

Agreement No. CE69/2001(HY)

**Tsuen Wan Bypass,  
Widening of Tsuen Wan Road  
between Tsuen Tsing Interchange and  
Kwai Tsing Interchange and  
Associated Junction Improvement Works**

Environmental Impact Assessment

Final Report

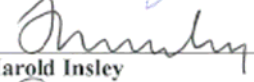
Environmental Monitoring and Audit Manual

September 2008

Prepared by :

  
Rodney Ip

Checked by :

  
Harold Insley

Approved by :

  
Geoffrey Phillips

Scott Wilson Ltd

**Agreement No. CE 69/2001 (HY)**  
**Tsuen Wan Bypass, Widening of Tsuen Wan Road between**  
**Tsuen Tsing Interchange and Kwai Tsing Interchange and**  
**Associated Junction Improvement Works**

**Environmental Monitoring and Audit Manual**

**Table of Contents**

<b>1.</b>	<b>INTRODUCTION.....</b>	<b>1</b>
1.1	Purpose of the Manual .....	1
1.2	Background.....	2
1.3	Environmental Monitoring and Audit Requirements.....	2
1.4	Project Organization .....	3
1.5	Construction Programme .....	5
<b>2.</b>	<b>NOISE IMPACT .....</b>	<b>6</b>
2.1	Noise Parameters .....	6
2.2	Monitoring Equipment.....	6
2.3	Monitoring Locations .....	6
2.4	Baseline Monitoring .....	8
2.5	Impact Monitoring .....	8
2.6	Event and Action Plan for Noise .....	9
2.7	Noise Mitigation Measures during Construction Period.....	13
2.8	Parameters for Traffic Noise.....	13
2.9	Monitoring Equipment.....	14
2.10	Monitoring Locations .....	14
2.11	Baseline Monitoring .....	16
2.12	Impact Monitoring .....	16
2.13	Event and Action Plan for Noise .....	16
2.14	Noise Mitigation Measures .....	19
<b>3.</b>	<b>AIR QUALITY .....</b>	<b>20</b>
3.1	Air Quality Parameters .....	20
3.2	Monitoring Equipment.....	20
3.3	Laboratory Measurement / Analysis.....	21
3.4	Monitoring Locations .....	22
3.5	Baseline Monitoring .....	23
3.6	Impact Monitoring .....	23
3.7	Event and Action Plan for Air Quality .....	24
3.8	Construction Dust Mitigation Measures .....	28

<b>4.</b>	<b>WATER QUALITY IMPACTS.....</b>	<b>30</b>
4.1	Introduction.....	30
4.2	Mitigation Measures .....	30
4.3	Residual Impacts on Water Quality .....	33
4.4	Site Inspections .....	33
<b>5.</b>	<b>WASTE MANAGEMENT .....</b>	<b>34</b>
5.2	Waste Management Hierarchy.....	34
5.3	Training.....	34
5.4	Records of Waste Arisings and Management .....	35
5.5	Site Planning .....	35
5.6	Construction and Demolition Waste.....	35
5.7	Chemical Waste .....	36
5.8	General Refuse.....	37
5.9	Site Inspections .....	37
<b>6.</b>	<b>LANDFILL GAS HAZARDS .....</b>	<b>38</b>
6.1	Introduction.....	38
6.2	Landfill Gas Parameters (Methane, Carbon Dioxide, and Oxygen) .....	38
6.3	Protection and Precautionary Measures.....	38
6.4	Landfill Gas Monitoring .....	40
6.5	Monitoring Equipments .....	41
6.6	Limit Levels and Action Plan for Landfill Gas.....	42
6.7	Specific Advice Relating to Drilling of Boreholes .....	42
<b>7.</b>	<b>LANDSCAPE AND VISUAL.....</b>	<b>43</b>
7.1	Introduction.....	43
7.2	Baseline Monitoring .....	43
7.3	Construction and Operational Phase Audit.....	43
<b>8.</b>	<b>HAZARD TO LIFE .....</b>	<b>45</b>
8.1	Introduction.....	45
8.2	Mitigation Measures .....	45
<b>9.</b>	<b>ECOLOGY .....</b>	<b>46</b>
<b>10.</b>	<b>CULTURAL HERITAGE IMPACTS.....</b>	<b>47</b>
<b>11.</b>	<b>SITE ENVIRONMENTAL AUDIT.....</b>	<b>48</b>
11.1	Site Inspections .....	48
11.2	Compliance with Legal and Contractual Requirements .....	49
11.3	Environmental Complaints .....	49
<b>12.</b>	<b>REPORTING.....</b>	<b>51</b>
12.1	General.....	51
12.2	Baseline Monitoring Report.....	51
12.3	Monthly EM&A Reports .....	52
12.4	Quarterly EM&A Summary Reports .....	54
12.5	Final EM&A Review Reports.....	55
12.6	Data Keeping .....	56
12.7	Interim Notifications of Environmental Quality Limit Exceedances .....	57

## LIST OF TABLES

Table 2-1	Construction Noise Monitoring Locations (Existing Receiver)
Table 2-2	Construction Noise Monitoring Locations (Planned Receiver)
Table 2-3	Action and Limit Levels for Construction Noise
Table 2-4	Event / Action Plan for Construction Noise
Table 2-5	Traffic Noise Monitoring Locations (Existing Noise Sensitive Receivers)
Table 2-6	Traffic Noise Monitoring Locations (Planned Noise Sensitive Receivers)
Table 2-7	Action Levels for Traffic Noise
Table 2-8	Event / Action Plan for Traffic Noise
Table 3-1	Dust Monitoring Locations
Table 3-2	Action and Limit Levels for Air Quality Monitoring
Table 3-3	Event / Action Plan for Air Quality Monitoring
Table 6-1	Limit Levels and Action Plan for Landfill Gas

## List of Figures

<a href="#">Figure 1-1</a>	General Layout of the Project
<a href="#">Figure 1-2</a>	Project Organisation
Figure 1-3	Construction Programme for Tsuen Wan Bypass, Widening of Tsuen Wan Road between Tsuen Tsing Interchange and Kwai Tsing Interchange and Associated Junction Improvement Works
<a href="#">Sheet 1, 2, 3</a>	
Figure 2-1	Construction Noise Monitoring Locations
<a href="#">Sheet 1, 2, 3, 4</a>	
Figure 2-2	Traffic Noise Monitoring Locations
<a href="#">Sheet 1, 2, 3</a>	
Figure 3-1	Dust Monitoring Locations
<a href="#">Sheet 1, 2, 3</a>	

## List of Appendices

<a href="#">Appendix A</a>	Noise and Air Sensitive Receivers
<a href="#">Appendix B</a>	Summary of Environmental Mitigation Measures – Implementation Schedule
<a href="#">Appendix C</a>	Environmental Monitoring Data Recording Sheets
<a href="#">Appendix D</a>	Complaint Handling Procedures
<a href="#">Appendix E</a>	Complaint Log
<a href="#">Appendix F</a>	Interim Notification of Environmental Quality Limits Exceedance

## 1. INTRODUCTION

### 1.1 *Purpose of the Manual*

- 1.1.1 The purpose of this EM&A Manual is to guide the setup of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action.
- 1.1.2 This Manual outlines the monitoring and audit programme to be undertaken for the Tsuen Wan Bypass, Widening of Tsuen Wan Road between Tsuen Tsing Interchange and Kwai Tsing Interchange and Associated Junction Improvement Works. It aims to provide systematic procedures for monitoring, auditing and minimising of the environmental impacts associated with the construction works.
- 1.1.3 Hong Kong environmental regulations for air quality, noise and waste, the Hong Kong Planning Standards and Guidelines, and recommendations in the EIA study final report on Tsuen Wan upgrading have served as environmental standards and guidelines in the preparation of this Manual.
- 1.1.4 This Manual contains the following:
- (a) duties of the Contractor, the Engineer's Representative (ER), the Independent Environmental Checker (IEC) and the Environmental Team (ET) with respect to the environmental monitoring and audit requirements during construction;
  - (b) information on project organisation and programming of construction activities for the project;
  - (c) requirements with respect to the construction schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
  - (d) definition of Action and Limit levels;
  - (e) establishment of event and action plans;
  - (f) requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria;
  - (g) requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures.
- 1.1.5 For the purpose of this manual, the "Engineer" shall refer to the Engineer as defined in the Contract and the Engineer's Representative (ER), in cases where the Engineer's powers have been delegated to the ER, in accordance with the Contract. The ET leader, who shall be responsible for

and in charge of the ET, shall refer to the person delegated the role of executing the environmental monitoring requirements. The IEC shall undertake the auditing role.

## **1.2 Background**

- 1.2.1 A Study Brief (No. ESB-037/1999) for a similar Project of a different Project title namely “Tsuen Wan Road Upgrading” was issued under the EIAO on 14 September 1999. The current application for a new study brief with a new project title was made as Civil Engineering and Development Department (CEDD) considers that part of the project scope has been changed while the new project title can better reflect the scope of the project.
- 1.2.2 An application (No. ESB-141/2006) for an Environmental Impact Assessment (EIA) study brief under Section 5(1) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by CEDD on 9 February 2006 with a Project Profile (No. PP-277/2006). According to Section 5(7)(a) of the EIAO, the Director of Environmental Protection (the Director) issued a new EIA Study Brief (ESB-141/2006) in March 2006 to CEDD to carry out an EIA study.
- 1.2.3 The Project title for the current EIA study is “Tsuen Wan Bypass, Widening of Tsuen Wan Road between Tsuen Tsing Interchange and Kwai Tsing Interchange and Associated Junction Improvement Works” (hereinafter known as the “Project”).
- 1.2.4 The general study area and the proposed road alignment are identified in **Figure 1-1**.

## **1.3 Environmental Monitoring and Audit Requirements**

- 1.3.1 The EIA Report identified the likely environmental impacts during construction and operational phases, including noise and air quality. It has been identified that these impacts can be minimised to acceptable levels with the implementation of environmental mitigation measures. In order to ensure compliance with relevant environmental standards, baseline and compliance monitoring for noise and air quality during construction is recommended, as well as operational monitoring of traffic noise to confirm the effectiveness of noise mitigation measures. These requirements are specified in the subsequent sections. The works will also result in the generation of materials that will require management, entire as wastes for disposal offsite or for reuse within the project. These materials will require management and the procedures should be monitored on-site.
- 1.3.2 The works will require the removal and subsequent re-planting of a number of trees along the alignment. Measures for the supervision and audit of these works by a qualified Landscape Architect should be included in the contract documents.

## 1.4 *Project Organization*

1.4.1 The Project Organisation with lines of communication with respect to environmental protection works and Project Implementation Program for Construction are shown in **Figure 1-2** and **Figure 1-3** respectively.

1.4.2 There shall be two elements to the environmental monitoring and audit team, the Environmental Team (ET) and the Independent Environmental Checker (IEC). The ET shall be employed by the contractor and will undertake the monitoring. The IEC shall be engaged by the ER and audit the work of the ET. The IEC shall not be in any way an associated body of the Contractor. The ET and the IEC Team Leaders shall have relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the Environmental Protection Department (EPD).

1.4.3 Appropriate staff shall be included in the ET and IEC under the supervision of the ER/IEC Team Leader, to fulfil the EM&A duties specified in this manual.

1.4.4 The general duties/responsibilities of various parties comprise the following:

### The Contractor

- Employ an Environmental Team (ET) to undertake monitoring, laboratory analysis and reporting of environmental monitoring and audits;
- Provide assistance to the ET in carrying out 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 impacts where Action and Limit Levels are exceeded; and
- Adhere to the procedures for carrying out complaint investigation in accordance with Section 11.3 of this Manual.

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

- Supervise the Contractor's activities and ensure that the requirements in the EM&A Manual are fully complied with;
- Inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans;
- Employ an Independent Environmental Checker (IEC) to audit the results of the EM&A works carried out by the ET; and
- Adhere to the procedures for carrying out complaint investigation in accordance with Section 11.3 of this Manual.

### Environmental Team (ET)

#### *Environmental Team Leader*

- Overall supervision and administration of the ET's daily operation;
- Managing the various specialist and professionals who are designated as members of the ET;
- Liaison with other government departments or external parties regarding any environmental issues arising from the project; and
- Ensure the outputs of the Team meet the objectives and requirements set out in this manual.

#### *Environmental Engineer / Scientist*

- Schedule the environmental monitoring activities;
- Check the validity of data upon receipt of field measurement and laboratory results;
- Prepare reports, which are specified in the EM&A Manual, in timely manner and ensure the quality of the outputs;
- Liaise with the ER and Contractor upon receipt of complaints and/or breaching of statutory limits;
- Ensure the Event/Action Plan is implemented;
- Investigate the causes of complaints and/or limit exceedances;
- Advise on required mitigation measures;
- Ensure the proposed mitigation measures are implemented;
- Perform regular audits of the environmental monitoring data;
- Provide advice on any pollution control measures, if necessary, after a site inspection; and
- Provide, calibrate and maintain monitoring equipment.

#### *Environmental Technician*

- Perform monitoring activities for the environmental parameters as required by the EM&A Manual;
- Be proficient in the monitoring methodologies and QA/QC procedures set out in this EM&A Manual;



- Ensure the quality of the monitoring data;
- Know the specified Action and Limit Levels in the EM&A Manual;
- Alert the ET Leader of any observed exceedances of the Action/Limit Levels;
- Calibrate and maintain the monitoring equipment; and
- Assist the Environmental Engineer / Scientist in performing regular site inspections as required.

*Independent Environmental Checker (IEC)*

- Review the EM&A works performed by the ET;
- Audit the monitoring activities and results;
- Report the audit results to the ER;
- Review the EM&A reports submitted by the ET;
- Review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans; and
- Adhere to the procedures for carrying out complaint investigation in accordance with Section 11.3 of this Manual.

1.4.5 Appropriate resources shall be allocated by the Contractor and the ER to fulfil their duties specified in this manual.

**1.5 Construction Programme**

1.5.1 The proposed works are due to be undertaken over a period of 48 months commencing June 2011, with completion scheduled for May 2015. The construction programme is shown in **Figure 1-3**.

1.5.2 This programme is for the information of the ET and IEC Team Leader to gain an initial understanding of the projection of the works. The ET and IEC Team Leader shall make reference to the actual works progress and programme during the construction stage to schedule the EM&A works, and the Contractor shall provide the respective information to the ET Leader for formulating the EM&A schedule.

## 2. NOISE IMPACT

### Construction Phase

#### 2.1 *Noise Parameters*

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

2.1.2 As supplementary information for data auditing, statistical results such as  $L_{10}$  and  $L_{90}$  shall also be obtained for reference. A sample data record sheet is shown in **Appendix C1** for reference.

#### 2.2 *Monitoring Equipment*

2.2.1 As referred to in the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0dB.

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

2.2.3 The ET Leader is responsible for the provision of the monitoring equipment. He shall ensure that sufficient noise monitoring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

#### 2.3 *Monitoring Locations*

2.3.1 Those most affected noise sensitive receivers identified in the EIA report already has considered as the noise monitoring locations in this EM&A Manual. The noise monitoring locations during construction phase are listed in **Tables 2.1** and **2.2** and shown **Figure 2-1**. These monitoring locations are at the 10 NSRs (existing and planned) with the predicted construction noise level exceed corresponding construction noise criteria under mitigated scenario according to **Section 3.8** in EIA Report.

**Table 2-1 Construction Noise Monitoring Locations (Existing Receiver)**

Monitoring Location No.	Description	Landuses
E1	Wang Fat Ching She	Place of Worship
E2	Po On Commercial Association Wong Siu Ching Secondary School	School
E3	Salvation Army Ng Kok Wai Memorial Kindergarten	School
E4	Clague Garden Estate Block C	Residential
E5	Waterside Plaza Block 1	Residential
E6	Shak Chung Shan Memorial Catholic Primary School	School
E7	S K H Chu Yan Primary School	School
E8	CNEC Lee I Yao Memorial Secondary School	School

**Table 2-2 Construction Noise Monitoring Locations (Planned Receiver)**

Monitoring Location No.	Description	Landuses
P1	Development at TW7 Tower 7	Residential
P2	Proposed School Site at TW7	School

- 2.3.2 The status and locations of noise sensitive receivers may change after issuing this manual. In this event, the ET Leader shall propose updated monitoring locations and seek approval from ER/IEC and agreement from EPD of the proposal.
- 2.3.3 When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria in that they should be:

- (a) at locations close to the major site activities which are likely to have noise impacts;
- (b) close to the noise sensitive receivers (N.B. For the purposes of this section, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law or performing arts centre should be considered as a noise sensitive receiver); and
- (c) for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

2.3.4 The monitoring station shall normally be at a point 1m from the exterior of the sensitive receiver's building facade and be at a position 1.2m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to the free-field measurements. The ET Leader shall agree with the ER/IEC on the monitoring positions and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

#### **2.4 *Baseline Monitoring***

2.4.1 The ET Leader shall carry out baseline noise monitoring prior to the commencement of the construction works. The baseline monitoring shall be carried out daily for a period of at least two weeks. A schedule on the baseline monitoring shall be submitted to the ER/IEC for approval before the monitoring starts.

2.4.2 There shall not be any construction activities in the vicinity of the stations during the baseline monitoring.

2.4.3 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with IEC and EPD to agree on an appropriate set of data to be used as a baseline reference and submit this to the ER/IEC for their approval.

#### **2.5 *Impact Monitoring***

2.5.1 Noise monitoring shall be carried out at all the designated monitoring station. The monitoring frequency shall depend on the scale of the construction activities. The following is an initial guide on the regular monitoring frequency for each station on a per week basis when noise generating activities are underway:

- (a) one set of measurements between 0700-1900 hours on normal weekdays;
- (b) one set of measurements between 1900-2300 hours;

(c) one set of measurements between 2300-0700 hours of next day; and

(d) one set of measurements between 0700-2300 hours on holidays.

2.5.2 For the Measurements (a), (b), (c) and (d) above, one set of measurements shall at least include 3 consecutive  $L_{eq(5min)}$  results.

2.5.3 In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Action Plan in **Section 2.6** shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

## **2.6** *Event and Action Plan for Noise*

2.6.1 The Action and Limit levels for construction noise are defined in **Table 2-3**. Should non-compliance of the criteria occur, action in accordance with the Action Plan in **Table 2-4**, shall be carried out. Necessary mitigation measures are shown in **Section 2.7**. Timing and responsibilities for the implementation of mitigation measures are shown in **Appendix B**.

**Table 2-3 Action and Limit Levels for Construction Noise**

Time Period	Action	Limit
0700-1900 hrs on normal weekdays	When one documented complaint is received	75* dB(A)
0700-2300 hrs on holidays (including Sundays); and 1900-2300 hrs on all days		60/65/70** dB(A)
2300-0700 hrs of all days		45/50/55** dB(A)

**Notes:**

Construction noise during restricted hours is under the control of Noise Control Ordinance.

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

\*\* to be selected based on Area Sensitivity Rating.

**Table 2-4 Event / Action Plan for Construction Noise**

EVENT	ACTION			
	ET	IEC	ER	Contractor
Action Level exceeded	<ol style="list-style-type: none"> <li>1. Notify ER, IEC and Contractor;</li> <li>2. Carry out investigation;</li> <li>3. Report the results of investigation to the IEC, ER and Contractor;</li> <li>4. Discuss with the IEC and Contractor on remedial measures required;</li> <li>5. Increase monitor frequency to check mitigation effectiveness;</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the investigation results submitted by the ET;</li> <li>2. Review the proposed remedial measures by the Contractor and advise the ER accordingly;</li> <li>3. Advise the ER on the effectiveness of the proposed remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>4. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to ET Leader / ER;</li> <li>2. Implement noise mitigation proposals.</li> </ol>

EVENT	ACTION			
	ET	IEC	ER	Contractor
Limit Level exceeded	<ol style="list-style-type: none"> <li>1. Inform IEC, ER, Contractor and EPD;</li> <li>2. Repeat measurements to confirm findings;</li> <li>3. Increase monitoring frequency;</li> <li>4. Identify source and investigate the cause of exceedance;</li> <li>5. Carry out analysis of Contractor's working procedures;</li> <li>6. Discuss with the IEC, Contractor and ER on remedial measures required;</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>4. Supervise the implementation of remedial measures;</li> <li>5. If exceedance continues, consider stopping the Contractor to continue working on that portion of work which causes the exceedance until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC and ER within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Submit further proposal if problem still not under control;</li> <li>5. Stop the relevant portion of works as instructed by the ER until the exceedance is abated.</li> </ol>



## **2.7 Noise Mitigation Measures during Construction Period**

2.7.1 The EIA report has recommended construction noise control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures as listed below:

- selection and optimization of construction programmes, avoidance of parallel operation of noisy PME, and/or reduction in number and/or the on-time percentage of PME during noise sensitive periods such as school examination period;
- use of “quiet” PME and working methods;
- use of temporary at-source noise mitigation measures such as noise barriers, noise enclosures, noise jacket and mufflers; and
- use of good site practice to limit noise emission from construction site.

2.7.2 Good Practices are also recommended as follow:

- use of well-maintained and regularly-serviced plant during the works;
- plant operating on intermittent basis should be turned off or throttled down when not in active use;
- plant that is known to emit noise strongly in one direction should be orientated to face away from the NSRs;
- silencers, mufflers and enclosures for plant should be used where possible and maintained adequately throughout the works;
- where possible fixed plants should be sited away from NSRs; and
- stockpiles of excavated materials and other structures such as site buildings should be used effectively to screen noise from the works.

2.7.3 In particular, NSR 39 (Salvation Army Ng Kok Wai Memorial Kindergarten) is of close proximity to works area S5 and subject to high level of unmitigated construction noise. It is recommended that the work stages “transportation & utilities diversion” and “piling” shall not take place simultaneously during operation time of the kindergarten for the same location in works area S5, such that cumulative noise to this kindergarten is further minimized.

2.7.4 If the above measures are not sufficient to restore the construction noise quality to acceptable levels, upon the advice of ET Leader, the Contractor shall liaise with the ET Leader on alternative mitigation measures, propose such measures to the ER/IEC for approval, and implement the mitigation measures.

### **Operation Phase**

## **2.8 Parameters for Traffic Noise**

2.8.1 The traffic noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level  $L_{10}$ ,  $L_{eq}$ ,  $L_{90}$  and  $L_{max}$  shall be used as the monitoring

parameter for the time period between 0700-1900 hours on normal weekdays. For all other time periods,  $L_{eq(5 \text{ min})}$  shall be employed for comparison with the NCO criteria.

- 2.8.2 As supplementary information for data auditing, statistical results such as  $L_{10}$  and  $L_{90}$  shall also be obtained for reference. A sample data record sheet is shown in **Appendix C1** for reference.

## **2.9** *Monitoring Equipment*

- 2.9.1 As referred to in the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0dB.
- 2.9.2 Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding 5m/s or wind with gusts exceeding 10m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.
- 2.9.3 The ET Leader is responsible for the provision of the monitoring equipment. He shall ensure that sufficient noise monitoring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

## **2.10** *Monitoring Locations*

- 2.10.1 Those most affected noise sensitive receivers identified in the EIA report already has considered as the noise monitoring locations in this EM&A Manual. The traffic noise monitoring locations during operation phase are listed in **Tables 2.5** and **2.6** and shown **Figure 2-2**. In addition, noise monitoring shall be carried out for one year following construction. The locations for operational noise monitoring shall be defined during detailed design on the basis of the status of the most up-to-date information on proposed developments surrounding the Highway.

**Table 2-5 Traffic Noise Monitoring Locations (Existing Noise Sensitive Receivers)**

Monitoring Location No.	Description	Landuses
X1	Summit Terrace Tower 3	Residential
X2	Summit Terrace Tower 5	Hospital
X3	Tsuen Wan Adventist Hospital	School
X4	Wang Fat Ching She	Place of Worship
X5	The Panorama	Residential
X6	Salvation Army Ng Kok Wai Memorial Kindergarten	School
X7	Clague Garden Estate Block A	Residential
X8	Clague Garden Estate Block B	Residential
X9	Clague Garden Estate Block C	Residential
X10	Waterside Plaza Block 4	Residual

**Table 2-6 Traffic Noise Monitoring Locations (Planned Noise Sensitive Receivers)**

Monitoring Location No.	Description	Landuses
T1	Development at TW6 Tower 2	Residential
T2	Development at TW7 Tower 3	Residential
T3	Development at TW7 Tower 4	Residential
T4	Development at TW7 Tower 7	Residential

2.10.2 The status and locations of noise sensitive receivers may change after issuing this manual. In this event, the ET Leader shall propose updated monitoring locations and seek approval from ER/IEC and agreement from EPD of the proposal.

2.10.3 When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria in that they should be:

- (a) at locations close to the major site activities which are likely to have noise impacts;
- (b) close to the noise sensitive receivers (N.B. For the purposes of this section, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law or performing arts centre should be considered as a noise sensitive receiver); and
- (c) for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

2.10.4 The monitoring station shall normally be at a point 1m from the exterior of the sensitive receiver's building facade and be at a position 1.2m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to the free-field measurements. The ET Leader shall agree with the ER/IEC on the monitoring positions and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

### 2.11 *Baseline Monitoring*

2.11.1 No baseline monitoring is required.

### 2.12 *Impact Monitoring*

2.12.1 Traffic noise monitoring shall be carried out at representative NSRs within one year of the road opening. The following is an initial guide on the traffic noise monitoring requirements during the operational phase:

- one set of measurements at the morning traffic peak hour on normal weekdays (exact timing to be confirmed with Transport Department and agreed with EPD);
- one set of measurements at the evening traffic peak hour on normal weekdays (exact timing to be confirmed with Transport Department and agreed with EPD);
- a concurrent census of traffic flow and percentage heavy vehicle shall be conducted for the road and the existing road network in the vicinity of each measuring point;
- average vehicle speed estimated; and
- the two sets of monitoring data should be obtained within the first year of operation.
- Measured noise levels should be compared with predicted noise levels by applying appropriate conversion corrections to allow for the traffic conditions as the time of measurement. **Appendix C1** shows a sample data record sheet for operational noise monitoring.

2.12.2 Each set of measurements shall include three measurements of 30 minutes. The parameters  $L_{10}$ ,  $L_{eq}$ ,  $L_{90}$  and  $L_{max}$  will be recorded for data auditing and reference. The exact timing shall be confirmed with the CEDD and agreed with EPD

### 2.13 *Event and Action Plan for Noise*

2.13.1 The Action levels for traffic noise are defined in **Table 2-7**. Should non-compliance of the criteria occur, action in accordance with the Event / Action Plan in **Table 2-8**, shall be carried out. Necessary mitigation measures are shown in **Section 2.15**. Timing and responsibilities for the implementation of mitigation measures are shown in **Appendix A**.

**Table 2-7 Action Levels for Traffic Noise**

<b>Sensitive Receivers</b>	<b>Action Level (Peak Hour Traffic L<sub>10</sub> (1 hr) dB(A))</b>
Office and all domestic premises including Hotel, hostels and temporary housing accommodation	70 dB(A)
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	65 dB(A)

**Table 2-8 Event / Action Plan for Traffic Noise**

EVENT	ACTION				
	ET	IEC	ER	Monitoring Contractor	Highways Department
Action level is exceeded in any of the proposed monitoring stations	<ol style="list-style-type: none"> <li>1. Inform IEC, ER, and HyD;</li> <li>2. Repeat measurements to confirm findings;</li> <li>3. Identify source and investigate the cause of exceedance;</li> <li>4. Carry out analysis of Monitoring Contractor's working procedures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ET, and HyD on the potential remedial actions;</li> <li>2. Review the remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Monitoring Contractor;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify HyD. Provide details of traffic flow and other monitoring condition to EPD.</li> </ol>	<ol style="list-style-type: none"> <li>1. Liaise with EPD to investigate noise mitigation proposals;</li> <li>2. Implement noise mitigation proposals if required.</li> </ol>

## **2.14**     *Noise Mitigation Measures*

2.14.1     As the noise sensitive receivers close to the proposed road will be exposed to traffic noise during the operational phase, a noise monitoring programme shall be developed to include noise measurements at noise sensitive receivers during the peak traffic hour. The programme shall be carried out by the Environmental Team (ET) to ensure that the traffic noise levels are comparable to those predicted in the EIA under the full provision of the mitigation measures recommended.

2.14.2     The recommended noise mitigation measures in the EIA report are described below:

- Concrete parapet walls of 0.8m high are adopted along all elevated sections of the existing and planned roads, with the exception of the elevated roads joining Castle Peak Road – Tsuen Wan Section and Tsuen Mun Road where noise barriers are currently in place.
- Cantilevered road barriers, as well as semi-enclosures or full noise enclosures have been considered for the road traffic noise impact.

### 3. AIR QUALITY

#### 3.1 *Air Quality Parameters*

- 3.1.1 Monitoring and audit of the Total Suspended Particulates (TSP) levels shall be carried out by the ET during construction to ensure that any deteriorating air quality can be readily detected and timely action taken to rectify the situation.
- 3.1.2 1-hour and 24-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The TSP levels shall be measured by following the standard high volume sampling method as set out in the “*Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B*”.
- 3.1.3 Upon approval of the ER/IEC, 1-hour TSP levels can be measured by direct reading methods which are capable of producing comparable results as that by the high volume sampling method, to indicate short event impacts.
- 3.1.4 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site etc. shall be recorded in detail. A sample data sheet is shown in **Appendix C2**.

#### 3.2 *Monitoring Equipment*

- 3.2.1 The following equipment shall be used when carrying out the construction phase, air quality monitoring:
- 3.2.2 High volume sampler (HVS) in compliance with the following specifications shall be used for carrying out the 1-hr and 24-hr TSP monitoring:
- (a) 0.6-1.7 m<sup>3</sup>/min (20-60 SCFM) adjustable flow range;
  - (b) equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
  - (c) installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
  - (d) capable of providing a minimum exposed area of 406 cm<sup>2</sup> (63 in<sup>2</sup>);
  - (e) flow control accuracy: +/- 2.5% deviation over 24-hr sampling period;
  - (f) equipped with a shelter to protect the filter and sampler;
  - (g) incorporated with an electronic mass flow rate controller or other equivalent devices;
  - (h) equipped with a flow recorder for continuous monitoring;
  - (i) provided with a peaked roof inlet;
  - (j) incorporated with a manometer;
  - (k) able to hold and seal the filter paper to the sampler housing at horizontal position;
  - (l) easy to change the filter; and
  - (m) capable of operating continuously for 24-hr period.
- 3.2.3 The Contractor / ET shall be responsible for provision of the monitoring equipment. He shall ensure that a sufficient number of High Volume Samplers (HVSs) with an appropriate calibration kit are available for carrying out the baseline monitoring,



- regular impact monitoring and ad hoc monitoring. The HVSs shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc. shall be clearly labelled.
- 3.2.4 Initial calibration of dust monitoring equipment shall be conducted upon installation and thereafter at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognised primary standard and be calibrated annually. The calibration data shall be properly documented for future reference. All the data should be converted into standard temperature and pressure conditions.
- 3.2.5 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded in the data sheet as stated in **Section 3.1**.
- 3.2.6 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 ER/IEC to prove that the instrument is capable of achieving a comparable result with that of the HVS to confirm that it may be used for the 1-hr sampling. The instrument should 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 a direct reading method.
- 3.2.7 Wind data monitoring equipment shall also be provided and set up at strategic locations for logging wind speed and wind direction near the dust monitoring locations. The equipment installation location shall be proposed by the ET Leader and agreed with the ER/IEC. For installation and operation of wind data monitoring equipment, the following points shall be observed:
- (a) the wind sensors should be installed on masts at an elevated level 10m above ground so that they are clear of obstructions or turbulence caused by the buildings;
  - (b) the wind data should be captured by a data logger and to be downloaded for processing at least once a month;
  - (c) the wind data monitoring equipment should be re-calibrated at least once every six months; and
  - (d) wind direction should be divided into 16 sectors of 22.5 degrees each.
- 3.2.8 In exceptional situations, the ET Leader may propose alternative methods to obtain representative wind data upon approval from the ER and agreement from IEC.
- 3.3 Laboratory Measurement / Analysis**
- 3.3.1 A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory should be HOKLAS accredited.
- 3.3.2 If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analyses, the laboratory equipment shall be approved by the IEC/ER and the measurement procedures shall be witnessed by the IEC/ER. The ET

Leader shall provide the ER with one copy of Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), **Appendix B** for his reference.

- 3.3.3 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-weighted before use for the sampling.
- 3.3.4 After sampling, the filter paper, loaded with dust, shall be kept in a clean and tightly sealed plastic bag. The filter paper shall then be returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.
- 3.3.5 All the collected samples shall be kept in a good condition for 6 months before disposal.

**3.4 Monitoring Locations**

- 3.4.1 The dust monitoring locations are shown in **Table 3-1** and **Figure 3-1**. The status and locations of dust sensitive receivers may change after issuing this manual. In this event, the ET Leader shall propose updated monitoring locations and seek approval from ER/IEC and agreement from EPD on the proposal.

**Table 3-1 Dust Monitoring Locations**

Monitoring Location No.	Descriptions	Landuses
M1	Summit Terrace Tower 5	Residential
M2	The Panorama	Residential
M3	Clague Garden Estate Block A	Residential
M4	Clague Garden Estate Block B	Residential
M5	Clague Garden Estate Block C	Residential
M6	Tsuen Wan Park	Recreational
M7	Leader Industrial Centre Phase I & II	Industrial
M8	Broadway Centre	Industrial

- 3.4.2 The following criteria, as far as practicable, should be followed when alternative monitoring locations are proposed, in that the position should be:
  - (a) at the site boundary or such locations close to the major dust emission source;
  - (b) close to the sensitive receptors; and
  - (c) take into account the prevailing meteorological conditions.
- 3.4.3 The ET Leader shall agree with the ER/IEC on the position of the HVS for installation of the monitoring equipment. The following points shall be considered when positioning the samplers:
  - (a) a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
  - (b) no two samplers should be placed less than 2 meter apart;

- (c) the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
- (d) a minimum of 2 metres of separation from walls, parapets and penthouses is required for rooftop samplers;
- (e) a minimum of 2 metre separation from any supporting structure, measured horizontally is required;
- (f) no furnace or incinerator flue is nearby;
- (g) airflow around the sampler is unrestricted;
- (h) the sampler is more than 20 metres from the dripline;
- (i) any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;
- (j) permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- (k) a secured supply of electricity is needed to operate the samplers.

### **3.5 Baseline Monitoring**

- 3.5.1 The ET Leader shall carry out baseline monitoring at all of the designated monitoring locations for at least 14 consecutive days prior to the commissioning of the construction works to obtain daily 24-hr TSP samples. 1-hr sampling shall also be done at least 3 times per day while the highest dust impact is expected.
- 3.5.2 During the baseline monitoring, there should not be any construction or dust generation activities in the vicinity of the monitoring stations.
- 3.5.3 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/IEC and agreed with IEC.
- 3.5.4 In exceptional case, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with IEC and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to ER for approval.
- 3.5.5 Ambient conditions may vary seasonally and shall be reviewed at three monthly intervals. If the ET Leader considers that the ambient conditions have been changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be at times when the contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, should be revised. The revised baseline levels and air quality criteria should be agreed with ER, IEC and EPD.

### **3.6 Impact Monitoring**

- 3.6.1 The ET Leader shall carry out impact monitoring during the course of the Works. For regular impact monitoring, the sampling frequency of at least once in every six-days, shall be strictly observed at all the monitoring stations for 24-hr TSP monitoring. For

1-hr TSP monitoring, the sampling frequency of at least three times in every six-days should be undertaken when the highest dust impact occurs.

3.6.2 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 operator.

3.6.3 In case of non-compliance with the air quality criteria, more frequent monitoring exercise, as specified in the Event / Action Plan in **Section 3.7**, shall be conducted within 24 hours after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified.

### 3.7 *Event and Action Plan for Air Quality*

3.7.1 The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET Leader shall compare the impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. **Table 3-2** shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance of the air quality criteria occurs, the ET, the E/IEC and the Contractor shall undertake the relevant action in accordance with the Action Plan in **Table 3-3**.

**Table 3-2 Action and Limit Levels for Air Quality Monitoring**

Parameters	Action Level	Limit Level
24 Hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 200 \mu\text{g}/\text{m}^3$ , Action level = (baseline level plus 30% and Limit level)/2  For baseline level $> 200 \mu\text{g}/\text{m}^3$ , Action level = Limit level	260
1 Hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 384 \mu\text{g}/\text{m}^3$ , Action level = (baseline level plus 30% and Limit level)/2  For baseline level $> 384 \mu\text{g}/\text{m}^3$ , Action level = Limit level	500

Table 3-3 Event / Action Plan for Air Quality Monitoring

EVENT	ACTION			
ACTION LEVEL	ET	IEC	ER	Contractor
1. Exceedance for one sample	<ol style="list-style-type: none"> <li>Identify source;</li> <li>Inform IEC and ER;</li> <li>Repeat measurement to confirm finding;</li> <li>Increase monitoring frequency to daily.</li> </ol>	<ol style="list-style-type: none"> <li>Review the investigation results submitted by the ET;</li> <li>Check the working method of Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>Notify Contractors.</li> </ol>	<ol style="list-style-type: none"> <li>Rectify any unacceptable practice;</li> <li>Amend working methods if appropriate.</li> </ol>
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>Identify source;</li> <li>Inform IEC and ER;</li> <li>Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>Repeat measurements to confirm findings;</li> <li>Increase monitoring frequency to daily;</li> <li>Discuss with IEC and Contractor for remedial actions required</li> <li>If exceedance continues arrange meeting with IEC and ER;</li> <li>If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>Review the investigation results submitted by the ET;</li> <li>Review the Discuss with ET and Contractor on possible remedial measures; and advise the ER accordingly;</li> <li>Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>Discuss with ET and Contractor on possible remedial measures;</li> <li>Supervise Implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>Confirm receipt of notification of failure in writing;</li> <li>Notify Contractor;</li> <li>In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>Ensure remedial measures are properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>Submit proposals for remedial actions to ER within 3 working days of notification;</li> <li>Implement the agreed proposals;</li> <li>Amend proposal if appropriate.</li> </ol>

**Table 3-3 Event / Action Plan for Air Quality Monitoring (Continued)**

EVENT	ACTION			
	ET	IEC	ER	Contractor
1. Exceedance for one sample	<ol style="list-style-type: none"> <li>Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>Inform ER, Contractor and EPD;</li> <li>Repeat measurement to confirm finding;</li> <li>Increase monitoring frequency to daily;</li> <li>Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.</li> </ol>	<ol style="list-style-type: none"> <li>Check monitoring data submitted by ET;</li> <li>Check Contractor's working method;</li> <li>Discuss with ET and Contractor on possible remedial measures;</li> <li>Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>Supervise implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>Confirm receipt of notification of failure in writing;</li> <li>Notify Contractor;</li> <li>Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>Take immediate action to avoid further exceedance;</li> <li>Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>Implement the agreed proposals;</li> <li>Amend proposal if appropriate.</li> </ol>

EVENT	ACTION			
LIMIT LEVEL	ET	IEC	ER	Contractor
<p>2. Exceedance for two or more consecutive samples</p>	<ol style="list-style-type: none"> <li>1. Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>2. Inform ER, Contractor and EPD the causes &amp; actions taken for the exceedances;</li> <li>3. Repeat measurement to confirm findings;</li> <li>4. Increase monitoring frequency to daily;</li> <li>5. 6. Arrange meeting with IEC, EPD and ER to discuss the remedial actions to be taken;</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>4. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly;</li> <li>5. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>4. Ensure remedial measures properly implemented;</li> <li>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Resubmit proposals if problem still not under control;</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

### 3.8 *Construction Dust Mitigation Measures*

3.8.1 The EIA report has specified dust control and mitigation measures in accordance with the Air Pollution Control (Construction Dust) Regulation. The Contractor shall be responsible for the design and implementation of measures to control dust, these include:

- The Contractor shall undertake at all times to prevent dust nuisance as a result of his activities. Dust suppression measures such as water spraying are necessary and should be installed to ensure that the air quality at the boundary of the site and at any sensitive receivers complies with the Hong Kong Air Quality Objectives.
- The Contractor shall notify any specific construction work as stated in the Air Pollution Control (Construction Dust) Regulation to the Authority before the commencement of such work.
- The Contractor shall apply for a licence or permit under the requirements of the relevant legislation (e.g. Air Pollution Control Ordinance and its subsidiary regulations) wherever applicable.
- Watering of unpaved areas, access roads, construction areas and dusty stockpiles shall be undertaken at least eight times daily during dry and windy weather. Watering of the haul road shall be undertaken four to eight times daily during dry or windy weather. Water sprays may be either fixed or mobile to follow individual areas to be wetted as and when required. Application of suitable wetting agents, such as dust suppression chemicals, shall be used in addition to water, especially during the dry season (October to December).
- Effective water sprays shall be used during the delivery and handling of all raw sand and aggregate, and other similar materials, wet dust is likely to be created and to dampen all stored materials during dry and windy weather.
- Stockpiles of sand, aggregate or any other dusty materials greater than 20m<sup>3</sup> shall be enclosed on three sides, with walls extending above the pile and 1 metre beyond the front of the pile.
- Suitable chemical wetting agent such as dust suppression chemical shall be used on completed cuts and fills to reduce wind erosion.
- Areas within the construction site where there is a regular movement of vehicles shall have a paved surface and be kept clear of loose surface material.
- The Contractor shall restrict all motorized vehicles within the construction site, excluding those on public roads, to maximum speed of 20 km per hour and confine haulage and delivery vehicles to designated roadways inside the Site.
- Construction working areas will be restricted to a minimum practicable size.
- The Contractor shall ensure that no earth, rock or debris is deposited on public or private rights of way as result of his activities, including any deposits arising from the movement of plant or vehicles.



- The Contractor shall provide a wheel washing facility at the exits from work areas to the satisfaction of the Engineer and to the requirements of the Commissioner of Police. Water in wheel washing facilities and sediment shall be changed and removed respectively at least once a month.
- The Contractor shall submit details of the wheel washing facilities, which shall be usable prior to any earthworks excavation activity on the construction site. The Contractor shall also provide a hard-surfaced road between any washing facility and the public road.
- In the event of any spoil or debris from construction works being deposited on adjacent land, or streams, or any silt being washed down to any area, then all such spoil, debris or material and silt shall be immediately removed and the affected land and areas restored to their natural state by the Contractor to the satisfaction of the Engineer.
- If spoil cannot be immediately transported out of the Site, stockpiles should be stored in sheltered areas.
- Plant and vehicles shall be inspected annually to ensure that they are operating efficiently and that exhaust emissions are not causing a nuisance. All Site vehicle exhausts should be directed vertically upwards or directed away from ground.
- Path for complaints and handling procedures should be set up and implement.

3.8.2 If the above measures are not sufficient to restore the air quality to acceptable levels, upon the advice of ET Team Leader, the Contractor shall liaise with the IEC on other mitigation measures, propose such measures to the ER/IEC for approval, and implement the mitigation measures

## 4. WATER QUALITY IMPACTS

### 4.1 Introduction

4.1.1 The potential water quality impacts arising from the construction phase of Tsuen Wan Road upgrading works have been assessed and are presented in the EIA Report. The majority of the construction works will be land-based and thus direct impacts on marine water quality will not arise. The EIA concluded that through the implementation of mitigation measures mentioned in EIA, the potential impacts associated with the construction and operation of the highway is not considered significant. Monitoring of marine water quality during construction and operation phase was therefore not considered necessary.

4.1.2 The ET shall pay special attention to the issues relating to water quality, and check whether the Contractor has followed the relevant contract specifications and the procedures specified under the laws of Hong Kong. Stringent control and audit will be necessary to ensure that effective water pollution control measures are being implemented. Site inspection should include regular checking of the proposed measures and records of maintenance services to ensure their proper functioning.

4.1.3 The following is a summary of the recommended water quality mitigation measures. The implementation schedule of mitigation measures is presented in **Appendix B**.

### 4.2 Mitigation Measures

#### *Construction Phase*

#### Control and Mitigation of Silt-laden Run-off

4.2.1 Silt-laden surface run-off should be prevented from directly entering the sensitive receivers during the construction works. The mitigation measures described below for the construction phase are in accordance with *ProPECC PN 1/94*:

- (a) works sites and areas used for imported fill stockpiling should, as far as possible, avoid the water sensitive receivers;
- (b) stripping of existing vegetation should be sequential to avoid exposure of large areas of embankment slopes;
- (c) special precautions should be taken when working in the vicinity of streams and channels, especially when bridges along TWR are being widened. This may involve the installation of temporary drainage works to ensure that run-off does not enter the water bodies directly; typical example of this type of measure is the provision of suitable temporary drainage system, such as peripheral channels around the site, to intercept all on-site runoff to water quality treatment devices such as sedimentation pond / sand trap. Only treated run-off from these devices will be discharged offsite. Sizes and arrangement details of these drainage works depend on local conditions and will be addressed during the detailed design stage;
- (d) perimeter cut-off drains to direct off-site water around the works sites should be constructed. Internal drainage works, erosion and sedimentation control facilities should be implemented. Channels, earth bunds or sandbag barriers should be

provided on site to direct stormwater to silt removal facilities. The design of efficient silt removal facilities should be based on the guidelines provided in ProPECC PN 1/94;

- (e) sedimentation tanks of sufficient capacity, constructed from pre-formed individual cells of approximately 6-8 m<sup>3</sup> capacity should be adopted as a general mitigation measure which can be used for settling wastewaters prior to disposal. The tanks are readily available and used primarily for recycling water for bored piling operations. The system capacity should be flexible and able to handle multiple inputs from a variety of sources and particularly suited to applications where the influent is pumped. Various physical enhancement and chemical additives can be added to refine the sedimentation process;
- (f) construction works should be programmed to minimise surface excavations / cutting during the rainy period (April to September). If excavation of soil cannot be avoided during the rainy period, or at any time of year when rainstorms are likely, exposed slope surfaces should be covered by a tarpaulin or other means. Other measures that need to be implemented before, during and after rainstorms are summarized in ProPECC PN 1/94. Particular attention should be paid to the control of silty surface run-off during storms events, especially for sites located near steep slopes;
- (g) all exposed earth areas should be completed and re-vegetated promptly after earthworks have been completed, or alternately, within 14 days of the cessation of earthworks;
- (h) earthworks final surfaces should be well compacted and subsequent permanent work or surface protection should be carried out immediately after final surfaces are formed in order to prevent rainstorm erosion;
- (i) the overall slope of the site should be kept to a minimum to reduce the erosive potential of surface water flows and all trafficked areas and access roads should be protected by coarse stone ballast. An additional advantage accruing from the use of crushed stone is the positive traction gained during prolonged periods of inclement weather and the reduction of surface sheet flows;
- (j) silt contained water and drilling water collected from any boring operations, dewatering etc. should be removed with properly designed silt removal facilities, such as sedimentation tanks referred to above, such that the TM on Effluent Standards are achieved prior to the discharge of waters;
- (k) all drainage facilities, erosion and sediment control structures should be inspected regularly and maintained to ensure proper and efficient operation at all times and particularly following rainstorms. Deposited silt and grit should be removed regularly and disposed of by spreading evenly over stable and non-sensitive vegetated areas;
- (l) measures should be taken to minimise the ingress of site drainage into excavations. If the excavation of trenches in rainy period (April to September) is necessary, they should be dug and backfilled in short sections. Water pumped out

from trenches or foundation excavations should be discharged into the silt removal facilities;

- (m) all open stockpiles of construction materials (e.g. aggregates, sand and fill material) should be covered with a tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system;
- (n) manholes (including newly constructed ones) should always be covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the drainage system;
- (o) all vehicles and plants should be cleaned before leaving the construction site to ensure no earth, mud and debris is deposited on roads. An adequately designed and automatic wheel washing facilities should be provided at every site exit and wash-water should have sand and silt settled out and removed at least on a regular basis to ensure the continued efficiency of the process;
- (p) the section of access road leading to, and exiting from the wheel-wash bay to the public road should be paved with sufficient backfill toward the wheel-wash bay to prevent vehicle tracking of soil and silty water to public roads and drains;
- (q) water used for construction purposes on site should, as far as practical, be recycled for use and;
- (r) information detailing storm run-off and wastewater discharge points, and the corresponding maximum (or range of) volumes of discharges expected from the construction sites on a dry day should be provided in the WPCO licence application. In general, assuming adequate information has been provided together with the license application, EPD would need at least 20 days for the processing of a license for a discharge. It is therefore recommended that the Contractor submit the licence application to EPD as early as possible before the commencement of any discharge.

4.2.2 If the good management practices abovementioned are implemented, adverse impacts on the aquatic environment due to surface run-off should be avoided.

#### Construction Materials

4.2.3 In order to prevent water quality impact associated with construction material, the following mitigation techniques are recommended:

- (a) stockpiles of cement and other construction material should be kept covered when not being used;
- (b) stockpiles of cement and other construction material should not be located adjacent to nullahs and streams;
- (c) entry points into the surface drainage system should be fitted with oil interceptors;
- (d) waste oil and other chemical waste as defined in the Waste Disposal (Chemical Waste) (General) Regulation require disposal by an appropriate means and require pre-notification to EPD prior to disposal. An appropriate disposal facility

should be the Chemical Waste Treatment Centre (CWTC) at Tsing Yi. If chemical wastes are to be generated, the Contractor will need to register with EPD as a chemical waste producer and observe the requirements for chemical waste storage, labelling, transportation and disposal. The requirements for waste storage, transportation and disposal are considered in EIA Report Chapter 6 - Waste Management Implications;

- (e) impact associated with spillages should be managed through careful handling procedures. Oil and fuel should only be used and stored in designated areas with pollution prevention facilities. Fuel tanks and drums of fuel oils and other polluting fluids/chemicals should be provided with locks and bounded to a capacity of 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after raining events.

#### Sewage from Construction Workers

- 4.2.4 Sewage effluent arising from the on-site construction workforce has the potential to cause water pollution. Therefore, plans for the collection, treatment and disposal of sewage during construction phase should be specified. Sewage generated on site should be disposed of through connection of the sanitation facilities with the existing foul sewerage system. Where this is not possible, temporary portable chemical toilets, septic tanks or package sewage treatment plants may need to be used. Overall it is considered that no water quality impact is expected to arise from on-site generated sewage if such sewage facilities are provided.

#### *Operational Phase*

- 4.2.5 The amount of sediment accumulating on the road surface during operation is not expected to be large, particularly due to the proposals for landscaping of adjacent embankments, which will minimize soil exposure immediately next to the carriageways. The road drainage system will be incorporated as part of the general road improvement scheme and will facilitate drainage of run-off of floodwater directly into the water system.
- 4.2.6 If the measures highlighted above are adopted, and if the drainage network is maintained appropriately, the impact on the aquatic environment should be minimal.

### **4.3 *Residual Impacts on Water Quality***

- 4.3.1 With the full implementation of the recommended mitigation measures for the construction and operation phases of the Project, no unacceptable residual impacts on water quality are anticipated. It is recommended that regular audit of the implementation of these measures be carried out during the construction phase.

### **4.4 *Site Inspections***

- 4.4.1 The site inspections and the document review procedures are mentioned in **Section 11** of this manual, the ET Leader shall pay special attention to the issues relating to water quality, and check whether the Contractor has followed the recommended mitigation measures and the relevant legislation and guidelines.

## 5. WASTE MANAGEMENT

- 5.1.1 The Contractor is responsible for the management of materials and wastes arising during the construction of the proposed works. This includes; control of wastes on site, removal of the waste materials from the site and the implementation of any mitigation measures to minimise waste or redress any problems that arise from waste associated with the works. In addition to C&D waste and domestic wastes, this material may include sewage, waste water or effluent contaminated with sand, cement, silt or any other suspended or dissolved material that flows from the site onto any adjoining land, sewer, or water course. This also includes any waste matter or refuse deposited anywhere within the site or onto any adjoining land.
- 5.1.2 The Contractor should develop procedures for the management of wastes in the form of a waste management plan (WMP). The proposed widening works will result in a net deficit of fill, and it will be necessary to import fill material for the construction of embankments etc. In this regard, the Contractor shall take all reasonable measures to ensure that materials are reused on site, as far as is practicable and shall introduce a programme for on-site training of staff to promote the issues of site cleanliness and good waste management.
- 5.1.3 The WMP should be prepared and submitted for approval by Architect / Engineer / Supervising Officer prior any construction activities. During the construction period the WMP should be used as a working document to detail the on-going management procedures and to record waste arisings and import of fill throughout the Contract. The WMP shall be subject to audit under the requirements of the Environmental Monitoring and Audit Procedures. The implementation schedule of waste management is detailed in **Appendix B**.

### 5.2 *Waste Management Hierarchy*

- 5.2.1 The following hierarchy should be used to evaluate waste management options, thus allowing maximum waste reduction and often reducing costs:
- avoidance and minimisation, i.e. avoiding or not generating waste through changing or improving practices and design;
  - reuse of materials, thus avoiding disposal (generally with only limited reprocessing);
  - recovery and recycling, thus avoiding disposal (although reprocessing may be required); and
  - treatment and disposal, according to relevant laws, guidelines and good practice.
- 5.2.2 The suitability (or otherwise) of material for reuse on site shall be detailed in the WMP. If, for any reason, the recommendations cannot be implemented, full justification should be given in the WMP for approval by Architect / Engineer / Supervising Officer.

### 5.3 *Training*

- 5.3.1 To facilitate adoption of the best-practice philosophy, training shall be provided to all personnel working on site. The training shall promote the concept of general site

cleanliness and clearly explain the appropriate waste management procedures defined in the WMP. Overall, the training should encourage all workers to reduce, reuse and recycle wastes.

#### **5.4 *Records of Waste Arisings and Management***

5.4.1 During construction, the WMP should be kept up to date on a monthly basis with records of the actual quantities of wastes generated, recycled and disposed of off-site, as well as fill imported to site. Quantities shall be determined by weighing each load or other methods agreed to by the Engineer's Representative. Waste shall only be disposed of at licensed sites and the WMP should include procedures to ensure that illegal disposal of wastes does not occur. Only reputable waste hauliers authorised to collect the specific category of waste concerned should be employed and a trip ticket system shall be implemented for offsite disposal of C&D and solid waste at public filling facilities and landfills (in accordance with WBTC 5/99). Appropriate measures should be employed to minimise windblown litter and dust during transportation by either covering trucks or transporting wastes in enclosed containers.

#### **5.5 *Site Planning***

5.5.1 Work site(s) shall be arranged and managed to facilitate the proper management of wastes and materials. The WMP shall include plans indicating specific areas designated the storage of particular types of waste, reusable and recyclable materials as well as areas and management proposals for any stockpiling areas. Waste storage areas should be well maintained and cleaned regularly. Specific provisions for different types of material are outlined below. In general, these areas should be designed to avoid cross contamination of materials as well as pollution of the surrounding environment.

#### **5.6 *Construction and Demolition Waste***

5.6.1 Careful design, planning and good site management can minimise over ordering and generation of surplus materials such as concrete, mortars and cement grouts. The design of formwork should maximise the use of standard wooden panels so that high reuse levels can be achieved. Alternatives such as steel formwork or plastic facing should be considered to increase the potential for reuse.

5.6.2 C&D materials should be segregated on site into different waste and material types. This will increase the feasibility of certain components of the waste stream being recycled by specialised contractors. The Contractor should clearly demonstrate in the WMP how he intends to maximise the reuse of C&D material on-site. Where reuse of materials on site is not feasible, the Contractor should explore opportunities for recycling materials off-site. Inert C&D materials shall be reused on site or recycled with the remaining non-inert materials which cannot be reused or recycled being disposed of to landfill.

5.6.3 Potential opportunities for recycling and reuse of C&D materials from the Widening works includes:

- milling wastes arising from regrading of the existing pavement could be recycled on site and reused as either road-base in the new carriageways or fill for new embankments;
- existing marginal roadside barriers comprise pre-cast units, it may be possible to re-use these following widening works; and
- existing bridge parapets comprise aluminum post and railings, these have a recyclable value and could be sold on for reconditioning or reused for scrap metal.

5.6.4 Any stockpile should be sited away from existing watercourses and suitably covered to prevent wind erosion and impacts on air and water quality.

## 5.7 Chemical Waste

5.7.1 Chemical waste should be handled in accordance with the *Code of Practice on the packaging, Handling and Storage of Chemical Wastes* as follows. Containers used for the storage of chemical wastes should:

- be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed;
- have a capacity of less than 450L unless the specifications have been approved by the EPD; and
- display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the *Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C)*.

5.7.2 The storage area for chemical wastes should:

- be clearly labelled and used solely for the storage of chemical waste;
- be enclosed on at least 3 sides;
- have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest;
- have adequate ventilation;
- be covered to prevent rainfall entering (water collected within the bund must be tested and disposed as chemical waste if necessary); and
- Be arranged so that incompatible materials are adequately separated.

5.7.3 The Contractor shall register with EPD as a Chemical Waste Producer. Waste oils and other chemical wastes as defined in the *Waste Disposal (Chemical Waste) (General) Regulation* will require disposal by an appropriate means and could require pre-notification to EPD prior to disposal. Appropriate means include disposal:

- via a licensed waste collector; and
- to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Facility which also offers a chemical waste collection service and can supply the necessary storage containers; or



- to a reuser of the waste, under approval from EPD. The Centre for Environmental Technology operates a Waste Exchange Scheme, which can assist in finding receivers or buyers.

## **5.8** *General Refuse*

5.8.1 General refuse generated on-site should be stored in enclosed bins or compaction units separate from construction and chemical wastes. A reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily or every second day basis to minimize odour, pest and litter impacts. The burning of refuse on construction sites is prohibited by law.

5.8.2 General refuse is generated largely by food service activities on site, so reusable rather than disposable dishware should be used if feasible. Aluminum cans are often recovered from the waste stream by individual collectors if they are segregated or easily accessible. Therefore separate, labelled bins for their deposit should be provided if feasible. Office waste can be reduced through recycling of paper if volume is large enough to warrant collection. Participation in a local collection scheme should be considered if one is available. burning of refuse on construction sites is prohibited by law

## **5.9** *Site Inspections*

5.9.1 The site inspections and the document review procedures are mentioned in **Section 11** of this manual, the ET Leader shall pay special attention to the issues relating to waste management, and check whether the Contractor has followed the recommended mitigation measures and the relevant legislation and guidelines.

## 6. LANDFILL GAS HAZARDS

### 6.1 *Introduction*

6.1.1 GDBL is a restored landfill with comprehensive LFG control measures consisting both active and passive LFG management systems and there is no evidence indicating that there is significant migration of LFG beyond GDBL. Also, no excavation will be conducted within the boundary fence of the landfill site and it is considered that the stored waste as well as landfill restoration facilities will not be affected. As result, the overall LPG risks posed by GDBL to Tsuen Wan Bypass, Widening of Tsuen Wan Road between Tsuen Tsing Interchange and Kwai Tsing Interchange and Associated Junction Improvement Works are medium and low for construction phase and operation phase respectively.

6.1.2 Landfill gas monitoring for methane, carbon dioxide and oxygen shall be carried out to identify any migration between the landfill and the site and to ensure the safety of the Contractor's personnel.

6.1.3 Monitoring shall be carried out and reported in a similar manner to that for the Restoration Contract to provide comparable data. An example of landfill gas monitoring field measurement recording sheet as used in the Restoration Contract is presented in **Appendix C3**. The presentation format for landfill gas monitoring shall be based on this format and agreed with EPD.

### 6.2 *Landfill Gas Parameters (Methane, Carbon Dioxide, and Oxygen)*

#### Appointment of a Safety Officer

6.2.1 A Safety Officer, trained in the use of gas detection equipment and LFG related hazards should be present on site throughout the groundwork phase. The Safety Officer should be provided with an intrinsically safe portable instrument (or instruments), appropriately calibrated and capable of measuring the following gases in the ranges indicated:

- Methane 0 to 100% LEL and 0 to 100% by volume
- Carbon dioxide 0 to 100%; and
- Oxygen 0 to 21%

### 6.3 *Protection and Precautionary Measures*

#### Outline of Safety Requirements

6.3.1 In all construction work adjacent to GDBL, safety precautions should be implemented to minimize the risks of:

- Fires and explosions;
- Asphyxiation of workers; and
- Toxicity effects.

6.3.2 Precautions should be clearly laid down and rigidly adhered to with respect to:

- Trenching and excavation; and

- Creation of confined spaces at, near to or below ground level.

6.3.3 In addition to normal site safety procedures, gas detection equipment and appropriate breathing apparatus should be available and used when entering confined spaces or trenches deeper than 1m.

#### Safety Measures

6.3.4 The following safety measures should be implemented during the construction phase of the Project:

- (a) All personnel who work on site and all visitors to the site should be made aware of the possibility of ignition of gas in the vicinity of the excavations. Safety notices should be posted warning of the potential hazards.
- (b) Those staff who work in, or have responsibility for “at risk” areas, including all excavation workers, supervisors and engineers working within the CZ, should receive appropriate training on working in areas susceptible to LFG, fire and explosion hazards.
- (c) An excavation procedure or code of practice to minimize LFG related risk should be devised and carried out by the contractor.
- (d) No worker should be allowed to work alone at any time in or near to any excavation. At least one other worker should be available to assist with a rescue if needed.
- (e) Smoking, naked flames and all other sources of ignition should be prohibited within 15m of any excavation or ground-level confined space. “No Smoking” and No Naked Flame” notices should be posted prominently on the construction site and, if necessary, special areas designated for smoking.
- (f) Welding, flame-cutting or other hot works should be confined to open areas at least 15m from any trench or excavation.
- (g) Welding, flame cutting or other hot works may only be carried out in trenches or confined spaces when controlled by a “permit to work” procedure, properly authorised by the Safety Officer or other appropriately qualified person.
- (h) The permit to work procedure should set down clearly the requirements for continuous monitoring for methane, carbon dioxide and oxygen throughout the period for which the hot works are in progress. The procedure should also require the presence of an appropriately qualified person in attendance outside the “confined area” who shall be responsible for reviewing the gas measurements as they are made, and who shall have executive responsibility for suspending the work in the event of unacceptable or hazardous conditions. Only those workers who are appropriately trained and fully aware of the potentially hazardous conditions which may arise should be permitted to carry out hot works in confined areas.
- (i) Ground level construction plant should be fitted with vertical exhausts at least 0.6m above ground level and with spark arrestors.

- (j) Any electrical equipment, such as motors and extension cords, should be intrinsically safe.
- (k) During piping assembly or construction, all valves/seals should be closed immediately after installation. As construction progresses, all valves/seals should be closed as installed to prevent the migration of gases through the pipeline/conduit. All piping/conducting should be capped at the end of each working day.
- (l) Mobile offices, equipment stores, mess rooms etc should be located on an areas which has been proven to be gas free (by survey with portable gas detectors) and ongoing monitoring should be carried out to ensure that these areas remain gas free. The use of permanent gas detectors may be appropriate in some circumstances where there is a relatively high risk but for many developments it will be sufficient to have regular monitoring undertaken manually by the safety officer. The particular arrangements to be adopted at a specific site will need to be determined during the risk assessment/design of protection measures.
- (m) Alternatively, such buildings should be raised clear of the ground. If buildings are raised clear of the ground, a minimum clear separation distance (as measured from the highest point on the ground surface to the underside of the lowest floor joist) should be 500mm.
- (n) During construction, adequate fire extinguishing equipment, fire-resistant clothing and breathing apparatus (BA) sets should be made available on site.

6.3.5 The Contractor should formulate a health and safety policy, standards and instructions for site personnel to follow.

#### **6.4 Landfill Gas Monitoring**

6.4.1 The following should be noted for LFG monitoring:

- (a) Periodically during groundwork construction, the works area should be monitored for methane, carbon dioxide and oxygen using appropriately calibrated portable gas detection equipment.
- (b) The monitoring frequency and areas to be monitored should be set down prior to commencement of groundworks by either the Safety Officer or by an appropriately qualified person.
- (c) Routine monitoring should be carried out in all excavations, manholes and chambers and any other confined spaces that may have been created by, for example, the temporary storage of building materials on the site surface.
- (d) All measurements in excavations should be made with the monitoring tube located not more than 10mm from the exposed ground surface,
- (e) Monitoring of excavations should be undertaken as follows:
  - i) *For excavations deeper than 1m, measurements should be made:*
    - At the ground surface before excavation commences;
    - Immediately before any workers enter the excavation;

- At the beginning of each working day for the entire period the excavation remains open; and
  - Periodically through the working day whilst workers are in the excavation.
- ii) *For excavations between 300mm and 1m deep, measurements should be made:*
- Directly after the excavation has been completed; and
  - Periodically whilst the excavations remains open.
- iii) *For excavations less than 300mm deep, monitoring may be omitted, at the discretion of the Safety Officer or other appropriately qualified person.*

## 6.5 *Monitoring Equipments*

6.5.1 Intrinsically safe, portable gas detectors shall be used when working in any confined space which has the potential for the presence of landfill gas, and the risk of explosion or asphyxiation. The landfill gas monitoring instrument shall :

- Where possible, comply with BS6020 and be approved by BASEEFA as intrinsically safe, suitable for use in a Zone 2 area to BS5345;
  - Be capable of continuous monitoring of methane, oxygen and carbon dioxide;
  - Be capable of continuous barometric pressure and gas pressure measurement;
  - Normally operate in diffusion mode unless required for spot sampling, when it should be capable of operating by means of an aspirator or pump;
  - Have low battery, fault and over range indication incorporated;
  - Store monitoring data, and shall be capable of being down-loaded directly to a PC;
  - Measure in the following ranges:
- |   |                         |
|---|-------------------------|
| • Methane                               | 0-100% LEL & 0-100% v/v |
| • Oxygen                                | 0-25% v/v               |
| • Carbon dioxide                        | 0-100% v/v              |
| • Barometric pressure                   | mBar (absolute)         |
| • Gas pressure (relative to atmosphere) | Pascals                 |
| • Temperature                           | 0-100°C                 |

6.5.2 The monitoring equipment shall alarm (both audibly and visually) in the event that the concentrations of the following are exceeded :

- Methane – higher than 10 % LEL
- Carbon dioxide – higher than 0.5 %
- Oxygen – lower than 18 % by volume

6.5.3 The equipment used to monitor LFG concentrations in excavations shall be same as that for LFG monitoring for utility manholes and chambers.

**6.6 Limit Levels and Action Plan for Landfill Gas**

6.6.1 As a general measure to minimise the risk of explosion due to the presence of methane, “no smoking” signs shall be placed at entry or access points of the work site.

6.6.2 The Limit Levels and relevant Action Plan for landfill gas detected in utilities and any on-site areas following construction are shown in **Table 6-1** below.

**Table 6-1 Limit Levels and Action Plan for Landfill Gas**

Parameter	Level	Action
Oxygen	<19%	Ventilate trench/void to restore O <sub>2</sub> to >19%
	<18%	Stop works Evacuate personnel / prohibit entry Increase ventilation to restore O <sub>2</sub> to >19%
Methane	>10% LEL	Post “No Smoking” signs at concerned areas in addition to site entry/access points Prohibit hot works Increase ventilation to restore CH <sub>4</sub> to <10% LEL
	>20% LEL	Stop works Evacuate personnel / prohibit entry Increase ventilation to restore CH <sub>4</sub> to <10% LEL
Carbon Dioxide	>0.5%	Ventilate to restore CO <sub>2</sub> to < 0.5%
	>1.5%	Stop works Evacuate personnel / prohibit entry Increase ventilation to restore CO <sub>2</sub> to < 0.5%

**6.7 Specific Advice Relating to Drilling of Boreholes**

6.7.1 If drilling of boreholes is carried out within the CZ, then the advice given in **Sections 8.29 to 8.49** of *Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)* should be followed, and in particular the drilling contractor should provide a Method Statement detailing the procedures to be followed, which should include:

- (a) provision of an intrinsically safe portable methane gas detector;
- (b) no smoking to be allowed within 15m of a borehole;
- (c) capping of casing at the end of each working day; and
- (d) exhaust and air-intake stacks to be at least 1.5m above ground level.

## 7. LANDSCAPE AND VISUAL

### 7.1 *Introduction*

7.1.1 The EIA has recommended that EM&A for landscape and visual resources is undertaken during both the construction and operational phases of the project. The implementation and maintenance of the landscape compensatory planting measures is a key aspect of this and should be checked to ensure that the proposals are fully realised. The mitigation measures are detailed in Chapter 8 Landscape and Visual Impact Assessment of the EIA Report.

7.1.2 Also any potential conflicts between the proposed landscape measures and any other project works and operational requirements should be resolved at the earliest possible date and without compromise to the intention of the mitigation measures. In addition, implementation of the mitigation measures recommended by the EIA will be monitored through the construction phase site audit programme.

### 7.2 *Baseline Monitoring*

7.2.1 Baseline monitoring for the landscape and visual resources will comprise a vegetation survey of the entire widening undertaken on an 'area' basis. Representative vegetation types will be identified along with typical species composition. An assessment of landscape character will be made against which future change can be monitored. The landscape resources and elements of particular concern are to be noted.

7.2.2 The landscape and visual baseline will be determined with reference to the habitat maps included in the EIA Report.

### 7.3 *Construction and Operational Phase Audit*

7.3.1 A competent Landscape Architect should be employed by the Contractor for the implementation of landscape construction works particularly during the site clearance operations when the proposed tree felling, lifting and transplantation will take place and subsequent maintenance operations during the 12 month establishment period. The establishment works will be undertaken throughout the Contractor's one year maintenance period which will be within the first operational year of the project.

7.3.2 All measures undertaken by both the Contractor and the Landscape Contractor during the construction phase and first year of the operational phase shall be audited by a Landscape Architect, as a member of the Environmental Team. This will be completed on a regular basis to ensure compliance with the intended aims of the EIA. Site inspections should be undertaken at least once every two weeks throughout the construction period and once every two months during the operational phase. Operational phase auditing will be restricted to the 12 months establishment works of the landscaping proposals, with the appropriate agents taking over the maintenance and monitoring after this period as identified in the EIA Report **Chapter 14**.

7.3.3 In addition, audit of mitigation measures to avoid impacts on landscape and visual resources will be required during the construction period, together with supervision of the compensatory planting. The audit of the compensatory planting will also extend through the first year of the completed widening, during the Contractor's one year maintenance period, to ensure that the establishment of the planting.

- 7.3.4 The measures and inspection undertaken by Landscape Architect during construction and operational phase as mentioned above should be checked by Independent Environmental Checker (IEC) described in **Section 1.4.4** of this manual.



## 8. HAZARD TO LIFE

### 8.1 Introduction

8.1.1 The hazard to life associated with a potential chlorine spill at the Yau Kom Tau Water Treatment Works (YKTWTW) in light of the increased road and workforce population associated with the construction and operational phases of the Tsuen Wan Rd Upgrading Project was assessed in the EIA Report.

8.1.2 The risk levels to the road and workforce population of Tsuen Wan Rd are relatively low due to its significant distance to YKTWTW, and since the risk to this population is dominated by an earthquake event affecting the YKTWTW and the Tsuen Wan Rd and subsequent chlorine release at WTW, no mitigation measure that could significantly reduce such risk is considered cost-effective or practicable. Nevertheless, several measures are recommended in the EIA Report

### 8.2 Mitigation Measures

8.2.1 Mitigation Measures within the project boundary are:

- (a) Introduce the 'no stopping zones' on the western part of Tsuen Wan Rd and on all major roads within the area where the individual risk levels exceed  $1 \times 10^{-9}$  (see **Figure 8.3** in EIA Report). This measure (if not already implemented) would be particularly effective on Tuen Mun Rd.
- (b) Provide traffic signals to stop in case of emergency the traffic on western part of Tsuen Wan Rd and other major roads within the area that could be affected by a chlorine spill at YKTWTW.

8.2.2 Implementation of the following measures for protection of the Project construction workers should be considered:

- (a) The number of workers on site during construction stage should not exceed the levels assessed in this report.
- (b) Emergency evacuation procedures should be formulated and all workers on site should be familiar with these procedures as well as the route to escape in case of gas release incident. Relevant Departments, such as WSD and FSD, should be consulted during the development of Emergency procedures. Diagram showing the escape routes to a safe place should be posted in the site notice boards and at the entrance/exit of site.
- (c) The emergency procedures should specify means of providing a rapid and direct warning (e.g. Siren and Flashing Light) to construction workers in the event of chlorine gas release in the YKTWTW.
- (d) The construction site officer should establish a communication channel with the YKTWTW operation personnel during construction stage. In case of any hazardous incidents in the treatment works, operation personnel of YKTWTW should advise the site officer to evacuate the construction workers.

## 9. ECOLOGY

- 9.1.1 In accordance to EIA report findings, within the project area there is no recognized sites of conservation importance, or important habitats, and no species of conservation importance is identified. Thus, it is concluded from the EIA Report Chapter 10 that the ecological impacts arose from the project would be negligible.
- 9.1.2 Some tree felling and transplantation will be required in areas of urban parkland or amenity plantation, but these will be mitigated by compensatory planting as described in details in the Landscape and Visual Impacts section (EIA Report Chapter 8) of the EIA report. The EM & A requirements are mentioned in **Chapter 8** of this manual.

## 10. CULTURAL HERITAGE IMPACTS

- 10.1.1 In accordance with EIA report findings, key sites of cultural heritage interest identified by the Antiquities and Monuments Office occur in Wang Fat Ching She (WFCS) and lie at some distance from the Tsuen Wan Road (about 100 metres). These sites will not be impacted by the proposals either directly, or indirectly. However, it is recommended that any works leading to changes in the development area near the junction of Tsuen Wan Road and the Tuen Mun Highway should be noted in order to prevent any damage on the WFCS.
- 10.1.2 Potential impacts of the upgrading scheme upon existing graves site and the archaeology of the surrounding area are considered insignificant. Some tree felling and transplantation will be required in areas of urban parkland or amenity plantation, but these will be mitigated by compensatory planting as described in details in the Landscape and Visual Impacts section (EIA Report **Chapter 8**).
- 10.1.3 Hence, no specific mitigation measures to prevent impacts upon those identified sites of cultural heritage importance are deemed necessary. Mitigation measures generally relate to best practices described for other Chapters in this manual to avoid unnecessary disturbance to villages including the provision of replacement planting to compensate the loss of woodland and Fung Shui screen planting.

## 11. SITE ENVIRONMENTAL AUDIT

### 11.1 *Site Inspections*

- 11.1.1 Site Inspections provide a direct means to trigger and enforce the specified environmental protection and pollution control measures. They shall be undertaken routinely to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. With well defined pollution control and mitigation specifications and a well established site inspection, deficiency and action reporting system, the site inspection is one of the most effective tools to enforce the environmental protection requirements on the construction site.
- 11.1.2 The ET Leader is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspection works. He shall submit a proposal on the site inspection, deficiency and action reporting procedures within 21 days of the construction contract commencement to the Contractor for agreement and to the ER for approval. The ET's proposal for rectification would be made known to the IEC.
- 11.1.3 Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site; it should also review the environmental situation outside the site area which is likely to be affected, directly or indirectly, by the site activities. The ET Leader shall make reference to the following information in conducting the inspection:
- the EIA and EM&A recommendations on environmental protection and pollution control mitigation measures;
  - works progress and programme;
  - individual works methodology proposals (which shall include proposal on associated pollution control measures);
  - the contract specifications on environmental protection;
  - the relevant environmental protection and pollution control laws; and
  - previous site inspection results.
- 11.1.4 The Contractor shall update the ET Leader with all relevant information of the construction contract for him to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the ER/IEC and the Contractor within 24 hours, for reference and for taking immediate action. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the ET Leader to report on any remedial measures subsequent to the site inspections.
- 11.1.5 Ad hoc site inspections shall also be carried out if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an

environmental complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

## **11.2 Compliance with Legal and Contractual Requirements**

- 11.2.1 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong which the construction activities shall comply with.
- 11.2.2 In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the ER for approval shall be sent to the ET Leader for vetting to see whether sufficient environmental protection and pollution control measures have been included.
- 11.2.3 The ET Leader shall also review the progress and programme of the works to check that relevant environmental laws have not been violated, and that the any foreseeable potential for violating the laws can be prevented.
- 11.2.4 The Contractor shall regularly copy relevant documents to the ET Leader so that the checking work can be carried out. The document shall at least include the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws, and all the valid licence/permit. The site diary shall also be available for the ET Leader's inspection upon his request.
- 11.2.5 After reviewing the document, the ET Leader shall advise the ER and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence/permit application and any environmental protection and pollution control preparation works may not cope with the works programme or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise the Contractor and the ER accordingly.
- 11.2.6 Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ER shall follow up to ensure that appropriate action has been taken by the Contractor in order that the environmental protection and pollution control requirements are fulfilled.

## **11.3 Environmental Complaints**

- 11.3.1 Complaints shall be referred to the ET Leader for carrying out complaint investigation procedures. The ET Leader shall undertake the following procedures upon receipt of the complaints:
- (a) log complaint and date of receipt onto the complaint database and inform the IEC immediately;
  - (b) investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
  - (c) if a complaint is valid and due to works, identify mitigation measures in consultation with the IEC;

- (d) if mitigation measures are required, advise the Contractor accordingly;
  - (e) review the Contractor's response on the identified mitigation measures, and the updated situation;
  - (f) if the complaint is transferred from EPD, submit interim report to EPD on status of the complaint investigation and follow-up action within the time frame assigned by EPD;
  - (g) undertake additional monitoring and audit to verify the situation if necessary, and review that any valid reason for complaint does not recur;
  - (h) report the investigation results and the subsequent actions to the source of complaint for responding to complainant (If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD); and
  - (i) record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.
- 11.3.2 The complaint handling procedures and a sample of the complaint log are provided in **Appendix D** and **E** respectively.
- 11.3.3 During the complaint investigation work, the Contractor and ER shall cooperate with the ET Leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor shall promptly carry out the mitigation. The ER shall ensure that the measures have been carried out by the Contractor.

## 12. REPORTING

### 12.1 *General*

12.1.1 The following reporting requirements based upon a paper documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the ER and EPD. This would enable a transition from a paper/historic and reactive approach to an electronic/real time proactive approach.

12.1.2 Types of reports that the ET Leader shall prepare and submit include baseline monitoring report, monthly EM&A report, quarterly EM&A summary report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly, quarterly summary and final EM&A review reports shall be made available to the Director of Environmental Protection. The exact details of the frequency, distribution and time frame for submission shall be agreed with EPD prior to commencement of works.

### 12.2 *Baseline Monitoring Report*

12.2.1 The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to each of the four parties: the Contractor, the IEC, the ER and the EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies they want. The format of the report and the format of the baseline monitoring data in magnetic media to be submitted to EPD shall be agreed with EPD.

12.2.2 The baseline monitoring report shall include at least the following:

- (a) up to half a page executive summary;
- (b) brief project background information;
- (c) drawings showing locations of the baseline monitoring stations;
- (d) monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology;
  - equipment used and calibration details;
  - parameters monitored;
  - monitoring locations (and depth);
  - monitoring date, time, frequency and duration;
- (e) details on influencing factors, including:
  - major activities, if any, being carried out on the site during the period;
  - weather conditions during the period;
  - other factors which might affect the results;
- (f) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data;
- (g) revisions for inclusion in the EM&A Manual; and

(h) comments and conclusions.

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

12.3.1 The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report shall be prepared and submitted within 10 working days of the end of each reporting month, with the first report due in the month after construction commences. A maximum of 4 copies of each monthly EM&A report shall be submitted to each of the four parties: the Contractor, the IEC, the ER and EPD. Before submission of the first EM&A report, the ET Leader shall liaise with the parties on the exact number of copies and format of the monthly reports in both hard copy and electronic medium requirement.

12.3.2 The ET leader shall review the number and location of monitoring stations and parameters to monitor every 6 months or on as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

#### First Monthly EM&A Report

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

- (a) 1-2 pages executive summary;
- (b) basic project information including a synopsis of the project organisation, programme and management structure, and the work undertaken during the month;
- (c) a brief summary of EM&A requirements including:
  - all monitoring parameters;
  - environmental quality performance limits (Action and Limit levels);
  - Event-Action Plans;
  - environmental mitigation measures, as recommended in the project EIA study final report;
  - environmental requirements in contract documents;
- (d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;
- (e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (f) monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology
  - equipment used and calibration details
  - parameters monitored
  - monitoring locations (and depth)
  - monitoring date, time, frequency, and duration;



- (g) graphical plots of trends of monitored parameters over the past four reporting periods for representative monitoring stations annotated against the following:
  - major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results;
- (h) advice on the solid and liquid waste management status;
- (i) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (j) a review of the reasons for and the implications of noncompliance including review of pollution sources and working procedures;
- (k) a description of the actions taken in the event of noncompliance and deficiency reporting and any follow-up procedures related to earlier noncompliance;
- (l) a summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints; and
- (m) An account of the future key issues as reviewed from the works programme and work method statements.

Subsequent Monthly EM&A Reports

12.3.4 The subsequent monthly EM&A reports shall include the following :

- (a) Title Page
- (b) Executive Summary (1-2 pages)
  - Breaches of AL levels
  - Complaint Log
  - Reporting Changes
  - Future key issues
- (c) Contents Page
- (d) Environmental Status
  - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations
  - Summary of non-compliance with the environmental quality performance limits
  - Summary of complaints
- (e) Environmental Issues and Actions
  - Review issues carried forward and any follow-up procedures related to earlier non-compliance (complaints and deficiencies)
  - Description of the actions taken in the event of noncompliance and deficiency reporting

- Recommendations (should be specific and target the appropriate party for action)
  - Implementation status of the mitigatory measures and the corresponding effectiveness of the measures
- (f) Future Key Issues
- (g) Appendix
- AL levels
  - Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
    - i) major activities being carried out on site during the period;
    - ii) weather conditions during the period; and
    - iii) any other factors which might affect the monitoring results
  - Monitoring schedule for the present and next reporting period
  - Cumulative complaints statistics
  - Details of complaints, outstanding issues and deficiencies

#### 12.4 *Quarterly EM&A Summary Reports*

12.4.1 The quarterly EM&A summary report which should generally be around 5 pages (including about 3 of text and tables and 2 of figures) should contain at least the following information:

- (a) up to half a page executive summary;
- (b) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;
- (c) a brief summary of EM&A requirements including:
  - monitoring parameters;
  - environmental quality performance limits (Action and Limit levels); and
  - environmental mitigation measures, as recommended in the project EIA study final report;
- (d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;
- (e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (f) graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
  - the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results;

- (g) advice on the solid and liquid waste management status;
- (h) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (i) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- (j) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- (k) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (l) comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
- (m) proponents' contacts and any hotline telephone number for the public to make enquiries.

## **12.5 Final EM&A Review Reports.**

- 12.5.1 The EM&A program shall be terminated upon completion of those construction activities that have the potential to result in a significant environmental impact.
- 12.5.2 Prior to the proposed termination, it may be advisable to consult relevant local communities. The proposed termination should only be implemented after the proposal has been endorsed by the IC(E), the Engineer and the Project Proponent followed by final approval from the Director of Environmental Protection.
- 12.5.3 The ET Leader shall prepare and submit a final EM&A report within 14 working days after the completion of those construction activities that have the potential to result in a significant environmental impact. The final EM&A report should contain at least the following information:
  - (a) executive summary (1 - 2 pages);
  - (b) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
  - (c) basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;
  - (d) a brief summary of EM&A requirements including:
    - environmental mitigation measures, as recommended in the project EIA Report;
    - environmental impact hypotheses tested;
    - environmental quality performance limits (Action and Limit levels);
    - all monitoring parameters; and
    - Event-Action Plans.

- (e) a summary of the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report, summarised in the updated implementation schedule;
- (f) graphical plots and the statistical analysis of the trends of monitored parameters over the course of the project, including the post-project monitoring for all monitoring stations annotated against:
  - the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results.
- (g) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (h) a review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- (i) a description of the actions taken in the event of non-compliance;
- (j) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (k) 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;
- (l) a review of the validity of EIA predictions and identification of shortcomings in EIA recommendations; and
- (m) comments (for examples, a review of the effectiveness and efficiency of the mitigation measures and of the performance of the environmental management system, that is, of the overall EM&A programme);
- (n) recommendations and conclusions (for example, a review of success of the overall EM&A programme to cost-effectively identify deterioration and to initiate prompt effective mitigatory action when necessary).

## 12.6 *Data Keeping*

12.6.1 The site document such as the monitoring field records, laboratory analysis records, site inspection forms, etc, are not required to be included in the monthly EM&A reports for submission. However, the document shall be well kept by the ET and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the documents. The monitoring data shall also be recorded in magnetic media form, and the software copy can be available upon request. All the document and data shall be kept for at least one year after completion of the construction contract.

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

- 12.7.1 With reference to Event/Action Plans in **Tables 2.4, 2.8** and **3.3**, when the environmental quality limits are exceeded, the ET Leader shall immediately notify the IEC and EPD, as appropriate. The notification shall be followed up with advice to IEC and EPD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in **Appendix F**.

## **Figures**

**Appendix A**  
**Noise and Air Sensitive Receivers**

### Summary of Identified NSRs in the Project

NSR No.	Descriptions	Land Use	No. of Noise Sensitive Storeys above Podium/Site Level	Existing NSR (Base Year 2006)	Planned NSR (Base Year 2006)	Remarks
N1	Tsuen Tak Gardens Block A	Residential	30	✓		
N2	Tsuen Tak Gardens Block B	Residential	31	✓		
N3	Tsuen Tak Gardens Block C	Residential	31	✓		
N4	Tsuen Tak Gardens Block D	Residential	31	✓		
N5	Tsuen Tak Gardens Block E	Residential	31	✓		
N6	Joyful Building Block A	Residential	27	✓		
N7	Joyful Building Block B	Residential	27	✓		
N8	Sheeny Terrace	Residential	26	✓		
N9	Summit Terrace Block 1	Residential	39	✓		
N10	Summit Terrace Block 2	Residential	39	✓		
N11	Summit Terrace Block 3	Residential	40	✓		
N12	Summit Terrace Block 5	Residential	40	✓		
N13	Tsuen Wan Adventist Hospital	Hospital	4	✓		
N14	Tsuen Wan Adventist Hospital Staff Quarter	Residential	5	✓		
N15	Allway Gardens Block A	Residential	22	✓		
N16	Allway Gardens Block B	Residential	22	✓		
N17	Allway Gardens Block C	Residential	22	✓		
N18	Wang Fat Ching She	Place of Worship	2	✓		No daytime construction noise criteria in EIAO-TM
N19	The Panorama	Residential	43	✓		
N20	Phase I Belvedere Garden Block 1	Residential	35	✓		
N21	Phase I Belvedere Garden Block 2	Residential	35	✓		
N22	Phase I Belvedere Garden Block 3	Residential	35	✓		
N23	Serenade Cove Block A	Residential	33	✓		
N24	Serenade Cove Block B	Residential	32	✓		
N25	Serenade Cove Block C	Residential	33	✓		
N26	Phase III Belvedere Garden Block 7	Residential	41	✓		
N27	Phase III Belvedere Garden Block 6	Residential	41	✓		
N28	Phase III Belvedere Garden Block 5	Residential	41	✓		
N29	Fu Yung House	Residential	7	✓		
N30	Yen Wai Garden	Residential	23	✓		
N31	Tak Yan Building Stage 15	Residential	6	✓		
N32	On Hong Building	Residential	24	✓		
N33	Kan Fat Building	Residential	5	✓		



NSR No.	Descriptions	Land Use	No. of Noise Sensitive Storeys above Podium/Site Level	Existing NSR (Base Year 2006)	Planned NSR (Base Year 2006)	Remarks
N34	Heung Wo Building	Residential	21	✓		
N35	On Fung Building	Residential	20	✓		
N36	Po On Commercial Association Wong Siu Ching Secondary School	School	6	✓		Protected under "Noise Abatement Programme in schools", Stage IV
N37	Tsuen Wan Plaza Block 1	Residential	30	✓		
N38	Tsuen Wan Plaza Block 2	Residential	30	✓		
N39	Salvation Army Ng Kok Wai Memorial Kindergarten	School	2	✓		Window glazing with window-type air-conditioners were noted on site visit
N40	Clague Garden Estate Block A	Residential	40	✓		
N41	Clague Garden Estate Block B	Residential	40	✓		
N42	Clague Garden Estate Block C	Residential	40	✓		
N43	Skyline Plaza	Residential	35	✓		
N44	Development at TW5 Cityside Tower 10	Residential	50		✓	Anticipated to be completed by 2015-2016 <sup>[1]</sup>
N45	Development at TW5 Cityside Tower 11	Residential	52		✓	
N46	Development at TW5 Bayside Tower 1	Residential	49		✓	
N47	Development at TW5 Bayside Tower 2	Residential	42		✓	
N48	Development at TW5 Bayside Tower 3	Residential	42		✓	
N49	Development at TW5 Bayside Tower 4	Residential	39		✓	
N50	Development at TW5 Bayside Tower 5	Residential	39		✓	
N51	Development at TW5 Bayside Tower 6	Residential	42		✓	
N52	Development at TW5 Bayside Tower 7	Residential	42		✓	
N53	Development at TW5 Bayside Tower 8	Residential	42		✓	
N54	Development at TW5 Bayside Tower 9	Residential	42		✓	
N55	Vision City Tower 1	Residential	41	✓		Formerly known as Development of Tsuen Wan Town Lot 398
N56	Vision City Tower 2	Residential	43	✓		
N57	No. 57 Yeung Uk Road	Residential	5	✓		

<b>NSR No.</b>	<b>Descriptions</b>	<b>Land Use</b>	<b>No. of Noise Sensitive Storeys above Podium/Site Level</b>	<b>Existing NSR (Base Year 2006)</b>	<b>Planned NSR (Base Year 2006)</b>	<b>Remarks</b>
N58	No. 59-77 Yeung Uk Road	Residential	5	✓		
N59	Tsuen Wan Caritas Clinic	Clinic	4	✓		No daytime construction noise criteria in EIAO-TM
N60	No. 85-99 Yeung Uk Road	Residential	4	✓		
N61	Harmony Garden Block 1	Residential	24	✓		
N62	Harmony Garden Block 2	Residential	24	✓		
N63	Development at TWTL 394 Tower 1	Residential	45		✓	
N64	Development at TWTL 394 Tower 2	Residential	45		✓	
N65	Development at TW6 Tower 1	Residential	48		✓	Anticipated to be completed by 2011-2012
N66	Development at TW6 Tower 2	Residential	46		✓	
N67	Development at TW7 Tower 1	Residential	44		✓	Anticipated to be completed by 2012 – 2014 <sup>[1]</sup>
N68	Development at TW7 Tower 2	Residential	44		✓	
N69	Development at TW7 Tower 3	Residential	44		✓	
N70	Development at TW7 Tower 4	Residential	42		✓	
N71	Development at TW7 Tower 5	Residential	42		✓	
N72	Development at TW7 Tower 6	Residential	40		✓	
N73	Development at TW7 Tower 7	Residential	40		✓	
N74	Waterside Plaza Block 1	Residential	37	✓		
N75	Waterside Plaza Block 2	Residential	37	✓		
N76	Waterside Plaza Block 3	Residential	32	✓		
N77	Waterside Plaza Block 4	Residential	31	✓		
N78	Proposed School Site at TW7	School	6	✓		
N79	Shak Chung Shan Memorial Catholic Primary School	School	7	✓		
N80	Riviera Gardens Tower 1	Residential	31	✓		
N81	Riviera Gardens Tower 2	Residential	32	✓		
N82	Riviera Gardens Tower 3	Residential	36	✓		
N83	Riviera Gardens Tower 4	Residential	36	✓		
N84	Riviera Gardens Tower 17	Residential	34	✓		
N85	Riviera Gardens Tower 18	Residential	34	✓		
N86	Riviera Gardens Tower 19	Residential	30	✓		
N87	Riviera Gardens Tower 20	Residential	30	✓		
N88	Riviera Gardens Tower 21	Residential	30	✓		
N89	Riviera Gardens Tower 22	Residential	30	✓		

NSR No.	Descriptions	Land Use	No. of Noise Sensitive Storeys above Podium/Site Level	Existing NSR (Base Year 2006)	Planned NSR (Base Year 2006)	Remarks
N90	S K H Chu Yan Primary School	School	6	✓		Protected under "Noise Abatement Programme in schools", Stage IV
N91	Kwai Shing West Estate Block 6	Residential	17	✓		
N92	Kwai Shing West Estate Block 8	Residential	24	✓		
N93	Kwai Shing West Estate Block 9	Residential	21	✓		
N94	Kwai Shing West Estate Block 10	Residential	14	✓		
N95	CNEC Lee I Yao Memorial Secondary School	School	5	✓		Window glazing with window-type air-conditioners were noted on site visit
N96	Hibiscus Park Block 1	Residential	35	✓		
N97	Hibiscus Park Block 2	Residential	35	✓		

#### Summary of Representative Air Sensitive Receivers (ASRs) - Existing

ASR No.	Description	Land Use	No. of Storey	Podium (P) / Site (S) Levels (mPD) <sup>(1)</sup>	Horizontal Distance to the Site Boundary (m)
<b>Existing ASRs</b>					
1	Allway Gardens Block A	Residential	22	57.1 (P)	240
2	Tsuen Wan Adventist Hospital Staff Quarter	Residential	5	44.2 (S)	200
3	Summit Terrace Block 2	Residential	39	37.1 (P)	140
4	Summit Terrace Block 3	Residential	40	37.1 (P)	120
5	Summit Terrace Block 5	Residential	40	37.1 (P)	100
6	Kong Nam Industrial Building	Industrial	26	11.1 (S)	20
7	The Panorama	Residential	43	30.4 (P)	40
8	Wang Fat Ching She	Place of Worship	2	25.3 (S)	210
9	Lok Shun Seaview Factory Building	Industrial	14	4.1 (S)	10
10	Serenade Cove Block B	Residential	32	13.7 (P)	140
11	Golden Bear Industrial Centre	Industrial	25	4.4 (S)	5
12	Wong Siu Ching Secondary School	School	6	4.0 (S)	100
13	Clague Garden Estate Block A	Residential	40	4.0 (S)	20
14	Clague Garden Estate Block B	Residential	40	4.0 (S)	50
15	Clague Garden Estate Block C	Residential	40	4.0 (S)	30
16	Salvation Army Ng Kok Wai Memorial Kindergarten	School	2	5.1 (S)	10

ASR No.	Description	Land Use	No. of Storey	Podium (P) / Site (S) Levels (mPD) <sup>(1)</sup>	Horizontal Distance to the Site Boundary (m)
<b>Existing ASRs</b>					
28	Skyline Plaza	Residential	35	23.4 (P)	130
29	Vision City Tower 1	Residential	41	38.4 (P)	230
30	Vision City Tower 2	Residential	43	38.4 (P)	270
31	Tsuen Wan Park	Recreational	-----	5.8 (S)	Within Site Boundary <sup>(3)</sup>
35	No. 57 Yeung Uk Road	Residential	5	4.0 (S)	280
36	Tsuen Wan Caritas Clinic	Clinic	4	4.0 (S)	310
41	Texaco Road Industrial Centre	Industrial	16	4.0 (S)	60
56	Waterside Plaza Block 1	Residential	37	18.2 (P)	60
57	Waterside Plaza Block 2	Residential	37	18.2 (P)	60
58	Waterside Plaza Block 3	Residential	32	19.5 (P)	70
59	Waterside Plaza Block 4	Residential	31	19.5 (P)	80
60	Shak Chung Shan Memorial Catholic Primary School	School	7	4.5 (S)	160
62	Riviera Gardens Tower 22	Residential	30	22.3 (P)	160
63					165
64	Metropolitan Industrial & Warehouse Building No.2	Industrial	22	4.8 (S)	0 <sup>(2)</sup>
65	Leader Industrial Centre Phase I & II	Industrial	15	4.9 (S)	0 <sup>(2)</sup>
66	Tak Fung Industrial Centre	Industrial	26	4.0 (S)	0 <sup>(2)</sup>
67	Kerry Godown (Tsuen Wan)	Industrial	17	21.8 (S)	20
68	Chun Shing Factory Estate	Industrial	25	20.2 (S)	10
69	Wing Kei Road 5-A-Side Soccer Pitch	Recreational	-----	15.6 (S)	5
70	Broadway Centre	Industrial	23	20.0 (S)	0 <sup>(2)</sup>
71	S K H Chu Tan Primary School	School	6	61.0 (S)	140
72	Kwai Shing West Estate Block 8	Residential	24	61.0 (S)	130
73	Lee I Yao Secondary School	School	5	26.5 (S)	70
74	Wing Kin Industrial Building	Industrial	26	7.3 (S)	0 <sup>(2)</sup>
75	Kingsford Industrial Building Phase 1	Industrial	26	7.6 (S)	20
76	Waford Industrial Building	Industrial	12	7.6 (S)	20
77	Marvel Industrial Building Block B	Industrial	16	5.9 (S)	110
78	Kwai Tak Industrial Building Block 2	Industrial	11	5.0 (S)	120
79	Kwai Shun Street Playground	Recreational	-----	5.5 (S)	150
80	Profit Industrial Building	Industrial	15	5.7 (S)	220
81	Kwai Shun Industrial Centre	Industrial	12	5.4 (S)	230
82	Lai King Catholic Secondary School	School	5	7.2 (S)	500
83	Lai King Estate Fung King House	Residential	14	18.3 (S)	500
84	Supermarket at G/F of the Panorama	Commercial	1	11.3 (S)	65
85	Shop at G/F of Skyline Plaza	Commercial	1	4.2 (S)	100

ASR No.	Description	Land Use	No. of Storey	Podium (P) / Site (S) Levels (mPD) <sup>(1)</sup>	Horizontal Distance to the Site Boundary (m)
<b>Existing ASRs</b>					
86	Shopping Centre of Vision City	Commercial	-----	4.3 (S)	225
87	Allway Gardens Shopping Arcade	Commercial	2	52.1 (S)	240
88	Shopping Centre of Waterside Plaza	Commercial	1	4.4 (S)	60
89	Riviera Gardens Tower 22 – G/F	Commercial	1	6.9 (S)	160

**Notes:**

- 1) (P) for podium level and (S) for site level.
- 2) ASRs are located adjacent to the site boundary, i.e. horizontal distance to the Site boundary equals to 0m.
- 3) Since part of Tsuen Wan Park is located beneath the Tsuen Wan Road viaduct, part of this ASR is within site boundary.

**Summary of Representative Air Sensitive Receivers (ASRs) – Planned**

ASR No.	Description	Land Use	No. of Storey	Podium (P) / Site (S) Levels (mPD) <sup>(1)</sup>	Horizontal Distance to the Site Boundary (m)
<b>Planned ASRs</b>					
17	Development at TW5 Bayside Tower 1	Residential	49	30.6 (P)	80
18	Development at TW5 Bayside Tower 2	Residential	42	30.6 (P)	90
19	Development at TW5 Bayside Tower 3	Residential	42	30.6 (P)	110
20	Development at TW5 Bayside Tower 4	Residential	39	30.6 (P)	90
21	Development at TW5 Bayside Tower 5	Residential	39	30.6 (P)	60
22	Development at TW5 Bayside Tower 6	Residential	42	30.6 (P)	20
23	Development at TW5 Bayside Tower 7	Residential	42	30.6 (P)	10
24	Development at TW5 Bayside Tower 8	Residential	42	30.6 (P)	10
25	Development at TW5 Bayside Tower 9	Residential	42	30.6 (P)	10
26	Development at TW5 Cityside Tower 10	Residential	50	33.2 (P)	10
27	Development at TW5 Cityside Tower 11	Residential	52	33.2 (P)	70
32	Tsuen Wan Town Lot 394 Tower 1	Residential	44	30.6 (P)	180
33	Tsuen Wan Town Lot 394 Tower 2	Residential	44	30.6 (P)	170
34	Tsuen Wan Town Lot 393	Commercial	-----	4.3 (S)	130
37	Development at TW6 Tower 1	Residential	48	23.5 (P)	40
38					50
39	Development at TW6 Tower 2	Residential	46	23.5 (P)	50
40					50
42	Development at TW7 Tower 1	Residential	44	20.5 (P)	10
43					10
44	Development at TW7 Tower 2	Residential	44	20.5 (P)	10
45					10
46	Development at TW7 Tower 3	Residential	44	20.5 (P)	10
47					10
48	Development at TW7 Tower 4	Residential	42	20.5 (P)	10

<b>ASR No.</b>	<b>Description</b>	<b>Land Use</b>	<b>No. of Storey</b>	<b>Podium (P) / Site (S) Levels (mPD) <sup>(1)</sup></b>	<b>Horizontal Distance to the Site Boundary (m)</b>
49					10
50	Development at TW7 Tower 5	Residential	42	20.5 (P)	10
51					20
52	Development at TW7 Tower 6	Residential	40	20.5 (P)	5
53					10
54	Development at TW7 Tower 7	Residential	40	20.5 (P)	10
55					20
61	Proposed School Site at TW7	School	6	17.5 (S)	80

**Notes:**

(P) for podium level and (S) for site level.

**Appendix B**  
**Summary of Mitigation Measures - Implementation Schedule**

### Summary of Mitigation Measures - Implementation Schedule

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
Section 3  3.3.4.3	<p style="text-align: center;"><b><u>Noise Mitigation</u></b></p> <p><b><u>Construction Mitigation Measures</u></b></p> <p><u>Selection and Programming of Construction Processes</u></p> <p>The timing and sequencing of the various construction activities shall be carefully arranged according to the actual site work situation, in order to limit the amount of concurrent activities and where applicable, to avoid parallel operation of noisy PME in order to minimize the total noise generated during construction periods. Limiting the quantity of PME to be operated concurrently and also their on-time percentage were recommended in the Project and incorporated in this assessment. The proposed quantity of PMEs and their percentage on-time have been confirmed feasible by the Project Engineer and the Proponent. In the case during school examination while more stringent construction noise criteria should be imposed, the potentially most disruptive construction activities should be avoided, and arranged to be conducted during school holidays as far as practicable. In particular, NSR 39 (Salvation Army Ng Kok Wai Memorial Kindergarten) is of close proximity to works area S5 and subject to high level of unmitigated construction noise. It is recommended that the work stages “transportation &amp; utilities diversion” and “piling” shall not take place simultaneously during operation time of the kindergarten for the same location in works area S5, such that cumulative noise to this kindergarten is further minimized. This requirement will be specified in the EM&amp;A Manual for Contractor to follow.</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00-19:00 from Monday to Saturday except public holiday)</p>	HyD & Contractor		✓		TM on EIA Process, NCO

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road



EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
3.3.4.4	<p><u>Use of “Quiet” Alternative Plant and Working Methods</u></p> <p>The use of particular plant with equipment noise levels quieter than those specified in the GW-TM.</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00-19:00 from Monday to Saturday except public holiday)</p>	HyD & Contractor		✓		<p><u>TM on EIA Process, NCO</u></p> <p>Noise from Construction Work Other Than Percussive Piling (GW-TM)</p>
3.3.4.5	<p>“Quiet” plant is defined as a PME having actual Sound Power Levels (SWLs) lower than the values specified for PME in the GW-TM.</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00-19:00 from Monday to Saturday except public holiday)</p>	HyD & Contractor		✓		<p><u>TM on EIA Process, NCO</u></p> <p>Noise from Construction Work Other Than Percussive Piling (GW-TM)</p>
3.3.4.7	<p>Temporary noise barriers provide noise attenuation by screening NSRs from stationary and mobile plants from direct line-of-sight in shadow zone. The use of 3m high movable barriers with skid footing and a small cantilevered upper portion can be adopted. The barrier material shall have a surface mass of not less than 14kg/m<sup>2</sup> on skid footing with 25mm thick internal sound absorptive lining to achieve the maximum screening effect.</p> <p>The temporary noise barriers should also be located along the working area in order to make sure that the construction plant could be screened during all kinds of construction activities as far as practicable.</p> <p>A solid hoarding will also be provided along the NSR 39 of height not less than 3m and length well cover the NSR39, so as to further reduce the construction noise impacts at NSR39.</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00-19:00 from Monday to Saturday except public holiday)</p>	HyD & Contractor		✓		<p><u>TM on EIA Process, NCO</u></p> <p>Noise from Construction Work Other Than Percussive Piling (GW-TM)</p>

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
3.3.4.8	<p>Depending on site situation, when temporary noise barriers are not practicable or noise reduction achieved is insufficient, noise jacket/muffler can be applied to cover the noisy part of the engine or at the engine exhaust of particular mobile plants respectively. Applicable PME with temporary noise barrier include road roller, excavator, mobile crane, hand-held breaker, poker vibrator, excavator mounted breaker, asphalt paver, vibratory roller and paint line marker.</p> <p>Considered the practicability, the site access of dump trucks would not be screened by temporary barrier; yet, the unloading activities of dump trucks should be screened by temporary noise barriers.</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00-19:00 from Monday to Saturday except public holiday)</p>	HyD & Contractor		✓		<p><u>TM on EIA Process, NCO</u></p> <p>Noise from Construction Work Other Than Percussive Piling (GW-TM)</p>
3.3.4.9	<p>For the stationary plant bored pile oscillator, temporary noise barriers of sufficient height with skid footing and small cantilevered upper portion can provide total screening to the NSRs. It is estimated that temporary noise barriers of this type can provide full screening of 10 dB(A) to the NSRs. This is considered achievable by careful selection of insulation material, and, if necessary, acoustic mats at noisy mechanical parts of the equipment. Barrier material of surface density of at least 14 kg/m<sup>2</sup> is recommended in order to achieve the necessary screening effect.</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00-19:00 from Monday to Saturday except public holiday)</p>	HyD & Contractor		✓		<p><u>TM on EIA Process, NCO</u></p> <p>Noise from Construction Work Other Than Percussive Piling (GW-TM)</p>
3.3.4.10	<p>Full noise enclosures, which completely cover the PME, can provide significant noise reduction up to 20 dB(A). The degree of reduction will vary depending on the nature of the material used for the enclosures.</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00-19:00 from Monday to Saturday except public holiday)</p>	HyD & Contractor		✓		<p><u>TM on EIA Process, NCO</u></p> <p>Noise from Construction Work Other Than Percussive Piling (GW-TM)</p>

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
3.3.4.11	<p>The use of good site practice/techniques can provide considerable reductions in noise emissions. Examples of these site practice include:</p> <ul style="list-style-type: none"> <li>• use of well-maintained and regularly-serviced plant during the works;</li> <li>• plant operating on intermittent basis should be turned off or throttled down when not in active use;</li> <li>• plant that is known to emit noise strongly in one direction should be orientated to face away from the NSRs;</li> <li>• silencers, mufflers and enclosures for plant should be used where possible and maintained adequately throughout the works;</li> <li>• where possible fixed plants should be sited away from NSRs; and</li> <li>• stockpiles of excavated materials and other structures such as site buildings should be used effectively to screen noise from the works.</li> </ul>	<p>Within the boundaries of all construction sites / Operation Time (07:00-19:00 from Monday to Saturday except public holiday)</p>	HyD & Contractor		✓		<p><u>TM on EIA Process, NCO</u></p> <p>Noise from Construction Work Other Than Percussive Piling (GW-TM)</p>
3.3.7.1	<p>Environmental monitoring and audit measures are recommended during the construction phase of the Project. A proactive EM&amp;A programme is necessary to be provided by the Contractor, in order to ensure that construction noise impact to the NSRs should be minimized as far as practicable. An appropriate path for noise complaints handling procedures is a key element of the EM&amp;A programme.</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00-19:00 from Monday to Saturday except public holiday)</p>	HyD & Contractor		✓		<p><u>TM on EIA Process, NCO</u></p> <p>Noise from Construction Work Other Than Percussive Piling (GW-TM)</p>

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
Table 3-8	<p>Operational Mitigation Measures</p> <p><u>Proposed noise mitigation measures along the DP roads of the project include:</u>(C1) 5.5m with 3.5m cantilevered barrier length of 200m</p> <p>(C2) 5.5m with 3.5m cantilevered barrier length of 371m</p> <p>(C3) 5.5m with 3.5m cantilevered barrier length of 560m</p> <p>(C4) 5.5m with 3.5m cantilevered barrier length of 104m</p> <p>(C5) 5.5m with 3.5m cantilevered barrier length of 635m</p> <p>(C6) 5.5m with 3.5m cantilevered barrier length of 334m</p> <p>(S1) Semi-enclosure length of 50m</p> <p>(S2) Semi-enclosure length of 229m</p> <p>(S3) Semi-enclosure length of 84m</p> <p>(S4) Semi-enclosure length of 105m</p> <p>(F1) Full enclosure length of 110m</p> <p>(F2) Full enclosure length of 93m</p> <p>(F3) Full enclosure length of 58m</p>	During the TWR Operation	HyD	✓	✓	✓	TM on EIA Process, NCO

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
3.2.8.1	Road traffic noise monitoring is recommended at representative NSRs during the first year of the road opening.	During the TWR Operation				✓	
Section 4  4.6.3	<p style="text-align: center;"><b><u>Air Quality Mitigation</u></b></p> <p><b><u>Construction Mitigation Measures</u></b></p> <p>The following site practices are recommended to be fully implemented by Contractor, in order to suppress dust emissions during construction work. Recommendations are represented in the form of contractual clauses</p> <ul style="list-style-type: none"> <li>The Contractor shall undertake at all times to prevent dust nuisance as a result of his activities. Dust suppression measures such as water spraying are necessary and should be installed to ensure that the air quality at the boundary of the site and at any sensitive receivers complies with the Hong Kong Air Quality Objectives</li> <li>The Contractor shall notify any specific construction work as stated in the Air Pollution Control (Construction Dust) Regulation to the Authority before the commencement of such work.</li> <li>The Contractor shall apply for a licence or permit under the requirements of the relevant legislation (e.g., Air Pollution Control Ordinance and its subsidiary regulations) wherever applicable.</li> </ul>	Within the boundaries of all construction sites / Operation Time (07:00 – 19:00 form Monday to Saturday except public holiday)	Contractor/HyD		✓		APCO Air Pollution Control (Construction Dust) Regulations AQOs TM (Annex 4)

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
4.6.3	<ul style="list-style-type: none"> <li>Watering of unpaved areas, access roads, construction areas and dusty stockpiles shall be undertaken at least eight times daily during dry and windy weather. Watering of the haul road shall be undertaken four to eight times daily during dry or windy weather. Water sprays may be either fixed or mobile to follow individual areas to be wetted as and when required. Application of suitable wetting agents, such as dust suppression chemicals, shall be used in addition to water, especially during the dry season (November to March)</li> <li>Effective water sprays shall be used during the delivery and handling of all raw sand and aggregate, and other similar materials, wet dust is likely to be created and to dampen all stored materials during dry and windy weather</li> <li>Stockpiles of sand, aggregate or any other dusty materials greater than 20 m3 shall be enclosed on three sides, with walls extending above the pile and 1 metre beyond the front of the pile</li> <li>Suitable chemical wetting agent such as dust suppression chemical shall be used on completed cuts and fills to reduce wind erosion.</li> <li>Areas within the construction site where there is a regular movement of vehicles shall have a paved surface and be kept clear of loose surface material.</li> <li>The Contractor shall restrict all motorized vehicles within the construction site, excluding those on public roads, to maximum speed of 20 km per hour and confine haulage and delivery vehicles to designated roadways inside the Site.</li> </ul>	Within the boundaries of all construction sites / Operation Time (07:00 – 19:00 form Monday to Saturday except public holiday)	Contractor/HyD		<ul style="list-style-type: none"> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> </ul>		APCO Air Pollution Control (Construction Dust) Regulations AQOs TM (Annex 4)

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
4.6.3	<ul style="list-style-type: none"> <li>Construction working areas will be restricted to a minimum practicable size.</li> <li>The Contractor shall ensure that no earth, rock or debris is deposited on public or private rights of way as result of his activities, including any deposits arising from the movement of plant or vehicles.</li> <li>The Contractor shall provide a wheel washing facility at the exits from work areas to the satisfaction of the Engineer and to the requirements of the Commissioner of Police. Water in wheel washing facilities and sediment shall be changed and removed respectively at least once a month.</li> <li>The Contractor shall submit details of the wheel washing facilities; such shall be usable prior to any earthworks excavation activity on the construction site. The Contractor shall also provide a hard-surfaced road between any washing facility and the public road.</li> <li>In the event of any spoil or debris from construction works being deposited on adjacent land, or streams, or any silt being washed down to any area, then all such spoil, debris or material and silt shall be immediately removed and the affected land and areas restored to their natural state by the Contractor to the satisfaction of the Engineer.</li> <li>If spoil cannot be immediately transported out of the Site, stockpiles should be stored in sheltered areas.</li> </ul>	Within the boundaries of all construction sites / Operation Time (07:00 – 19:00 form Monday to Saturday except public holiday)	Contractor/HyD	✓	✓		APCO Air Pollution Control (Construction Dust) Regulations AQOs TM (Annex 4)

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
4.6.3	<ul style="list-style-type: none"> <li>Plant and vehicles shall be inspected annually to ensure that they are operating efficiently and that exhaust emissions are not causing a nuisance. All Site vehicle exhausts should be directed vertically upwards or directed away from ground.</li> <li>Path for complaints and handling procedures should be set up and implement.</li> </ul>	Within the boundaries of all construction sites / Operation Time (07:00 – 19:00 form Monday to Saturday except public holiday)	Contractor/HyD	✓	✓		APCO Air Pollution Control (Construction Dust) Regulations AQOs TM (Annex 4)
4.7.1	With the implementation of the proposed dust suppression measures, good site practices and dust monitoring and audit programme, no adverse dust impact would be expected at the ASRs. Details of the monitoring requirements such as monitoring locations, frequency of baseline and impact monitoring are presented in the EM&A manual separate for this report.	Within the boundaries of all construction sites / Operation Time (07:00 – 19:00 form Monday to Saturday except public holiday)	Contractor/HyD		✓		TM on EIA process,
Section 5	<b><u>Water Quality Mitigation</u></b>						
5.7.1	<p><b><u>Construction Mitigation Measures</u></b></p> <p>Silt-laden surface run-off should be prevented from directly entering the sensitive receivers during the construction works. The mitigation measures described below for the construction phase are in accordance with <i>ProPECC PN 1/94</i>:</p> <p>a) Works sites and areas used for imported fill stockpiling should, as far as possible, avoid the water sensitive receivers.</p>	Within the boundaries of all construction sites / Operation Time (07:00 – 19:00 form Monday to Saturday except public holiday)	Contractor	✓	✓		TM on EIA process, WPCO, ProPECC PN 1/94

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road



EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
5.7.1	<p>b) Stripping of existing vegetation should be sequential to avoid exposure of large areas of embankment slopes;</p> <p>c) Special precautions should be taken when working in the near vicinity of nullahs and streams, especially when bridges along the TWR are being widened. This may involve the installation of temporary drainage works to ensure that runoff does not enter the nullahs directly; typical example of this type of measure is the provision of suitable temporary drainage system, such as peripheral channels around the site, to intercept all on-site runoff to water quality treatment devices such as sedimentation pond / sand trap. Only treated runoff from these devices will be discharged offsite. Sizes and arrangement details of these drainage works depend on local conditions and will be addressed during the detailed design stage.</p> <p>d) Perimeter cut-off drains to direct off-site water around the works sites should be constructed and internal drainage works and erosion and sedimentation control facilities implemented. Channels, earth bunds or sandbag barriers should be provided on site to direct stormwater to silt removal facilities. The design of efficient silt removal facilities should be based on the guidelines provided in ProPECC PN 1/94;</p> <p>e) Sediment tanks of sufficient capacity, constructed from pre-formed individual cells of approximately 6-8 m<sup>3</sup> capacity are adopted as a general mitigation measure which can be used for settling wastewaters prior to disposal. The tanks are readily available and used primarily for recycling water for bored piling operations. The system capacity is flexible and able to handle multiple inputs from a variety of sources and particularly suited to applications where the influent is pumped. Various physical and chemical filters such infiltration tank can be added should refinement of the sedimentation process be required;</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00 – 19:00 form Monday to Saturday except public holiday)</p>	Contractor	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>		<p>TM on EIA process, WPCO, ProPECC PN 1/94</p>

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
5.7.1	<p>f) Construction works should be programmed to minimise surface excavations/ cutting during the rainy season (April to September). If excavation of soil cannot be avoided during the rainy season, or at any time of year when rainstorms are likely, exposed slope surfaces should be covered by a tarpaulin or other means. Other measures that need to be implemented before, during and after rainstorms are summarised in ProPECC PN 1/94. Particular attention should be paid to the control of silty surface run-off during storms events, especially for sites located near steep slopes;</p> <p>g) All exposed earth areas should be completed and re-vegetated promptly after earthworks have been completed, or alternately, within 14 days of the cessation of earthworks.</p> <p>h) Earthworks final surfaces should be well compacted and subsequent permanent work or surface protection should be carried out immediately after final surfaces are formed in order to prevent rainstorm erosion;</p> <p>i) The overall slope of the site should be kept to a minimum to reduce the erosive potential of surface water flows and all trafficked areas and access roads protected by coarse stone ballast. An additional advantage accruing from the use of crushed stone is the positive traction gained during prolonged periods of inclement weather and the reduction of surface sheet flows;</p> <p>j) Silt contained in ground water and drilling water collected from any boring operations, dewatering etc. should be removed with properly designed silt removal facilities, such as the specified portable sedimentation tanks referred to above, such that Technical Memorandum on Effluent Standards are achieved prior to the discharge of waters;</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00 – 19:00 form Monday to Saturday except public holiday)</p>	Contractor	<p>✓</p>	<p>✓</p>	<p>✓</p>	<p>TM on EIA process, WPCO, ProPECC PN 1/94</p>

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
5.7.1	<p>k) All drainage facilities and erosion and sediment control structures should be inspected monthly and maintained to ensure proper and efficient operation at all times and particularly following rainstorms. Deposited silt and grit should be removed monthly and disposed of by spreading evenly over stable, non-sensitive vegetated areas;</p> <p>l) Measures should be taken to minimise the ingress of site drainage into excavations. If the excavation of trenches in wet periods (June – October) is necessary, they should be dug and backfilled in short sections. Water pumped out from trenches or foundation excavations should be discharged into the silt removal facilities;</p> <p>m) All open stockpiles of construction materials (e.g. aggregates, sand and fill material) should be covered with a tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system;</p> <p>n) Manholes (including newly constructed ones) should always be covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the drainage system;</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00 – 19:00 form Monday to Saturday except public holiday)</p>	Contractor		<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>		<p>TM on EIA process, WPCO, ProPECC PN 1/94</p>

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
5.7.1	<p>o) All vehicles and plant should be cleaned before leaving the construction site to ensure no earth, mud and debris is deposited on roads. An adequately designed and sited wheel washing bay should be provided at every site exit and wash-water should have sand and silt settled out and removed at least on a weekly basis to ensure the continued efficiency of the process.</p> <p>p) The section of access road leading to, and exiting from the wheel-wash bay to the public road should be paved with sufficient backfill toward the wheel-wash bay to prevent vehicle tracking of soil and silty water to public roads and drains;</p> <p>q) Water used for construction purposes on site should, as far as practical, be recycled for use;</p> <p>r) Information detailing storm run-off and wastewater discharge points, and the corresponding maximum (or range of) volumes of discharges expected from the construction sites on a dry day should be provided in the WPCO license application. In general, assuming adequate information has been provided together with the license application, EPD would need at least 20 days for the processing of a license for a discharge. It is therefore recommended that the Contractor submit the licence application to EPD as early as possible before the commencement of any discharge.</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00 – 19:00 form Monday to Saturday except public holiday)</p>	Contractor	✓	✓		<p>TM on EIA process, WPCO, ProPECC PN 1/94</p>

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
5.7.3	<p><b>Construction Material</b></p> <p>In order to prevent water quality impact associated with construction material, the following mitigation techniques are recommended:</p> <ul style="list-style-type: none"> <li>a) Stockpiles of cement and other construction material should be kept covered when not being used;</li> <li>b) Stockpiles of cement and other construction material should not be located adjacent to nullahs and streams;</li> <li>c) Entry points into the surface drainage system should be fitted with oil interceptors;</li> <li>d) Waste oils and other chemical wastes as defined in the Waste Disposal (Chemical Waste) (General) Regulation will require disposal by an appropriate means and could require pre-notification to EPD prior to disposal. An appropriate disposal facility could be the Chemical Waste Treatment Centre (CWTC) at Tsing Yi. If chemical wastes are to be generated, the contractor will need to register with EPD as a chemical waste producer and observe the requirements for chemical waste storage, labelling, transportation and disposal.</li> <li>e) Impacts associated with spillages should be managed through careful handling procedures. Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities. Fuel tanks and drums of fuel oils and other polluting fluids/chemicals should be provided with locks and banded to a capacity of 110% of the storage capacity of the largest tank. The bund should be drained of rain water after raining event.</li> </ul>	<p>Within the boundaries of all construction sites / Operation Time (07:00 – 19:00 form Monday to Saturday except public holiday)</p>	<p>Contractor</p>	<p>✓</p>	<p>✓</p>	<p></p>	<p>TM on EIA process, WPCO, ProPECC PN 1/94</p>

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
5.7.4	<p><u>Sewage from Construction Workers</u></p> <p>Sewage effluent arising from the on-site construction workforce has the potential to cause water pollution. Therefore, plans for the collection, treatment and disposal of sewage wastewater during the construction phase must be specified. Sewage generated on site should be disposed of through connection of the sanitation facilities with the existing foul sewerage system. Where this is not possible, temporary portable chemical toilets, septic tanks or package sewage treatment plants may need to be used.</p>	<p>Within the boundaries of all construction sites / Operation Time (07:00 – 19:00 form Monday to Saturday except public holiday)</p>	Contractor	✓	✓		<p>TM on EIA process, WPCO, ProPECC PN 1/94</p>
Section 6  6.6.3	<p style="text-align: center;"><b><u>Waste Management</u></b></p> <p><u>Waste Management Plan</u></p> <p>In accordance with ETWBTC(W) No 15/2003 – Waste Management on Construction Site, the WMP should be prepared and submitted for approval by the Architect/ Engineer/ Supervising Officer prior to any construction activities. During the construction period the WMP should be used as a working document to detail the on-going management procedures and to record waste arising from construction works and import of fill throughout the Contract. The WMP shall be subject to audit under the requirements of the Environmental Monitoring and Audit (EM&amp;A) Procedures set out in the EM&amp;A Manual accompanying this EIA Report.</p>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor	✓	✓		<p>Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws ETWBTC(W) No 15/2003 – Waste Management on Construction Site</p>

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.4	<p>The WMP shall be developed and implemented according to a best-practice philosophy of waste management. There are various waste management options, which can be categorized in terms of preference from an environmental viewpoint. The options considered to be more preferable have the least impacts and are more sustainable in a long-term context. The hierarchy is as follows:</p> <ul style="list-style-type: none"> <li>• avoidance and minimisation, i.e. avoiding or not generating waste through changing or improving practices and design;</li> <li>• reuse of materials, thus avoiding disposal (generally with only limited reprocessing);</li> <li>• recovery and recycling, thus avoiding disposal (although reprocessing may be required); and</li> <li>• treatment and disposal, according to relevant laws, guidelines and good practice.</li> </ul>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor		✓		<p>Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws</p>

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.5	The Waste Disposal Authority should be consulted by the Contractor on the final disposal of wastes.	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor		✓		Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road



EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.6	The suitability (or otherwise) of material for reuse on site shall be detailed in the WMP. If, for any reason, the recommendations cannot be implemented, full justification should be given in the WMP for approval by Architect/Engineer/Supervising Officer according to ETWBTC(W) No. 15/2003.	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor	✓	✓		Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws ETWBTC(W) No 15/2003 – Waste Management on Construction Site

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.7	To facilitate adoption of the best-practice philosophy, training shall be provided to all personnel working on site. The training shall promote the concept of general site cleanliness and clearly explain the appropriate waste management procedures defined in the WMP. Overall, the training should encourage all workers to reduce, reuse and recycle wastes.	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor		✓		Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws

\*D = design, C = construction, O = operation  
 TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.8	During construction, the WMP should be kept up-to-date on a monthly basis with records of the actual quantities of wastes generated, recycled and disposed of off-site. Quantities shall be determined by weighing each load or other methods agreed to by the Engineer's Representative. Waste shall only be disposed of at licensed sites and the WMP should include procedures to ensure that illegal disposal of wastes does not occur. Only waste haulers authorized to collect the specific category of waste concerned should be employed and a trip ticket system shall be implemented for offsite disposal of C&D and solid waste at public filling facilities and landfills. Appropriate measures should be employed to minimize windblown litter and dust during transportation by either covering trucks or transporting wastes in enclosed containers.	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor		✓		Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws

\*D = design, C = construction, O = operation  
 TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.9	Work site(s) shall be arranged and managed to facilitate the proper management of wastes and materials. The WMP shall include plans indicating specific areas designated for the storage of particular types of waste, reusable and recyclable materials as well as areas and management proposals for any stockpiling areas. Waste storage areas should be well maintained and cleaned regularly. Specific provisions for different types of material are outlined below. In general, these areas should be designed to avoid cross contamination of materials as well as pollution of the surrounding environment.	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor	✓	✓		Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws

\*D = design, C = construction, O = operation  
 TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.10	<p><u>Construction and Demolition Materials</u></p> <p>The design of formwork should maximise the use of standard wooden panels so that high reuse levels can be achieved.</p> <p>Alternatives such as steel formwork or plastic facing should be considered to increase the potential for reuse.</p>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor	✓	✓		<p>Waste Disposal Ordinance (Cap 354)</p> <p>Waste Disposal (Chemical Waste)(General) Regulation (Cap 354)</p> <p>Land (Miscellaneous Provisions) Ordinance (Cap 28)</p> <p>Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws</p>

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.11	<p>C&amp;D materials should be segregated on site into different waste and material types to increase the feasibility of certain components of the waste stream being recycled by specialised contractors.</p> <p>Where materials cannot be reused on site, opportunities for recycling materials off-site shall be explored.</p>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor	✓	✓		<p>Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws</p>

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.12	<p>Potential opportunities for recycling and reuse of C&amp;D materials from the Project include:</p> <ul style="list-style-type: none"> <li>• Milling wastes arising from regrading of the existing pavement could be recycled on site and reused as either road-base in the new carriageways or fill for new embankments;</li> <li>• Existing marginal roadside barriers comprise pre-cast units, it may be possible to re-use these following widening works; and</li> <li>• Existing bridge parapets comprise aluminium post and railings, these have a recyclable value and could be sold on for reconditioning or reused for scrap metal.</li> </ul>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor	✓	✓		<p>Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws</p>

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.13	Any stockpile should be sited away from existing watercourses and suitably covered to prevent wind erosion and impacts on air and water quality.	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor	✓	✓		Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws

\*D = design, C = construction, O = operation  
 TWR – Tsuen Wan Road



EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.14	<p><u>Chemical Waste</u></p> <p>Chemical waste should be handled in accordance with the <i>Code of Practice on the Packaging, Handling and Storage of Chemical Wastes</i> as follows. Containers used for the storage of chemical wastes should:</p> <ul style="list-style-type: none"> <li>• be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed;</li> <li>• have a capacity of less than 450L unless the specifications have been approved by the EPD; and</li> <li>• display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations.</li> </ul>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	<p>Contractor</p>		<p>✓</p>		<p>Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws</p>

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.15	<p>The storage area for chemical wastes should:</p> <ul style="list-style-type: none"> <li>• be clearly labelled and used solely for the storage of chemical waste;</li> <li>• be enclosed on at least 3 sides;</li> <li>• have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest;</li> <li>• have adequate ventilation</li> <li>• be covered to prevent rainfall entering (water collected within the bund must be tested and disposed as chemical waste if necessary); and</li> <li>• be arranged so that incompatible materials are adequately separated.</li> </ul>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor		✓		<p>Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws</p>

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.16	<p>The Contractor shall register with EPD as a Chemical Waste Producer. Waste oils and other chemical wastes as defined in the Waste Disposal (Chemical Waste) (General) Regulation will require disposal by appropriate means and could require pre-notification to EPD prior to disposal. Appropriate means include disposal:</p> <ul style="list-style-type: none"> <li>• be via a licensed waste collector; and</li> <li>• be to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Facility which also offers a chemical waste collection service and can supply the necessary storage containers; or</li> <li>• to a reuser of the waste, under approval from EPD. The Centre for Environmental Technology operates a Waste Exchange Scheme, which can assist in finding receivers or buyers.</li> </ul>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor	✓	✓		<p>Waste Disposal Ordinance (Cap 354)                      Waste Disposal (Chemical Waste)(General) Regulation (Cap 354)                      Land (Miscellaneous Provisions) Ordinance (Cap 28)                      Public Health and Municipal Services Ordinance (Cap 132) –                      Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws</p>

\*D = design, C = construction, O = operation  
 TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.17	General refuse generated on-site should be stored in enclosed bins or compaction units separate from construction and chemical wastes. A reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily or every second day basis to minimize odour, pest and litter impacts. The burning of refuse on construction sites is prohibited by law.	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor		✓		Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.18	General refuse is generated largely by food service activities on site, so reusable rather than disposable dishware should be used if feasible. Aluminum cans are often recovered from the waste stream by individual collectors if they are segregated or easily accessible. Therefore separate, labelled bins for their deposit should be provided if feasible.	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor		✓		Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws

\*D = design, C = construction, O = operation  
 TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
6.6.19	Office waste can be reduced through recycling of paper if volumes are large enough to warrant collection. Opportunities for participation in a local collection scheme should be investigated.	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor		✓		Waste Disposal Ordinance (Cap 354) Waste Disposal (Chemical Waste)(General) Regulation (Cap 354) Land (Miscellaneous Provisions) Ordinance (Cap 28) Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws
Section 7	<b><u>Landfill Gas Hazard Mitigation Measures</u></b>						
7.7.1	Particular precautions will be required with respect to any trenching or excavation, and any creation of confined spaces at, near to or below ground level.	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor	✓	✓		Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
7.7.2	<p>Construction contractors should be made aware that methane and carbon dioxide are always likely to be present in the soil voids.</p> <p>There exists outside the boundary of GDBL localized pocketed of waste which were deposited during the operation of the landfill. Therefore it is necessary to state in the roadwork contract that waste materials may be encountered during the excavation work, and proper handling as well as disposal of the waste may be needed.</p>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor		✓		Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)
7.7.3	<p>In all construction work adjacent to GDBL, safety precautions should be implemented to minimize the risks of:</p> <ul style="list-style-type: none"> <li>• Fires and explosions;</li> <li>• Asphyxiation of workers; and</li> <li>• Toxicity effects.</li> </ul>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor		✓		Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)
7.7.4	<p>Precautions should be clearly laid down and rigidly adhered to with respect to:</p> <ul style="list-style-type: none"> <li>• Trenching and excavation; and</li> <li>• Creation of confined spaces at, near to or below ground level.</li> </ul>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor	✓	✓		Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
7.7.5	In addition to normal site safety procedures, gas detection equipment and appropriate breathing apparatus should be available and used when entering confined spaces or trenches deeper than 1m.	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor		✓		Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)
7.7.6	A Safety Officer, trained in the use of gas detection equipment and LFG related hazards should be present on site throughout the groundwork phase. The Safety Officer should be provided with an intrinsically safe portable instrument (or instruments)	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor		✓		Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road



EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
7.7.7	<p>The following safety measures should be implemented during the construction phase of the Project:</p> <ul style="list-style-type: none"> <li>a) All personnel who work on site and all visitors to the site should be made aware of the possibility of ignition of gas in the vicinity of the excavations. Safety notices should be posted warning of the potential hazards.</li> <li>b) Those staff who work in, or have responsibility for “at risk” areas, including all excavation workers, supervisors and engineers working within the CZ, should receive appropriate training on working in areas susceptible to LFG, fire and explosion hazards.</li> <li>c) An excavation procedure or code of practice to minimize LFG related risk should be devised and carried out by the contractor.</li> <li>d) No worker should be allowed to work alone at any time in or near to any excavation. At least one other worker should be available to assist with a rescue if needed.</li> <li>e) Smoking, naked flames and all other sources of ignition should be prohibited within 15m of any excavation or ground-level confined space. “No Smoking” and No Naked Flame” notices should be posted prominently on the construction site and, if necessary, special areas designated for smoking.</li> <li>f) Welding, flame-cutting or other hot works should be confined to open areas at least 15m from any trench or excavation. Welding, flame cutting or other hot works may only be carried out in trenches or confined spaces when controlled by a “permit to work” procedure, properly authorised by the Safety Officer or other appropriately qualified person</li> </ul>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor		✓		<p>Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)</p>

\*D = design, C = construction, O = operation  
 TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
7.7.7	<p>g) The permit to work procedure should set down clearly the requirements for continuous monitoring for methane, carbon dioxide and oxygen throughout the period for which the hot works are in progress. The procedure should also require the presence of an appropriately qualified person in attendance outside the “confined area” who shall be responsible for reviewing the gas measurements as they are made, and who shall have executive responsibility for suspending the work in the event of unacceptable or hazardous conditions. Only those workers who are appropriately trained and fully aware of the potentially hazardous conditions which may arise should be permitted to carry out hot works in confined areas.</p> <p>h) Ground level construction plant should be fitted with vertical exhausts at least 0.6m above ground level and with spark arrestors.</p> <p>i) Any electrical equipment, such as motors and extension cords, should be intrinsically safe.</p> <p>j) During piping assembly or construction, all valves/seals should be closed immediately after installation. As construction progresses, all valves/seals should be closed as installed to prevent the migration of gases through the pipeline/conduit. All piping/conducting should be capped at the end of each working day.</p> <p>k) Mobile offices, equipment stores, mess rooms etc should be located on an areas which has been proven to be gas free (by survey with portable gas detectors) and ongoing monitoring should be carried out to ensure that these areas remain gas free. The use of permanent gas detectors may be appropriate in some circumstances where there is a relatively high risk but for many developments it will be sufficient to have regular monitoring undertaken manually by the safety officer. The particular arrangements to be adopted at a specific site will need to be determined during the risk assessment/design of protection measures.</p>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor		✓		Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
7.7.7	l) Alternatively, such buildings should be raised clear of the ground. If buildings are raised clear of the ground, a minimum clear separation distance (as measured from the highest point on the ground surface to the underside of the lowest floor joist) should be 500mm. m) During construction, adequate fire extinguishing equipment, fire-resistant clothing and breathing apparatus (BA) sets should be made available on site. n) The Contractor should formulate a health and safety policy, standards and instructions for site personnel to follow.	Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities	Contractor		✓		Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
7.7.8	<p>The following should be noted for LFG monitoring:</p> <p>a) Periodically during groundwork construction, the works area should be monitored for methane, carbon dioxide and oxygen using appropriately calibrated portable gas detection equipment.</p> <p>b) The monitoring frequency and areas to be monitored should be set down prior to commencement of groundworks by either the Safety Officer or by an appropriately qualified person.</p> <p>c) Routine monitoring should be carried out in all excavations, manholes and chambers and any other confined spaces that may have been created by, for example, the temporary storage of building materials on the site surface.</p> <p>d) All measurements in excavations should be made with the monitoring tube located not more than 10mm from the exposed ground surface,</p>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor		✓		Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
7.7.8	<p>e) Monitoring of excavations should be undertaken as follows:</p> <p>i.) For excavations deeper than 1m, measurements should be made:</p> <ul style="list-style-type: none"> <li>• At the ground surface before excavation commences;</li> <li>• Immediately before any workers enter the excavation;</li> <li>• At the beginning of each working day for the entire period the excavation remains open; and</li> <li>• Periodically through the working day whilst workers are in the excavation.</li> </ul> <p>ii.) For excavations between 300mm and 1m deep, measurements should be made:</p> <ul style="list-style-type: none"> <li>• Directly after the excavation has been completed; and</li> <li>• Periodically whilst the excavations remains open.</li> </ul> <p>iii.) For excavations less than 300mm deep, monitoring may be omitted, at the discretion of the Safety Officer or other appropriately qualified person.</p>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor		✓		Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)
7.7.10	<p>Drilling contractor should provide a Method Statement detailing the procedures to be followed, which should include:</p> <p>a) Provision of an intrinsically safe portable methane gas detector;</p> <p>b) no smoking to be allowed within 15m of a borehole;</p> <p>c) capping of casing at the end of each working day; and</p> <p>d) exhaust and air-intake stacks to be at least 1.5m above ground level.</p>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor		✓		Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
7.7.12	<p>Realignment of or new utilities routes that are formed as part of the road-widening works are identified within the CZ. They should be designated as “special routes” and the utility companies notified accordingly, such that the necessary precautions can be implemented during maintenance or extension</p> <p>Any new utility routes passing through the boundary of the CZ should have a protective impermeable barrier installed at the boundary of the CZ</p>	<p>Within the boundaries of all construction sites as well as transportation routes to designated areas for off-site disposal of materials / Prior to and during construction activities</p>	Contractor		✓	✓	Landfill Gas Hazard Assessment Guidance Note
Section 8	<b><u>Landscape and Visual Impacts</u></b>						
8.11.4	<p>A total of 375, 243 and 589 trees were scheduled for felling, transplanting and retaining respectively (refer to <b>Appendix 8-A</b>). The locations of affected trees/palms are shown in <b>Figure 8-19</b>.</p>	<p>Within the Project Site / Design prior to commencement of site clearance works , during the construction period following the phased completion of the engineering works.</p>	<p>Funding and implementation by CEDD</p> <p>Management and maintenance by HyD, LCSD since day 1 of operation</p>	✓		✓	<p>Allocation of Space for Urban Street Trees (Works Branch), WBTC No. 25/92;</p> <p>Tree Preservation, ETWBTC 3/2006.</p>

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
8.11.6	<p>The mitigation measures include:</p> <ul style="list-style-type: none"> <li>retention of 589 trees,</li> <li>transplantation of a total number of 243 trees</li> <li>landscape works including 375 compensatory trees following completion of the Project. Compensatory planting is provided in the Tree Survey – “<b>CONCEPTUAL PLANTING PLAN</b>” (refer to <b>Appendix 8-B</b>): All transplanting trees and compensatory trees (i.e. 618 trees) shall be planted within the Project site and properly maintained during operation of the Project. Any of these trees damaged during operation of the Project shall be replaced. Details of compensatory planting such as detailed location and compensatory plant species will be decided at the design stage. It is recommended, as stipulated in <i>ETWB TC(W) No.3/2006 Tree Preservation</i>, that the implementation of compensatory plant should not be less than 1:1 (i.e. not less than 375 nos. of trees in this project) and the compensatory planting trees should be at least of “heavy standard” type.</li> </ul>	<p>Within the Project Site / Design prior to commencement of site clearance works , during the construction period following the phased completion of the engineering works.</p>	<p>Funding and implementation by CEDD</p> <p>Management and maintenance by HyD, LCSD since day 1 of operation</p>	✓		✓	<p>Maintenance of Vegetation and Hard Landscape Features, ETWB TCW No. 2/2004;</p> <p>Allocation of Space for Urban Street Trees (Works Branch), WBTC No. 25/92;</p> <p>Tree Preservation, ETWBTC 3/2006.</p>

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
8.13.1	<p>The Conceptual Landscape Proposals (figures 8-5 to 8-9) indicate, inter alia, those landscape measures, which are proposed to mitigate significant visual and landscape effects identified through the assessment process. These measures include:</p> <ul style="list-style-type: none"> <li>• Regarding of cut slopes</li> </ul>	Whole alignment / Prior to commencement of site clearance works and construction works	CEDD	✓	✓		<p>Control of Visual Impact of Slopes (Works Branch), WBTC No. 25/93;</p> <p>Improvement to the Appearance of Slopes (Works Branch), WBTC No. 17/2000;</p> <p>Technical Guidelines on Landscape Treatment and Bio-engineering for Manmade Slopes and Retaining Walls (GEO Publication No. 1/2000);</p> <p>Tree Preservation, ETWBTC 3/2006.</p>

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road



EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
8.13.1	<ul style="list-style-type: none"> <li>Revegetation of chunam slopes</li> <li>Tree planting</li> </ul>	<p>Whole alignment / During the construction period following the phased completion of the engineering works.</p> <p>Whole alignment / During the construction period following the phased completion of the engineering works.</p>	<p>Funding and implementation by CEDD</p> <p>Management and maintenance by HyD, LCSD since day 1 of operation</p> <p>Funding and implementation by CEDD</p> <p>Management and maintenance by HyD, LCSD since day 1 of operation</p>	<p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p>	<p>Control of Visual Impact of Slopes (Works Branch), WBTC No. 25/93;</p> <p>Improvement to the Appearance of Slopes (Works Branch), WBTC No. 17/2000;</p> <p>Technical Guidelines on Landscape Treatment and Bio-engineering for Manmade Slopes and Retaining Walls (GEO Publication No. 1/2000);</p> <p>Tree Preservation, ETWBTC 3/2006.</p> <p>Maintenance of Vegetation and Hard Landscape Features, ETWB TCW No. 2/2004;</p> <p>Allocation of Space for Urban Street Trees (Works Branch), WBTC No. 25/92;</p> <p>Tree Preservation, ETWBTC 3/2006.</p>	

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
8.13.1	• Screen walls	Whole alignment / Prior to commencement of site clearance works	CEDD	✓	✓		The Advisory Committee on the Appearance of Bridges and Associated Structures (ACABAS), ETWBTC 36/2004. The Advisory Committee on the Appearance of Bridges and Associated Structures (ACABAS), ETWBTC 36/2004. Maintenance of Vegetation and Hard Landscape Features, ETWB TCW No. 2/2004 Maintenance of Vegetation and Hard Landscape Features, ETWB TCW No. 2/2004;  Allocation of Space for Urban Street Trees (Works Branch), WBTC No. 25/92.
	• Feature finishes to structures and floorscape	Whole alignment / Prior to commencement of site clearance works	CEDD	✓	✓		
	• Provision of new recreational/amenity facilities	Whole alignment / operation phase	HyD & LCSD			✓	
	• Amenity shrub, ground cover and climber planting	Whole alignment / Prior to commencement of site clearance works	CEDD	✓	✓		

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
8.24.1	<p>The assessment process has generated a range of practical landscape proposals, which will effectively mitigate those significant landscape and visual effects identified. These mitigation proposals include:</p> <ul style="list-style-type: none"> <li>• MM1 - The replacement of amenity planting lost as a consequence of road widening and the remodelling of junctions;</li> <li>• MM2 - The re-use of areas beneath the elevated road deck as 3 public car parks, screened by feature granite block walls and amenity planting;</li> <li>• MM3 - The provision of feature granite block screen walls and raised planters around car parks and on traffic islands and meridians;</li> <li>• MM4 - Reinstatement of Tsuen Wan Park.</li> </ul>	Whole alignment / Design prior to commencement of site clearance works , during the construction period following the phased completion of the engineering works.	<p>Funding and implementation by CEDD</p> <p>Management and maintenance by HyD, LCSD since day 1 of operation</p>	✓	✓	✓	<p>Maintenance of Vegetation and Hard Landscape Features, ETWB TCW No. 2/2004;</p> <p>Allocation of Space for Urban Street Trees (Works Branch), WBTC No. 25/92.</p> <p>Tree Preservation, ETWBTC 3/2006.</p>

\*D = design, C = construction, O = operation  
 TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
8.24.1	<ul style="list-style-type: none"> <li>MM5 - The provision of a visual/acoustic screen partially the noise barriers adjacent to the Clague Gardens Estate.</li> </ul> <p>This should be achieved through the use of innovative form, recessive and muted colours and tones, and through use of materials. And green plant such as colorful shrubs and climbers is proposed to plant along part of the overall noise enclosure structure. The design of the engineering structure thus aims to minimize visual impact as far as possible and visually integrate as far as possible into the landscape context.</p>	Whole alignment / During construction phase and operation phase	Funding and implementation by CEDD  Management and maintenance by HyD, LCSD since day 1 of operation	✓	✓	✓	The Advisory Committee on the Appearance of Bridges and Associated Structures (ACABAS), ETWBTC 36/2004;  Allocation of Space for Urban Street Trees (Works Branch), WBTC No. 25/92;  Visibility of Directional Signs, HyDTC 10/2001;  ETWBTC 10/2005 Planting on Footbridges and Flyovers;  Maintenance of Vegetation and Hard Landscape Features, ETWB TCW No. 2/2004.

\*D = design, C = construction, O = operation  
 TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
8.24.1	i.) Design and Construction of the soft works recommended at MM 1 - 5  During the construction stages, soft landscape measures should be used where appropriate, employing native plant species as fast as practicable, to restore the green land cover and enhance the vegetated, urban environment. This includes tree/ shrub planting and HyDro-seeding in the peripheral site area, footpath side, access road, park and open spaces.	Whole alignment / During the construction period	CEDD	✓	✓		EIAO TM  Allocation of Space for Urban Street Trees (Works Branch), WBTC No. 25/92.  Tree Preservation, ETWBTC 3/2006.

\*D = design, C = construction, O = operation  
 TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
8.24.1	<p>ii.) During the operation stages, the newly planted trees, shrubs and grassed areas are maintained throughout the establishment period at the intervals established in the soft works specification, particularly in respect of the following:</p> <ul style="list-style-type: none"> <li>- Regular grass cutting for reinstated areas frequently to be established in the soft works specification;</li> <li>- Firming up of trees after periods of strong winds periods to be established in the soft works specification;</li> <li>- Regular checks for and eradication of pests, fungal infections etc. frequently to be established in the soft works specification;</li> <li>- Pruning of dead or broken branches frequently to be established in the soft work specification;</li> <li>- Replacement of dead plants and resending of failed areas of grass as early as possible during the planting seasons, i.e. between March and September, although the optimum period is between April and July, to ensure the landscape mitigation measures fulfil their design intention</li> <li>- The management and maintenance authority will make regular bimonthly inspections of the planted areas during the establishment period to ensure the intended objectives of the landscape and visual mitigation measures are achieved.</li> </ul>	Whole alignment / operational phases	HyD & LCS D			✓	<p>Tree Preservation, ETWBTC 3/2006;</p> <p>Maintenance of Vegetation and Hard Landscape Features, ETWB TCW No. 2/2004.</p>
8.24.4	All barriers, including cantilever types, will be based on a single design theme to create a single family of structures, which will also be integrated with the engineering structures, avoiding excessive visual clutter along the road. All barriers are noise reflective type and can, therefore, be clear. The barriers will comprise semi-transparent panels with a colour tint supported by posts coloured in muted tones reflecting the local visual environment.	Whole alignment / Design phase prior to the finalization of engineering proposals.	CEDD	✓	✓		The Advisory Committee on the Appearance of Bridges and Associated Structures (ACABAS), ETWBTC 36/2004.

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
8.24.5	In a majority of locations the barriers will be required along the elevated bridge structure. At these locations, planting along the bridge structure will be used to screen the barriers. Moreover, greening panel has been taken into design consideration for mitigate the visual impact of noise barriers. All barriers required will be submitted to ACABAS for comment during the detail design stages	Whole alignment / Design phase prior to the finalization of engineering proposals.	CEDD	✓	✓		The Advisory Committee on the Appearance of Bridges and Associated Structures (ACABAS), ETWBTC 36/2004;  Allocation of Space for Urban Street Trees (Works Branch), WBTC No. 25/92.
8.24.7	The funding and implementation of the proposed mitigation measures will be the responsibility of the Civil Engineering and Development Department. Once the day 1 operation started, the relevant departments, such as HyD, LCSD etc. will be the responsible for the management and maintenance of the proposed mitigation measures.	--	--			✓	--
Section 9 9.8.29	<p style="text-align: center;"><b><u>Hazard to Life</u></b></p> <p>Nevertheless two measures previously recommended in the EIA for Route 8 (formerly Route 16) warrant consideration:</p> <ul style="list-style-type: none"> <li>Introduce the 'no stopping zones' on the western part of Tsuen Wan Rd and on all major roads within the area where the individual risk levels exceed <math>1 \times 10^{-9}</math> (see <b>Figure 8.3</b> in EIA Report). This measure (if not already implemented) would be particularly effective on Tuen Mun Rd.</li> <li>Provide traffic signals to stop in case of emergency the traffic on western part of Tsuen Wan Rd and other major roads within the area that could be affected by a chlorine spill at YKT WTW</li> </ul>	Within Site Boundary/During construction and operation phases	Contractor & HyD	✓	✓	✓	

\*D = design, C = construction, O = operation

TWR – Tsuen Wan Road

EIA Ref	Environment Protection Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				D	C	O	
9.8.30	<p>Similarly, implementation of the following measures for protection of the Project construction workers should be considered:</p> <ul style="list-style-type: none"> <li>The number of workers on site during construction stage should not exceed the levels assessed in this report.</li> <li>Emergency evacuation procedures should be formulated and all workers on site should be familiar with these procedures as well as the route to escape in case of gas release incident. Relevant Departments, such as WSD and FSD, should be consulted during the development of Emergency procedures. Diagram showing the escape routes to a safe place should be posted in the site notice boards and at the entrance/exit of site.</li> <li>The emergency procedures should specify means of providing a rapid and direct warning (e.g. Siren and Flashing Light) to construction workers in the event of chlorine gas release in the YKTWTW.</li> <li>The construction site officer should establish a communication channel with the YKTWTW operation personnel during construction stage. In case of any hazardous incidents in the treatment works, operation personnel of YKTWTW should advise the site officer to evacuate the construction workers.</li> </ul>	Within Site Boundary/During construction	Contractor		✓		

\*D = design, C = construction, O = operation  
TWR – Tsuen Wan Road





**Appendix C**  
**Environmental Monitoring Data Recording Sheets**

**Appendix C1**

**Noise Monitoring Field Record Sheet**

Monitoring Location		
Description of Location		
Date of Monitoring		
Measurement Start Time (hh:mm)		
Measurement Time Length (min.)		
Noise Meter Model/Identification		
Calibrator Model/Identification		
Calibration Levels at 1,000 Hz	Before	
	After	
Measurement Results	L <sub>90</sub> (dB(A))	
	L <sub>10</sub> (dB(A))	
	L <sub>eq</sub> (dB(A))	
Major Construction Noise Source(s) During Monitoring		
Other Noise Source(s) During Monitoring		
Remarks		

Name & Designation

Signature

Date

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

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

**Appendix C2**

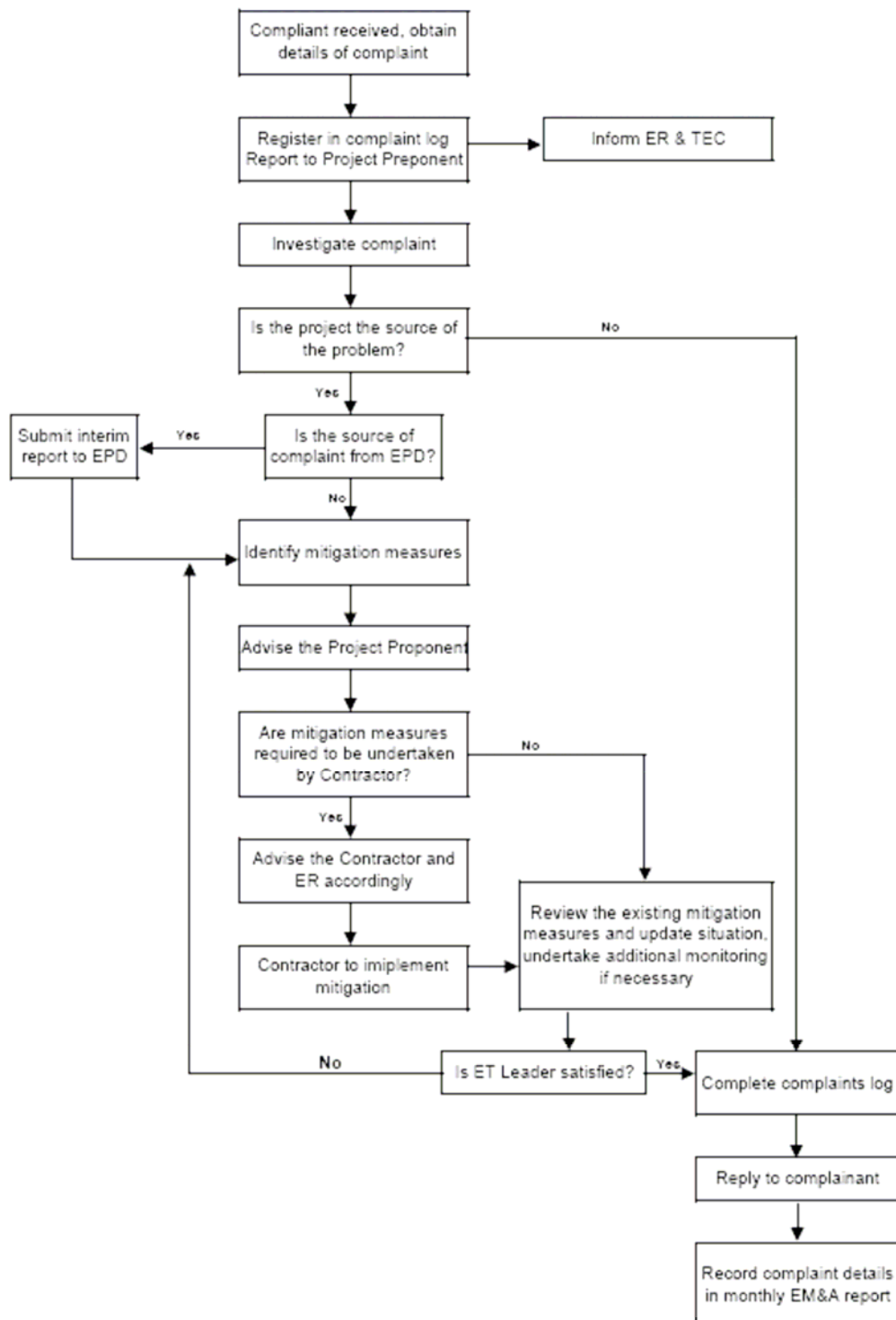
**Data Sheet for TSP Monitoring**

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

	<u>Name &amp; Designation</u>	<u>Signature</u>	<u>Date</u>
Field Operator :	_____	_____	_____
Laboratory Staff :	_____	_____	_____
Checked by :	_____	_____	_____



**Appendix D**  
**Complaint Handling Procedures**



**Appendix E**  
**Complaint Log**



## Complaint Log

Project Name	
Date of Receipt	
Name of Complainant	
Contact of Complainant	
The project is source of the problem (Yes / No)	
Details of the complaint	
Validity of the complaint (Yes / No)	
Remarks	
Attachment	

Prepared by: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**Appendix F**  
**Interim Notifications of Environmental Quality Limits Exceedances**

**Appendix F    Interim Notifications of Environmental Quality Limits  
Exceedances**

Incident Report on Action Level or Limit Level Non-compliance

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

**Location Plan**

Prepared by : \_\_\_\_\_

Designation : \_\_\_\_\_

Signature : \_\_\_\_\_

Date : \_\_\_\_\_