8.2 In accordance with the EIA Report, the predicted construction ground-borne noise level at the identified ground-borne NSR would comply with the noise criteria. Adverse ground-borne construction noise impact due to the Project would not be envisaged. Ground-borne noise monitoring is thus considered not necessary during construction phase.

### Operation Ground-borne Noise

- 8.3 A noise commissioning test should be conducted by the ET prior to the operation phase of the Project to confirm the compliance of the operational ground-borne noise levels with the NCO noise criteria.

### Testing Parameter and Criteria

- 8.4 The train operation ground-borne noise level should be measured in terms of the A-weighted equivalent continuous sound pressure level (Leq). Leq<sub>(30 min)</sub> should be used as the monitoring parameter.
- 8.5 With reference to the Technical Memorandum for the Assessment of Noise from Places Other Than Domestic Premises, Public Places or Construction Sites (IND-TM), the criteria for noise transmitted primarily through the structural elements of the building or buildings should be 10dB(A) less than the relevant acceptable noise level (ANL). The criteria for ground-borne rail noise assessment are given in **Table 8.1**.

**Table 8.1 Operation Ground-borne Noise Criteria**

Type of NSR / Assessment Point	Ground-borne Noise Criteria, (Leq 30 min, dB(A))	
	Day & Evening (0700 to 2300 hrs)	Night (2300 to 0700 hrs)
Domestic premises, hotels and service apartments	55	45
Schools	55	[a]

Note:

[a] No sensitive use/activity during this period.

### Monitoring Equipment and Methodology

- 8.6 In accordance with the requirements of 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 should be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement the accuracy of the sound level meter should 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 difference between the calibration levels obtained before and after the noise measurement agree to within 1.0 dB.
- 8.7 Existing Leq<sub>(30min)</sub> levels should be monitored at the monitoring stations without trains running to obtain the ambient noise levels. After the train noise levels are measured (if measured directly), these ambient levels should be deducted from the measured Leq<sub>(30min)</sub> levels to obtain the operational noise levels in the absence of ambient noise.

**Monitoring Locations**

8.8 The noise commissioning test should be performed once prior to the operation of the Project at key noise sensitive receivers (NSRs) listed in **Table 8.2** and shown in **Figure No. NEX2213/C/331/ENS/M62/021**.

**Table 8.2 Operational Ground-borne Noise Monitoring Stations**

Identification No.	NSR ID in EIA Report	Description	Land Use
GOM1	CH2	Hoi Kung Court	Residential
GOM2	EX4	HKAPA <sup>[a]</sup>	Educational
GOM3	AD4	Island Shangri-La Hotel	Hotel

Note:

[a] HKAPA is currently used as performing arts centre and provides professional education, training and research facilities in the performing arts, theatre and entertainment arts, film and television. With a similar nature of education, tutoring, communication and rehearsal in both performing arts centre and education institution, a criterion for educational use is considered appropriate for HKAPA.

8.9 The status and location of noise sensitive receivers may change after this Manual is issued. In such event, and if changes to the monitoring locations are considered necessary, the ET should discuss with the ER and IEC to propose alternative monitoring locations and seek approval from the ER and agreement from the IEC on the proposal. When alternative monitoring stations are proposed, the monitoring stations should be chosen based on the following criteria:

- Monitoring within the NSRs close to the alignment; and
- Avoiding disturbance to the occupants during monitoring within the NSRs.

8.10 The monitoring stations should be at the lowest sensitive floor of each designated monitoring location and normally be at a position 1.2m above ground inside the building structures. If there is a problem with access to the normal monitoring position, an alternative position should be chosen, and a correction to the measurement results should be made. The ET should agree with the IEC on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline and the impact monitoring shall be carried out at the same position. If changes to the monitoring stations are required upon commencing the baseline monitoring or thereafter, the ET should propose alternative locations based on the above-mentioned criteria and seek approval from the ER and agreement from the IEC and EPD on the proposal.

**Mitigation Measures**

**Construction Phase**

8.11 The predicted construction ground-borne noise levels at all representative NSRs would be within the noise criteria. No mitigation measure is therefore required.

**Operation Phase**

8.12 With direct fixation track, the predicted ground-borne noise levels at all representative NSRs would comply with the noise criteria. Mitigation measures are therefore not required.

## 9. WATER QUALITY

### Water Quality Parameters

- 9.1 As identified in the EIA Report, the key water quality impacts caused by the Project would be associated with the dredging works during the construction phase. The EIA Report has identified that suspended sediment is the most critical water quality parameter caused by the dredging works. Marine water quality monitoring should be carried out during the dredging and filling operation to ensure that any unacceptable increase in suspended solids / turbidity and decrease in dissolved oxygen due to the dredging activities or temporary reclamation works could readily be detected and timely action be taken to rectify the situation. As presented in the EIA Report, adverse impacts associated with the potential release of contaminants (such as heavy metals) from the marine mud during dredging activities is not expected. As such, no monitoring programme specific for contaminant release is considered necessary.
- 9.2 Dissolved Oxygen (DO), turbidity and Suspended Solids (SS) levels should be monitored at designated marine water quality monitoring stations during the construction phase. DO and turbidity should be measured in situ whereas SS should be determined by laboratory.
- 9.3 Adverse water quality impacts associated with the operation of the Project are not expected, in accordance with the EIA Report. Thus, no operational monitoring and audit programme specific for water quality is required.

### Monitoring Equipment

#### *pH Measurement Instrument*

- 9.4 The instrument should consist of a potentiometer, a glass electrode, a reference electrode and a temperature-compensating device. It should be readable to 0.1pH in a range of 0 to 14. Standard buffer solutions of at least pH 7 and pH 10 should be used for calibration of the instrument before and after use.

#### *Dissolved Oxygen and Temperature Measuring Equipment*

- 9.5 The Dissolved Oxygen (DO) measuring equipment should be portable and weatherproof. It should come complete with cable and sensor, and a DC power source. The equipment should be capable of measuring:
- a DO level in the range of 0 - 20 mg·L<sup>-1</sup> and 0 - 200% saturation; and
  - a temperature of 0 - 45 degree Celsius (°C).
- 9.6 It should have a membrane electrode with automatic temperature compensation complete with a cable.
- 9.7 Should salinity compensation not be built-in to the DO equipment, in-situ salinity should be measured to calibrate the DO measuring equipment prior to each DO measurement.

#### *Turbidity Measurement Instrument*

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

#### *Sampler*

- 9.9 A water sampler is required for SS 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).

**Water Depth Detector**

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

**Salinity**

- 9.11 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 station.

**Sample Containers and Storage**

- 9.12 Water samples for SS monitoring should be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4 °C without being frozen) and delivered to the laboratory and analyzed as soon as possible after collection

**Monitoring Position Equipment**

- 9.13 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 at the correct location before taking measurements.

**Calibration of In-Situ Instruments**

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

**Laboratory Measurement / Analysis for Marine Water**

- 9.16 Duplicate samples from each independent sampling event are required by EPD for all parameters. Analysis of suspended solids shall be carried out in a HOKLAS or other international accredited laboratory. Sufficient water samples shall be collected at the monitoring stations for carrying out the laboratory SS determinations, with detection limit shown in **Table 9.1**. The SS determination work shall start within 24 hours after collection of the water samples. The analyses shall follow the standard methods according to **Table 9.1** and as described in "American Public Health Association (APHA) Standard Methods for the Examination of Water and Wastewater", 19th edition, unless otherwise specified.

**Table 9.1 Analytical Methods to be applied to Marine Water Quality Samples**

Determinant	Standard Method	Detection Limit
Suspended Solids (mg/L)	APHA 2540 D	0.1 mg/L

### Marine Water Monitoring Locations

- 9.17 Water quality monitoring will be carried out at the representative water sensitive receivers (WSRs) which are shown in **Figure Nos. NEX2213/C/331/ENS/M62/030 to NEX2213/C/331/ENS/M62/032** and **Table 9.2**. Two control stations, C1 and C2, outside the area of influence of the works are selected at the east and the west of the Victoria Harbour. The status and location of WSRs may change after approval of this Manual. In such case, and if changes to the monitoring locations are considered necessary, the ET should propose alternative monitoring stations and seek approval from the ER and agreement from the IEC and EPD on the proposal.

**Table 9.2 Marine Water Quality Stations for Baseline and Impact Monitoring**

Identification No./ WSR ID in EIA Report	Description	Coordinates	
		Easting	Northing
8	Cooling Water Intake for Excelsior Hotel and World Trade Centre / No. 27 – 63 Paterson Street	837036	816008
9	Cooling Water Intake for Windsor House	837223	816150
14	Flushing Water Intake for Kowloon Station	834477	817891
21	Cooling Water Intake for East Rail Extension	836484	817642
34	Cooling Water Intake for Metropolis	836828	817844
A	Wan Chai WSD Flushing Water Intake	836211	815913
WSD9	Tai Wan WSD Flushing Water Intake	838133	817790
WSD17	Quarry Bay WSD Flushing Water Intake	839863	817077
C1	Control Station 1	833977	817442
C2	Control Station 2	841088	817223

- 9.18 When alternative monitoring locations are proposed, they shall be chosen based on the following criteria:
- at locations close to and preferably at the boundary of the mixing zone of the major site activities as indicated in the EIA final report, which are likely to have water quality impacts;
  - close to the sensitive receptors which are directly or likely to be affected;
  - for monitoring locations located in the vicinity of the sensitive receptors, care shall be taken to cause minimal disturbance during monitoring;
  - two or more control stations which shall be at locations representative of the project site in its undisturbed condition. Control stations shall be located, as far as is practicable, both upstream and down stream of the works area.
- 9.19 Control stations are necessary to compare the water quality from potentially impacted sites with the ambient water quality. Control stations shall be located within the same body of water as the impact monitoring stations but shall be outside the area of influence of the works and, as far as practicable, not affected by any other works.

### Baseline Monitoring

- 9.20 Baseline conditions for marine water quality should be established and agreed with EPD prior to the commencement of dredging works or any major marine 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 monitoring stations.



- 9.21 The baseline conditions should be established by measuring dissolved oxygen, turbidity and suspended solids levels at the selected monitoring stations as shown in **Figure Nos. NEX2213/C/331/ENS/M62/030 to NEX2213/C/331/ENS/M62/032**. For all monitoring stations at seawater intakes, it is recommended to conduct the monitoring behind the silt screens and at the appropriate vertical levels of the abstraction points of these intakes. For water quality monitoring at the control stations, the monitoring should be carried out 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. The baseline monitoring schedule should be submitted to EPD at least 2 weeks before commencement of monitoring for agreement. EPD should also be notified immediately for any changes in schedule.
- 9.22 The measurements should be taken at all designated monitoring stations, 3 days per week, at mid-flood and mid-ebb tides, for at least 4 weeks prior to the commencement of dredging works. Any marine construction works should be avoided in the vicinity of the stations during the baseline monitoring. The interval between 2 sets of monitoring should not be less than 36 hours. Duplicate in-situ measurements and water sampling should be carried out in each sampling event. For selection of tides for in-situ measurement and water sampling, tidal range of individual flood and ebb tides should be not less than 0.5 m.

### Impact Monitoring

- 9.23 During the period of marine construction works, monitoring should be undertaken three days per week, at mid-flood and mid-ebb tides, with sampling/measurement at the designated monitoring stations as shown in **Table 9.3**. For all monitoring stations at seawater intakes, it is recommended to conduct the monitoring behind the silt screens and at the appropriate vertical levels of the abstraction points of these intakes. For water quality monitoring at the control stations, the monitoring should be carried out at the surface, middle and bottom water level. The interval between two sets of monitoring should not be less than 36 hours except where there are exceedances of Action and/or Limit levels, in which case the monitoring frequency will be increased. **Table 9.3** shows the proposed monitoring frequency and water quality parameters. Duplicate in-situ measurements and water sampling should be carried out in each sampling event. For selection of tides for in-situ measurement and water sampling, tidal range of individual flood and ebb tides should be not less than 0.5 m. The impact monitoring schedule for water quality should be submitted to EPD on or before the first day of the monitoring month. EPD should also be notified immediately for any changes in schedule.

**Table 9.3 Proposed Marine Water Quality Monitoring Frequency and Parameters**

Activities	Monitoring Period	Monitoring Frequency Note 1	Key Parameters <sup>Note 2</sup>
Baseline Monitoring	At least 4 weeks prior to the commencement of dredging / filling works	Three days per week, at mid-flood and mid-ebb tides	Turbidity, SS, DO, pH, temperature, salinity
Impact Monitoring	During dredging / filling works	Three days per week, at mid-flood and mid-ebb tides	Turbidity, SS, DO, pH, temperature, salinity

Notes:

1. For selection of tides for *in-situ* measurement and water sampling, tidal range of individual flood and ebb tides should be not less than 0.5 m.
2. Turbidity, DO, pH, temperature and salinity should be measured in situ whereas SS should be determined by laboratory.

- 9.24 In order to avoid aggravation of odour nuisance from seawater arising from temporary reclamation in the CBTS, the DO levels at station ID Nos. 8 and 9 will be monitored during the construction period, in the presence of temporary reclamation in the CBTS under this Project. In case the temporary reclamation works for this Project is found during the water quality monitoring and audit programme to cause unacceptable oxygen depletion (e.g. DO level <2 mg/L) at station ID Nos. 8 and 9, remedial measures (e.g. use of aeration method to improve the DO levels in the marine embayment) will be considered and agreed by all current projects within the CBTS such as CWB and WDII. The proposed

remedial measures will be implemented in the CBTS as necessary to improve the problems.

### Post-project Monitoring

- 9.25 Upon completion of all marine activities, a post project monitoring exercise on water quality shall be carried out for four weeks in the same manner as the impact monitoring.

### Proposed Water Quality Monitoring Schedule

- 9.26 Proposed water quality monitoring schedule shall be faxed to EPD on or before the first day of the monitoring month. EPD shall also be notified immediately for any changes in schedule by fax.

### Field Log

- 9.27 Other relevant data should also be recorded, including monitoring location / position, time, water depth, sampling depth, pH, salinity, DO saturation, DO, turbidity, water temperature, tidal stages, weather conditions and any special phenomena or work underway nearby.
- 9.28 A sample data record sheet is shown in **Appendix B3** for reference.

### Event and Action Plan

- 9.29 The water quality monitoring criteria, namely Action and Limit levels are shown in **Table 9.4**. When exceedances of Action and Limit levels are detected at any designated monitoring stations, remedial actions should be taken in accordance with the Event and Action Plan in **Table 9.5**.
- 9.30 The ET Leader should assess the potential impacts caused by dredging or filling works on the seawater intakes based on the monitoring data.

**Table 9.4 Action and Limit Levels for Marine Water Quality Monitoring Stations**

Parameters	Action	Limit
<b>WSD Salt Water Intake</b>		
SS in mg·L <sup>-1</sup>	95 percentile of baseline data or >9.5 mg/L	99 percentile of baseline data or >10 mg/L
Turbidity in NTU	95 percentile of baseline data or >9.5 NTU	99 percentile of baseline data or >10 NTU
DO in mg/L	5 percentile of baseline data or <2.1 mg/L	1 percentile of baseline data or <2 mg/L
<b>Cooling Water Intake</b>		
SS in mg·L <sup>-1</sup>	95 percentile of baseline data	99 percentile of baseline data
Turbidity in NTU	95 percentile of baseline data	99 percentile of baseline data
DO in mg/L	5 percentile of baseline data	1 percentile of baseline data

Notes

1. It is recommended to conduct the monitoring behind the silt screens, as far as practicable, for monitoring stations with provision of silt screen and at the appropriate vertical levels of the abstraction points of these intakes
2. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
3. For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
4. All the figures given in the table are used for reference only and the EPD may amend the figures whenever it is considered as necessary.

**Table 9.5 Event and Action Plan for Marine Water Quality Monitoring**

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Inform the Contractor, IEC and ER;</li> <li>2. Check monitoring data, all plant, equipment and the Contractor's working methods; and</li> <li>3. Discuss remedial measures with the IEC and Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with the ET, ER and Contractor on the implemented mitigation measures;</li> <li>2. Review proposals on remedial measures submitted by the Contractor and advise the ER accordingly; and</li> <li>3. Review and advise the ET and ER the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with the ET, IEC and Contractor on the implemented mitigation measures;</li> <li>2. Make agreement on the remedial measures to be implemented; and</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 the ET, IEC and ER and propose remedial measures to IEC and ER; and</li> <li>7. Implement the agreed remedial 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 to confirm findings;</li> <li>2. Inform the Contractor, IEC and ER;</li> <li>3. Check monitoring data, all plant, equipment and the Contractor's working methods;</li> <li>4. Discuss remedial measures with the IEC and Contractor; and</li> <li>5. Ensure remedial measures are implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with the ET, ER and Contractor on the implemented mitigation measures;</li> <li>2. Review proposals on remedial measures submitted by the Contractor and advise the ER accordingly; and</li> <li>3. Review and advise the ET and ER the effectiveness of the implemented remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with the ET, IEC and Contractor on the implemented mitigation measures;</li> <li>2. Make agreement on the remedial measures to be implemented; and</li> <li>3. Discuss with the ET and IEC on the effectiveness of the implemented 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 the ET, IEC and ER and propose remedial measures to IEC and ER within 3 working days of notification; and</li> </ol>

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
				7. Implement the agreed remedial measures.
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Repeat in-situ measurement to confirm findings;</li> <li>2. Inform the Contractor, IEC, EPD and ER;</li> <li>3. Rectify unacceptable practice;</li> <li>4. Check monitoring data, all plant, equipment and the Contractor's working methods;</li> <li>5. Discuss with the ET and IEC and propose remedial measures to the IEC, EPD and ER; and</li> <li>6. Ensure the agreed remedial measures are implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with the 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 the effectiveness of the implemented remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with the ET, IEC and Contractor on the implemented mitigation measures;</li> <li>2. Request the Contractor to critically review the working methods;</li> <li>3. Make agreement on the remedial measures to be implemented; and</li> <li>4. Assess the effectiveness of the implemented remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment;</li> <li>4. Consider changes of working methods;</li> <li>5. Discuss with ET , IEC and ER and propose remedial measures to IEC and ER within 3 working days of notification; and</li> <li>6. Implement the agreed remedial measures.</li> </ol>
Limit level being exceeded by more than one consecutive sampling days	<ol style="list-style-type: none"> <li>1. Inform the Contractor, IEC, EPD and ER;</li> <li>2. Check monitoring data, all plant, equipment and the Contractor's working methods;</li> <li>3. Discuss remedial measures with the the IEC, EPD, ER and Contractor;</li> <li>4. Ensure remedial measures are implemented; and</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with the ET, ER and Contractor on the implemented measures;</li> <li>2. Review proposals on remedial measures submitted by the Contractor and advise the ER accordingly; and</li> <li>3. Review and advise the ET and ER the effectiveness of the implemented remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with the ET, IEC and Contractor on the implemented mitigation measures;</li> <li>2. Request the Contractor to critically review the working methods;</li> <li>3. Make agreement on the remedial measures to be implemented;</li> <li>4. Discuss with the the ET, IEC and Contractor on the</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 the ET, IEC and ER and propose remedial measures to IEC and ER within</li> </ol>

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
	5. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.		effectiveness of the implemented remedial measures; and  5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the marine work until no exceedance of Limit level.	3 working days of notification;  7. Implement the agreed remedial measures; and  8. As directed by the ER, to slow down or to stop all or part of the marine works or construction activities.

- 9.31 If monitoring results indicate that the dredging or filling works have caused an adverse impact on water quality at the WSD saltwater intakes or cooling water intakes, it is recommended that the Contractor should inform WSD and the owners of cooling water intakes. The ER should inform WSD immediately if an adverse impact on water quality has been caused or the ET should notify WSD the monitoring results reach the Limit level at the WSD saltwater intakes. Remedial measures should be recommended to rectify the non-compliance or the construction programme should be carefully reviewed to slow down the rate of dredging or filling.

#### **Mitigation Measures**

- 9.32 Mitigation measures for water quality control have been recommended in the EIA Report. The Contractor should be responsible for the design and implementation of these measures.
- 9.33 Recommended mitigation measures to minimize the adverse impacts on water quality during the proposed dredging and filling works are listed in the implementation schedule given in **Appendix A**.
- 9.34 The requirements of the environmental audit programme are set out in **Section 13** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

#### ***Regular Maintenance of Silt Screens and Silt Curtains***

- 9.35 Silt screens are recommended to be deployed at selected WSD flushing water intakes during the dredging and filling operation. The operation of the flushing water intakes would not be adversely affected by the silt screens provided that the silt screens are properly designed and maintained. Installation of silt screens at the selected flushing water intake points shall be implemented by the Contractor for the dredging and filling works. The Contractor shall demonstrate and ensure that the design of the silt screen will not affect the normal operation of flushing water intake. The Contractor shall obtain consensus from all relevant parties, including WSD and Marine Department, on the design of the silt screen at each of the selected flushing water intake points before installation of the silt screen and commencement of the proposed dredging / filling works. The water quality audits shall be jointly undertaken by the Contractor, ET and ER to ensure that the proposed works do not result in unacceptable impacts at the WSD flushing water intakes.
- 9.36 As a mitigation measure to avoid the pollutant and refuse entrapment problems and to ensure that the impact monitoring results are representative, regular maintenance of the silt screens, silt curtains and refuse collection should be performed by the Contractor at the silt screens at regular intervals on a daily basis. The Contractor should be responsible for keeping the water behind the silt screens and silt curtains free from floating rubbish and debris before the silt screens and silt curtains are removed.

## 10. WASTE MANAGEMENT IMPLICATIONS

### Introduction

- 10.1 Construction and Demolition (C&D) materials, sediment, general refuse from workforce and chemical waste would be generated during the construction phase. It is the Contractor's responsibility to ensure all the waste arisen from the Project are handled, stored and disposed of in accordance with good waste management practices, relevant legislation and waste management guidelines. Provided that these wastes are handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed, adverse environmental impacts would not be expected.
- 10.2 Large quantities of waste are not expected to be generated from the operation of the Project and no adverse environmental impacts will arise with the implementation of good waste management practices. Therefore, an audit programme for the operation phase of the Project will not be required.

### Audit Requirement

- 10.3 Regular audits and site inspections should be carried out during construction phase by the ER, ET and Contractor to ensure that the recommended good site practices and the recommended mitigation measures in **Appendix A** 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.
- 10.4 The requirements of the environmental audit programme are set out in **Section 13** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

### Mitigation Measures

- 10.5 The mitigation measures recommended in EIA Report should form the basis of the site Waste Management Plan (WMP) to be developed by the Contractor during the construction stage.
- 10.6 It is recommended that the waste generated during the construction activities should be audited regularly by the ET to determine if wastes are being managed in accordance with approved procedures and the site WMP. The audit should look at 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. In addition, the routine site inspections should check the implementation of the recommended good site practices and other waste management mitigation measures.
- 10.7 With the appropriate handling, storage and disposal of waste arising from the construction works as recommended in **Appendix A**, the potential of adverse environmental impacts would be minimized. During the site inspections, the ET should pay special attention to the issues relating to waste management and check whether the Contractor has implemented the recommended good site practices and mitigation measures.

## 11. LAND CONTAMINATION

### Introduction

- 11.1 The land contamination assessment has examined the potential contaminating land uses within the Project area and investigated the potential impacts of the contamination on future use. Based on the findings from the Stage 1 site investigation (SI), no adverse impacts have been identified within the Project area. No specific EM&A requirement is therefore required. Nevertheless, visual inspection is recommended as best practice during construction activities that disturb soil.
- 11.2 Due to current land use and site constraints, a site investigation was not conducted for one area within the Project works area during the Stage 1 SI. This area would be investigated in conjunction with the Stage 2 site investigation, which is due to be undertaken after decommissioning of existing buildings and access has been granted. Recommended precautionary measures in **Appendix A** shall be reference if site remediation is required. The potential contamination (if any found) at the sites due to be investigated during the Stage 2 SI would be expected to be surmountable, with the proposed mitigation measures.

### Mitigation Measures

- 11.3 Mitigation measures for land contamination have been recommended in the EIA Report. The Contractor should be responsible for the design and implementation of these measures. The implementation schedule of the recommended land contamination mitigation measures is presented in **Appendix A**.



## 12. HAZARD TO LIFE

### Introduction

- 12.1 Blasting will be carried for the overrun tunnel in Admiralty and underwater blasting may be required in Victoria Harbour when bedrock or large boulder are encountered during the construction of the IMT tunnels. Mines Division will be responsible for delivering explosives directly to works areas for the rock excavation of the ADM Overrun Tunnel. The transportation of explosives by Mines Division directly to sites is under Mines Division's responsibility and falls outside the scope of this Environmental Impact Assessment (EIA). Regarding the marine transportation of explosives by the contractor, the blasting activities should be supervised and audited by the competent site staff to ensure strict compliance with the blasting permit conditions..

### Mitigation Measures

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

## 13. ENVIRONMENTAL AUDITING

### Site Inspection

- 13.1 Site inspection is one of the most effective tools to enforce the environmental protection requirements at the works area by providing a direct mean to trigger and enforce specified environmental protection and pollution control measures. Site inspection should be undertaken regularly during the construction phase to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented for the activities associated with the Project.
- 13.2 The ET Leader should be responsible for formulating the environmental site inspection programme as well as the deficiency and remedial 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.
- 13.3 Regular site inspections should 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 should not be limited to the environmental conditions and the pollution control and mitigation measures within the works area, it should also review the environmental conditions of locations that are beyond the boundary of the works area but are likely to be affected directly or indirectly by the construction site activities of the Project. During the inspection, the following information should be referred to:
- The EIA Report and EM&A recommendations on environmental protection and pollution control mitigation measures;
  - Ongoing results of the EM&A programme;
  - Works progress and programme;
  - Individual works methodology proposals (which should include the proposal on associated pollution control measures);
  - Contract specifications on environmental protection and pollution prevention control;
  - Relevant environmental protection and pollution control legislations; and
  - Previous site inspection results undertaken by the ET and others.
- 13.4 The Contractor should keep the ER and ET Leader updated with all relevant environmental related information on the construction contract necessary for him/her 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 should follow the procedures and time-frame stipulated in the environmental site inspection, and the deficiency and remedial action reporting system to be formulated by the ET Leader, to report on any remedial measures subsequent to the site inspections.
- 13.5 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 an environmental complaint, or as part of the investigation work, as specified in the Event and Action Plan for the EM&A programme.

### Environmental Compliance

- 13.6 There are statutory requirements on environmental protection and pollution control with which construction activities must comply.
- 13.7 To ensure that the works are in compliance with all method statements of works should be submitted by the Contractor to the ER for approval and to the ET Leader for vetting to determine if sufficient environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarized in **Appendix A**. Any proposed changes to the mitigation measures in **Appendix A** 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.

- 13.8 The ER and ET Leader should 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.
- 13.9 The Contractor should provide the update of the relevant documents to the ET Leader so that works checking could be carried out effectively. The document should at least include the updated Works Progress Reports, updated Works Programme, method statements, any application letters for licences / permits under the environmental protection legislations, and copies of all valid licences / permits. The site diary should also be available for the inspection by the relevant parties.
- 13.10 After reviewing the documentation, the ET Leader should advise the 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 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.
- 13.11 Upon receipt of the advice, the Contractor should undertake immediate action to remedy the situation. The ER and ET should follow up to ensure that appropriate action has been taken in order to satisfy legal requirements.

#### **Choice of Construction Method**

- 13.12 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 B4** 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.

#### **Environmental Complaints**

- 13.13 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/Contractor 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 action 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.

## 14. REPORTING

### Introduction

- 14.1 Types of reports that the ET should prepare and submit include Baseline Monitoring Report, Monthly EM&A Reports 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 should be made available to the Director of Environmental Protection.
- 14.2 Reports can be provided in an electronic medium upon agreeing the format with the ER and EPD. All the monitoring data (baseline and impact) should be submitted in electronic medium. Sample data sheets for noise, air quality and water quality monitoring are shown in **Appendices B1 to B3**.

### Baseline Monitoring Report

- 14.3 The ET should prepare and submit a Baseline Environmental Monitoring Report (excluding water quality) at least one month before commencement of construction of the Project. Baseline Monitoring Report for water quality should be prepared and submitted at least one month before the commencement of dredging and filling works for 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.
- 14.4 The Baseline Monitoring Report should include at least the following information:
- (i) up to half a page of executive summary;
  - (ii) brief description of 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 (and depth)
    - monitoring date, time, frequency and duration
    - QA/QC results and detection limits
  - (v) details of influencing factors, including:
    - major activities, if any, being carried out on the Project site during the period
    - weather conditions during the period
    - other factors which might affect the monitoring results
  - (vi) determination of the Action and Limit Levels (AL levels) for each monitoring parameter and statistical analysis of the baseline data;
  - (vii) revisions for inclusion in the EM&A Manual; and
  - (viii) comments and conclusions.

### **Monthly EM&A Reports**

- 14.5 The results and findings of all EM&A works required in this Manual should be recorded in the monthly EM&A reports prepared by the ET and endorsed by the IEC. The first Monthly EM&A Report should be prepared and submitted to EPD within a month after the major construction works commences with the subsequently Monthly EM&A Reports due in 10 works days of the end of each reporting month. Copies of each monthly EM&A report should be submitted to each of the three parties: ER, IEC and EPD. Before submission of the first monthly EM&A Report, the ET should liaise with the parties on the exact number of copies and format of the monthly reports in both hard copy and electronic copies.
- 14.6 The ET Leader should 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**

- 14.7 The first Monthly EM&A Report should include at least but not limited to the following:
- (i) executive summary (1-2 pages):
    - breaches of Action and Limit levels;
    - complaint log;
    - notifications of any summons and successful prosecutions;
    - reporting changes; and
    - future key issues.
  - (ii) basic project information:
    - project organization including key personnel contact names and telephone numbers;
    - construction programme;
    - management structure; and
    - works undertaken during the reporting month.
  - (iii) environmental status:
    - advice on the status of statutory environmental compliance, such as the status of compliance with the EP conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
    - works undertaken during the reporting month with illustrations (e.g. location of works, etc); and
    - drawings showing the Project area, any environmental sensitive receivers and the locations of the monitoring stations.
  - (iv) summary of EM&A requirements:
    - all monitoring parameters;
    - environmental quality performance limits (Action and Limit levels);
    - Event and Action Plans;
    - environmental mitigation measures, as recommended in the EIA 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 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;
  - graphical plots of the monitoring parameters in the reporting month annotated against the following;
    - (a) major activities being carried out on site during the reporting period;
    - (b) weather conditions during the reporting period;
    - (c) any other factors which might affect the monitoring results; and
    - (d) QA/QC results and detection limits.
- (vii) report on non-compliance, complaints, notifications of summons and status of 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), 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 method statements of works;
  - advice on the solid and liquid waste management status;
  - a forecast of the works programme, impact predictions and monitoring schedule for the next three months;
  - compare the EM&A data in the reporting month with the EIA predictions and annotate with explanation for any discrepancies;
  - record of any project changes from that originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc); and
  - comments (e.g. the effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

### **Subsequent Monthly EM&A Reports**

14.8 Subsequent monthly EM&A Reports during the construction phase should include the following information:

- (i) executive summary (1-2 pages):
  - breaches of Action and Limit levels;
  - complaint log;
  - notifications of any summons and successful prosecutions;
  - reporting changes; and
  - future key issues.
- (ii) basic project Information:
  - project organization including key personnel contact names and telephone numbers;

- construction programme;
  - management structure;
  - works undertaken during the reporting 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, the status of compliance with the EP conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
  - works undertaken during the reporting month with illustrations (such as location of works, etc); and
  - drawings showing the Project area, any environmental sensitive receivers and the locations of the monitoring stations.
- (vi) implementation status:
- advice on the implementation status of environmental protection and pollution control/mitigation measures as recommended in the 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 (and depth);
  - monitoring date, time, frequency and duration;
  - graphical plots of the monitoring parameters in the reporting month annotated against the following;
    - (a) major activities being carried out on site during the reporting period;
    - (b) weather conditions during the reporting period;
    - (c) any other factors which might affect the monitoring results; and
    - (d) QA/QC results and detection limits.
- (vi) report on non-compliance, complaints, notifications of summons and status of 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), including the locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
  - record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
  - review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
  - descriptions of the actions taken in the event of non-compliances 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 method statements of works;
  - advice on the solid and liquid waste management status;
  - A forecast of the works programme, impact predictions and monitoring schedule for the next three months;
  - compare the EM&A data in the reporting month with the EIA predictions and annotate with explanation for any discrepancies;



- record of any project changes from that originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc); and
  - comments (e.g.. the effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.
- (viii) appendix:
- Action and Limit levels;
  - graphical plots of trends of the monitoring parameters over the past four reporting periods for the representative monitoring stations annotated against the following:
    - (a) major Project activities being carried out on site during the reporting period;
    - (b) weather conditions during the reporting 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;
  - outstanding issues and deficiencies.

#### **Final EM&A Review Report - Construction Phase**

- 14.9 The EM&A program (including the post-project monitoring described in **Section 9.25**) should be terminated upon completion of those construction activities that have the potential to result in a significant environmental impact.
- 14.10 Prior to the proposed termination, the proposed termination should be implemented after the proposal has been endorsed by the IEC, the Engineer and the Project Proponent followed by final approval from the Director of Environmental Protection.
- 14.11 The ET Leader should prepare and submit the Final EM&A Report which should contain at least the following information:
- (i) executive summary (1 - 2 pages);
  - (ii) drawings showing the Project area, environmental sensitive receivers and locations of the monitoring stations;
  - (iii) basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of works undertaken during the course of the Project;
  - (iv) a brief summary of EM&A requirements including:
    - environmental mitigation measures, as recommended in the EIA Report;
    - environmental impact hypotheses tested;
    - environmental quality performance limits (Action and Limit levels);
    - all monitoring parameters; and
    - Event and Action Plans;
  - (v) a summary of the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA Report, summarised in the updated implementation schedule;
  - (vi) graphical plots and the statistical analysis of the trends of monitoring parameters over the course of the Project, including the post-project monitoring for all monitoring stations annotated against:

- the major activities being carried out on site during the reporting period;
  - weather conditions during the reporting period; and
  - any other factors which might affect the monitoring results;
- (vii) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (viii) a review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- (ix) a description of the actions taken in the event of non-compliance;
- (x) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (xi) a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection / pollution control legislation, locations and nature of the breaches, investigation follow-up actions taken and results;
- (xii) a review of the validity of EIA predictions and identification of shortcomings of the recommendations proposed in EIA Report; and
- (xiii) comments (for example, 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);
- (xiv) recommendations and conclusions (for example, a review of success of the overall EM&A programme to cost-effectively identify deterioration and to initiate prompt effective mitigation action when necessary).

### **Data Keeping**

- 14.12 No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the EM&A reporting documents. However, any such document should be properly maintained by the ET and be ready for inspection upon request. All relevant information should be clearly and systematically recorded in the document. Monitoring data should also be recorded in magnetic media form, and the software copy must be available upon request. All documents and data should be kept for at least one year following the completion of the construction phase EM&A for each construction contract.

### **Interim Notifications of Environmental Quality Limit Exceedances**

- 14.13 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 C**.