



THE GOVERNMENT OF THE HONG KONG
SPECIAL ADMINISTRATIVE REGION



HIGHWAYS DEPARTMENT

Agreement No. CE 4/99

Lei Yue Mun Road Underpass, Modification at
Junction with Yau Tong Road and Associated
Improvement Works – Feasibility Study

ENVIRONMENTAL MONITORING AND AUDIT MANUAL

Report No. R/2134/021 Issue 2

June 2001

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LEI YUE MUN ROAD UNDERPASS, MODIFICATION AT JUNCTION
WITH YAU TONG ROAD AND ASSOCIATED IMPROVEMENT WORKS
FEASIBILITY STUDY**

ENVIRONMENTAL MONITORING AND AUDIT MANUAL

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1.0 INTRODUCTION

1.1 Purpose of the Manual

The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the set up 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. This Manual outlines the monitoring and audit programme to be undertaken for the construction of the Lei Yue Mun Road Underpass, junction modifications and associated improvement works. It aims to provide systematic procedures for monitoring, auditing and minimising the environmental impacts associated with the construction works.

Hong Kong SAR's environmental regulations for air, noise, and landfill gas, the *Technical Memorandum on Environmental Impact Assessment Process*, and recommendations in the EIA study final report on Lei Yue Mun Road Underpass, Modification at Junction with Yau Tong Road and Associated Improvement Works have served as environmental standards and guidelines in the preparation of this Manual.

The Manual contains the followings:-

- a) Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), Environmental Team (ET), and the Independent Environmental Checker (IEC) with respect to the EM&A requirements during the course of the project.
- b) Information on project organisation and programming of construction activities for the project.
- c) The hypotheses of potential impacts, the basis for, and description of the broad approach underlying the EM&A programme.
- d) Requirements with respect to the construction schedule and the necessary EM&A programme to track the varying environmental impact.
- e) The specific questions and testable hypotheses that the monitoring programme is designed to answer.
- f) Full details of the methodologies to be adopted, including all field, laboratory and analytical procedures, and details on quality assurance and quality control programme.
- g) The rationale on which the environmental monitoring data will be evaluated and interpreted and the details of the statistical procedures that will be used to interpret the data.
- h) Definition of action and Limit levels.
- i) Establishment of Event and Action Plans.

- j) Requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria and complaints.
- k) Requirements of presentation of environmental monitoring and appropriate reporting procedures.
- l) Requirements for review of EIA predictions and effectiveness of the EM&A programme.

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 shall refer to the person delegated the role of executing the EM&A requirements.

1.2 Background

This project is one of the improvement schemes recommended under the Comprehensive Traffic Review for East Kowloon (CTREK) in 1996, which concluded that the local network of Lei Yue Mun Road would be saturated beyond the year 2001 and the traffic conditions would further deteriorate due to the intake of population around the development of Ko Chiu Road Estate and Eastern Harbour Crossing (EHC) housing site, and the redevelopment of Yau Tong Estate and Lei Yue Mun Housing site in the area. The proposed project will support the development / redevelopment of the housing sites as well as creating opportunities to enhance the Yau Tong urban restructuring. Figure 1.1 shows the location of the site.

A preliminary project feasibility study (PPFS), completed in December 1997, was conducted to examine the alignment of the vehicular underpass and the layout of the associated road improvement scheme. A Preliminary Environmental Review (PER) was also carried out in conjunction with the PPFS to identify the potential environmental concerns arising from the implementation of the project. The results of the PER indicate that during construction stage, precautionary measures may be required, as the Works limit of the Project is located within the Consultation Zone of Sai Tso Wan Landfill. During operation stage, noise and air pollution impacts from vehicular traffic, and water quality impact such as runoff from the site are expected.

An EIA study has been carried out to provide detailed information on the nature and extent of environmental impacts arising from the construction and operation of the proposed project and all related activities taking place concurrently. As identified in the EIA report, the proposed project may give rise to landfill gas hazard, air quality and noise impacts on the nearby sensitive receivers during construction and operation phases. Therefore an Environmental Monitoring and Audit (EM&A) programme is considered necessary during both the construction and operation period.

1.3 Environmental Monitoring and Audit Requirements

The potential environmental impacts associated with the construction and operation of the proposed road works have been identified and assessed in the EIA Study in accordance with the requirements in the Study Brief and EIA Ordinance. The likely environmental impacts during construction phase and

operation phase, including impacts of air quality, noise, and landfill gas hazard. These impacts can be minimized to acceptable levels with the implementation of environmental mitigation measures. In order to ensure the compliance, baseline and compliance monitoring works have been recommended and are described in details in the subsequent sections.

- Baseline Monitoring refers to the measurement of environmental parameters, such as existing noise and dust levels, to determine the nature and ranges of natural variation and to establish, where appropriate, the nature of change. This information is useful for assessing the short and long term environmental impacts of the Project activities.
- Impact Monitoring involves the measurement of environmental parameters during the Project activities in order to determine the impacts of the activities and the effectiveness of the mitigation measures proposed in the EIA report, and to identify any further remedial measures, if necessary.
- Compliance Monitoring involves periodic sampling and/or continuous measurement of environmental parameters and the determination of their compliance with regulatory requirements and standards.

The environmental monitoring programme should be subject to environmental audit. The aim is to determine whether satisfactory compliance with the legislative requirements has been met, and to ensure that no annoyance is caused to sensitive receivers or else the remedial action plan will be initiated, if required. This will require information on the standards for parameters of concern and monitoring data.

Each audit will consist of a review of the monitoring data and comparison with the relevant legislative requirements and environmental performance standards specified in the Contract Document.

The monitoring and audit requirements for the Project will be as follows:

- Pre-Construction Phase including all baseline monitoring prior to any Project activity occurring on site.
- Construction Phase including impact/compliance monitoring and audit during all construction activities.
- Post-construction phase including road traffic noise impact/compliance monitoring for a 12-month period upon project operation.

1.4 Project Organisation

The project organisation and lines of communication for the EM&A programme is presented in Figure 1.2. Their responsibilities are listed below. In this Manual, the Engineer (E) refers to the Engineer as defined in the Contract and the Engineer's Representative (ER) in cases the Engineer's powers have been delegated to the ER in accordance with the Contract.

Appropriate staff shall be included in the Environmental Team (ET) under the supervision of the ET Leader to fulfill the EM&A duties specified in this manual. Basically, the duties of each role comprise the following:

The **Contractors** shall be responsible for:

- implementing good site practice and recommend mitigation measures;
- working within the scope of the construction contract and other tender conditions;
- following any reasonable directions given by the Engineer or the Engineer Representative ER(s) particularly as the result of the implementation of event/action plan;
- complying with all environmental Ordinances, by-laws, regulations and rules for the time being in force in Hong Kong; and
- adhering to the procedures for carrying out complaint investigation in accordance with Section 6.

The **Engineer (E) / (ER)** shall be responsible for:

- engaging an Environmental Team (ET) and appointing an Environmental Team leader from within the resident site staff;
- reviewing the monitoring and audit reports submitted by the ET and follow up the recommendations;
- ensuring that the EM&A programme is fully implemented in accordance with the requirements set out in this Manual;
- ensuring that the Contractor is implementing environmental controls and mitigation as set out in this Manual as well as any additional measures necessary for compliance with the environmental standards;
- ensuring that the Contractor is implementing in accordance with the event/action plans when exceedances of Action and Limit levels occur; and
- implementing a "stop work" action if repeated exceedance of limit levels justifies this action.
- undertaking an engineering audit of environmental reports; and
- conducting site liaison.

The Environmental Team (ET) shall not be in any way an associated body of the Contractor. The ET leader shall have relevant professional qualifications and have at least 7 years of EM&A experience subject to approval of the ER. Environmental Team Leader is responsible for and in charge of the Environmental Team (ET) refers to the person delegated the role of executing the EM&A. Appropriate staff shall be included in the ET, under the supervision of the ET leader to fulfil the EM&A duties specified in this manual. In general, ET is comprised of an ET leader, an Environmental Scientist and technicians. Number of staff employed is discretionary and depends on cost and the workload.

The **Environmental Team (ET)** shall be responsible for:

- monitoring the various environmental parameters as required in the EIA Report and collecting/ monitoring all necessary data by following the procedures outlined in this Manual;
- investigating and auditing the Contractors' equipment and work methodologies with respect to pollution control and environmental mitigation, and anticipate environmental issues for proactive action before problems arise;
- auditing and preparing audit reports on the environmental monitoring data and the site environmental conditions;

- undertaking regular maintenance and calibration of equipment to ensure precision of the data acquired;
- ensuring that EM&A results are reported timely to ER, IEC and EPD;
- complete Environmental Checklists and Schedule of Recommended Mitigation Measures implementation status. The checklist should include items such as:
 - i) construction activity item names, equipment, any night time activity;
 - ii) any mitigation measures to be implemented; and
 - iii) any affected sensitive receivers, any school nearby, any examination period.

The **Independent Environmental Checker** shall be appointed by the Project proponent to audit and verify the overall environmental performance of all the work sites and to assess the effectiveness of the ET in their duties. The IEC shall not be an associated body of the Contractor, ER & ET. The IEC is responsible for:

- Reviewing EM&A reports and making recommendations for improvement;
- Arranging and conducting monthly general site inspections / audits of the different works areas;
- Reviewing the programme of works, in order to anticipate any potential environmental impacts before they arise;
- Ensuring that impact monitoring is conducted at the recommended locations at the recommended frequency as identified in the EM&A Manual;
- Checking that mitigation measures that have been recommended in the EIA, the EM&A Manual and Contract documents, or as required, are properly implemented, in a timely manner; and
- Reporting the findings of site inspections / audits and other environmental performance reviews to the EPD and Project Proponent.

1.5 Construction Programme

Figure 1.3 shows a preliminary construction programme for the proposed road works. This programme is for information of the ET Leader to get an initial idea of the sequence and timing of the Project. The ET 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 for formulating the EM&A schedule.

According to the proposed programme, construction is scheduled to commence in December 2004 for completion by the end of 2007 (excluding landscape work). The scope of the comprises the following:

- construction of two sections of single lane eastbound underpasses. The first section is about 48m long while the second section is less 230m in length. They would be constructed beneath the existing Lei Yue Mun Road/Kai Tin Road roundabout and the new signalised control junction of Lei Yue Mun Road with Yau Tong Road and Slip Road to EHC;
- re-provision of a two lane slip road connecting Lei Yue Mun Road to the Kai Tin Road roundabout;

- construction of a single lane slip road connecting Kai Tin Road to the new signalised control junction;
- construction of a footbridge for pedestrian crossing at the junction of Lei Yue Mun Road and Kai Tin Road;
- junction modification at Lei Yue Mun Road/Yau Tong Road/Slip Road to EHC;
- construction of three sections of noise canopies, two sections of noise semi-enclosure, and a 7.7m high with 3m horizontal cantilevered noise barrier along Lei Yue Mun Road. The total lengths for the noise canopies, noise semi-enclosures and cantilevered noise barrier are 175m, 112m, and 115m respectively; and
- associated geotechnical, landscaping and road reconstruction works.

2.0 AIR QUALITY

2.1 Air Quality Parameters

Monitoring and audit of the Total Suspended Particulates (TSP) levels shall be carried out by the ET to ensure that any deteriorating air quality could be readily detected and timely action taken to rectify the situation.

1-hour and 24-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The 24-hour TSP levels shall be measured by following the standard high volume sampling method as set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B. Upon approval of the ER, 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.

All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and any other local atmospheric factors affecting or affected by site conditions etc. shall be recorded down in detail. A sample data sheet is shown in Appendix A1.

2.2 Monitoring Equipment

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

- a) 0.6-1.7 m³/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 cm² (63 in²)
- e) Flow control accuracy: +/- 2.5% deviation over 24-hour sampling period
- f) Equipped with a shelter to protect the filter and sampler
- g) Incorporated with an electronic mass flow rate controller or other equivalent devices
- h) Equipped with a flow recorder for continuous monitoring
- i) Provided with a peaked roof inlet
- j) Incorporated with a manometer

- k) Able to hold and seal the filter paper to the sampler housing at horizontal position
- l) Easy to change the filter
- m) Capable of operating continuously for 24-hour period.

The ET is responsible for provision of the monitoring equipment. They shall ensure that sufficient number of 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.

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 by the concern parties such as ER. All the data should be converted into standard temperature and pressure condition.

The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded in the data sheet as mentioned in Appendix A1.

If the ET proposes to use a direct reading dust meter to measure 1-hour TSP levels, he shall submit sufficient information to the ER to prove that the instrument is capable of achieving a comparable result to the HVS. The instrument should also be calibrated regularly, and the 1-hour sampling shall be determined periodically by HVS to check the validity and accuracy of the results measured by direct reading method.

Wind data monitoring equipment shall also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. The equipment installation location shall be proposed by the ET and agreed with the ER in consultation with the EPD. For installation and operation of wind data monitoring equipment, the following points shall be observed:

- a) The wind sensors should be installed 10m above ground so that they are clear of obstructions or turbulence caused by buildings.
- b) The wind data should be captured by a data logger. The data shall be down loaded for analysis at least once a month.
- c) The wind data monitoring equipment should be re-calibrated at least once every six months.
- d) Wind direction should be divided into 16 sectors of 22.5 degrees each.

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

2.3 Laboratory Measurement / Analysis

A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments, to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory should be HOKLAS accredited.

If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the ER and the measurement procedures shall be witnessed by the ER. Any measurement performed by the laboratory shall be demonstrated to the satisfaction of the ER who shall regularly audit to the measurement performed by the laboratory to ensure the accuracy of measurement results. The ET Leader shall provide the ER with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.

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-hour and be pre-weighed before use for the sampling.

After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper shall then be returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.

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

2.4 Monitoring Locations

Based on the EIA report, one location is designated for construction dust monitoring as listed in Table 2.1 and illustrated in Figure 2.1. The status and locations of dust sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER and IEC and agreement from EPD on the proposal.

Table 2.1 Construction Dust Monitoring Locations

Identification No.	Location
A1	SKH Kei Hau Secondary School
A2	Lam Tin Ambulance Depot

When alternative monitoring locations are proposed, the following criteria, as far as practicable, should be followed:

- 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.

The ET shall agree with the ER on the position of the HVS for the installation of the monitoring equipment. When positioning the samplers, the following points shall be noted:

- a) a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
- b) no two samplers should be placed less than 2 meters apart;
- c) the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;

- d) a minimum of 2 meters of separation from walls, parapets and penthouses is required for rooftop samplers;
- e) a minimum of 2 meters separation from any supporting structure, measured horizontally is required;
- f) no furnace or incinerator flue is nearby;
- g) airflow around the sampler is unrestricted;
- h) the sampler is more than 20 meters from the dripline;
- i) any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;
- j) permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- k) a secured supply of electricity is needed to operate the samplers.

2.5 Baseline Monitoring

Baseline monitoring shall be carried out 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-hour TSP samples. The selected baseline monitoring stations should reflect baseline conditions at the impact stations. 1-hour sampling should also be done at least 3 times per day while the highest dust impact is expected.

During the baseline monitoring, there should not be any construction or dust generation activities in the vicinity of the monitoring stations. Before commencing baseline monitoring the ET shall inform the ER of the baseline monitoring programme such that the ER can conduct on-site audit to ensure accuracy of the baseline monitoring results.

In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, the ET Leader shall carry out the monitoring at alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall be approved by the ER and IEC and agreed with EPD.

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

Ambient conditions may vary seasonally and shall be reviewed at three monthly intervals. When the ambient conditions have changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be carried out 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 EPD.

2.6 Impact Monitoring

The ET 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. Before commencing baseline monitoring, the ET shall inform the ER of the impact monitoring programme.

The specific time to start and stop the 24-hour TSP monitoring shall be clearly defined for each location and be strictly followed by the operator.

In case of non-compliance with the air quality criteria, more frequent monitoring, as specified in the Action Plan in the following section, shall be conducted within 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.

2.7 Event and Action Plan for Air Quality

The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET shall compare the impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. Table 2.2 shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance of the air quality criteria occur, actions in accordance with the Action Plan in Table 2.3 shall be carried out.

Table 2.2 Action / Limit Levels for Air Quality

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

Table 2.3 Event / Action Plan for Air Quality

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
ACTION LEVEL				
1. Exceedance for one sample	<ol style="list-style-type: none"> 1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform IEC and ER; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Check Contractor's working method. 	<ol style="list-style-type: none"> 1. Notify Contractor. 	<ol style="list-style-type: none"> 1. Rectify any unacceptable practice; 2. Amend working methods if appropriate.
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Identify source; 2. Inform IEC and ER; 3. Advise the ER on the effectiveness of the proposed remedial measures; 4. Repeat measurements to confirm findings; 5. Increase monitoring frequency to daily; 6. Discuss with IEC and Contractor on remedial actions required; 7. If exceedance continues, arrange meeting with IEC and ER; 8. If exceedance stops, cease additional monitoring; 	<ol style="list-style-type: none"> 1. Checking monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ET on the effectiveness of the proposed remedial measures; 5. Supervise Implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented. 	<ol style="list-style-type: none"> 1. Submit proposals for remedial to ER within 3 working days of notification; 2. Implement the agreed proposals; 3. Amend proposal if appropriate.

Table 2.3 Event / Action Plan for Air Quality (Cont'd)

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

2.8 Construction Dust Mitigation Measures

The EIA report has recommended dust suppression measures in the form of watering the works area at least twice a day. The *Air Pollution Control (Construction Dust) Regulation* shall also be adhered for compliance.

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

The implementation schedule for the mitigation measures is presented in Appendix B1.

3.0 NOISE

3.1 Noise Parameters

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 Noise Control Ordinance (NCO) criteria.

The road traffic noise during operation of the Project shall be measured in terms of the A-weighted equivalent of $L_{10}(1\text{-hour})$. During the traffic noise measurement, traffic count shall also be undertaken concurrently.

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 A2 for reference.

3.2 Monitoring Equipment

As referred to in the Technical Memorandum (TM) issued under 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.

Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding 5 m/s or wind with gusts exceeding 10 m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

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

3.3 Monitoring Locations

The construction and operation noise monitoring locations are presented in Tables 3.1 and 3.2, respectively. Locations of these monitoring locations are illustrated in Figures 3.1 and 3.2.

Table 3.1 Proposed Construction Noise Monitoring Locations

Identification No.	Proposed Location
CN1	S.K.H. Kei Hau Secondary School
CN2	St. Antonius Primary School

Table 3.2 Proposed Operation Phase Noise Monitoring Locations

Identification No.	Description of NSR
ON1	Block A, EHC Housing Site Phase 1
ON2	Block B, Yau Tong Estate Redevelopment Phase 3

The status and locations of noise sensitive receivers may change after issuing of this manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER and agreement from EPD of the proposal. When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria:

- a) at locations close to the major site activities which are likely to have noise impacts;
- b) close to the most affected existing 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 worship, library, court of law, performing art centre should be considered as 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.

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

3.4 Baseline Monitoring for Construction Noise

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 for approval before the monitoring starts.

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

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

3.5 Impact Monitoring for Construction Noise

Noise monitoring shall be carried out at all the designated monitoring locations. 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 location 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 0700-1900 hours on holidays (or Sunday).

For the measurements (b), (c) and (d) above, one set of measurements shall at least include 3 consecutive Leq(5 min) results.

If a school exists near the construction activity, noise monitoring shall be carried out at the monitoring locations for the schools during the school examination periods. The ET Leader shall liaise with the school's personnel and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract.

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

3.6 Event and Action Plan for Noise

The Action and Limit levels for construction noise are defined in Table 3.3. Should non-compliance of the criteria occur, action in accordance with the Action Plan in Table 3.4, shall be carried out.

Table 3.3 Action/Limit Levels for Construction Noise

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

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

** to be selected based on Area Sensitivity Rating

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

Table 3.4 Event / Action Plan for Construction Noise

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

3.7 Operation Phase Noise Monitoring

The traffic noise level shall be measured twice within the first year of the road opening. Measurements shall be made in terms of the A-weighted L10 over 3 half hour periods during the peak traffic hour, other metrics like Leq may be added as seen fit. A sample data record sheet is shown in Appendix A3 for reference.

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

- a) one set of measurements at the morning traffic peak hour on normal weekdays;
- b) one set of measurements at the evening traffic peak hour on normal weekdays;
- c) a concurrent census of traffic flow and percentage heavy vehicle shall be obtained for far-side and near-side of the road and the existing road network in the vicinity of each measuring point;
- d) average vehicle speed estimated for far-side and near-side of the road and the existing road network in the vicinity of each measuring point; and
- e) 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 at the time of measurement.

3.8 Event and Action Plan for Operation Noise

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

3.9 Noise Mitigation Measures

The EIA report has recommended noise control and mitigation measures during construction and operation phases. The Contractor shall be responsible for the implementation of these mitigation measures.

Construction Phase

The mitigation measures adopted for construction noise control are mainly good site practice, use of quieter plants, and use of movable barriers as shown below:

Good Site Practice

- Use of well-maintained and regularly-serviced plant during the construction works;
- Machinery plant that may operate on intermittent basis should be shut down between work periods or should be throttled down to a minimum;

- Plant that is known to emit noise strongly in one direction, should, where possible, be orientated to direct noise away from the NSRs;
- Noisy equipment and activities should be sited as far away from NSRs as possible; and
- Stockpiles of excavated materials and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.

Use of Quieter Plant

While it is not feasible to dictate the Powered Mechanical Equipment (PME) employed by the contractor, they are strongly encouraged to use the quiet equipment that is commercially available in Hong Kong. Quiet equipment is defined as PME whose actual SWL is less than the value specified in GW-TM for the same piece of equipment. More examples of SWLs for specific quiet PME could be referred *in Noise Control on Construction and Open Sites, BS5228: Part 1: 1997*.

Use of Movable Noise Barriers

Movable barriers with a skid footing and a cantilevered upper portion are considered to be very effective in screening NSRs from noise generated from a particular plant. It is expected that a movable noise barrier placed closely to the noise generating part of the PME such that the line of sight could be blocked when viewed from the NSRs, at least 10dB(A) screening can be produced for stationary plant and 5dB(A) for mobile plant. The noise screening benefit for each plant considered in this study is listed as follows:

- (i) **Stationary plant** - assuming 10dB(A) reduction for PME such as poker vibrator, hand-held breaker and hand-held rock drill
- (ii) **Mobile plant** – assuming 5dB(A) reduction for PME such as excavator, excavator mounted hydraulic breaker, mobile crane, backhoe, and power rammer

Operation Phase

In the EIA report, a number of direct mitigation measures as stated in the EIAO-TM has been considered to alleviate the noise impacts associated with the Project. The best practicable mitigation package has been recommended and is summarised below:

- Two sections of canopies (about 105m) and a semi-enclosure (about 50m) for the section of Lei Yue Mun Road in front of EHC housing site Phase 1;
- A 7.7m high and 3m horizontal cantilevered noise barrier of about 115m for the northbound carriageway of Lei Yue Mun Road in front of St. Antonius Primary School; and
- A 70m noise canopy for northbound of Lei Yue Mun Road leaning against Yau Tong Estate Redevelopment Phase 3.
- Low Noise Road Surfacing on new roads.

The implementation schedule for the mitigation measures is presented in Appendix B2. If the above measure is not sufficient to restore the construction

noise quality to an acceptable levels upon the advice of ET, the Contractor shall liaise with the ET on some other mitigation measures, propose to ER for approval, and carry out the mitigation measures.

4.0 LANDFILL GAS MONITORING

4.1 Landfill Gas Parameters

Although a comprehensive landfill gas management system has been constructed under the Restoration Contract for Sai Tso Wan Landfill, landfill gas monitoring shall be carried out to identify any migration between the landfill and the concerned area of the Project Site to ensure the safety of the Contractor's personnel.

4.2 Monitoring Equipment

Monitoring of Excavations During Construction Phase

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 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

Monitoring of Service Ducts/Chambers During Operation Phase

Pre-entry and routine monitoring shall be conducted at service ducts/chambers. The routine monitoring shall be conducted prior to entry to service ducts/chambers and on a regular basis as determined by a Safety Officer or an authorized qualified person. 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 date, 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

The equipment used to monitor LFG concentrations in excavations may be the same as that described for routine landfill gas monitoring of excavations described above, as long as safety parameters described above can be achieved.

4.3 Monitoring Locations

Monitoring of Excavations During Construction Phase

During construction, excavations of deeper than 300 mm should be monitored upon completion, prior to entry and periodically during the works, as stipulated in [Table 5.4 of the Final Environmental Impact Assessment Report](#). If drilling is required, the procedures for safety management and working procedures described in the EPD's *Landfill Gas Hazard Assessment – Guidance Note* should be adopted.

Monitoring of Service Ducts/Chambers During Operation Phase

Following construction, pre-entry and routine monitoring may be required at service ducts/chambers.

Limit Levels and Action Plans for Landfill Gas Monitoring

The Limit levels and relevant Action Plans for landfill gas detected in excavations during construction phase and service ducts/chambers during operation phase are shown in [Table 4.1](#) and [Table 4.2](#) respectively.

Table 4.1 Limit Levels/Action Plan for LFG Monitoring for Excavations

Parameter	Monitoring Results	Appropriate Action
Methane	> 0.5 % (v/v) (i.e. > 10 % LEL)	<ul style="list-style-type: none"> Prohibit all hot works inside excavation; and Ventilate to restore methane to < 0.5 % (v/v).
	> 1.0 % (v/v) (i.e. > 20 % LEL)	<ul style="list-style-type: none"> Prohibit entry to excavation or evacuate personnel and stop work; Increase ventilation to restore methane to < 0.5 % (v/v); and Ordinary breathing apparatus should be used when entering the excavation.
Carbon dioxide	> 0.5 %	Ventilate to restore carbon dioxide to < 0.5 %.
	> 1.5 %	<ul style="list-style-type: none"> Prohibit entry to excavation or evacuate personnel and stop work; Increase ventilation to restore carbon dioxide to < 0.5 %; and Ordinary breathing apparatus should be used when entering the excavation.
Oxygen	< 19 %	Ventilate to restore oxygen to > 19 %.
	< 18 %	<ul style="list-style-type: none"> Prohibit entry to excavation or evacuate personnel and stop work; Increase ventilation to restore oxygen to > 19 %; and Ordinary breathing apparatus should be used when entering the excavation.

Table 4.2 Limit Levels/Action Plan for LFG Monitoring for Service Ducts/Chambers

Parameter	Monitoring Results	Appropriate Action
Methane	> 0.5 % (v/v) (i.e. > 10 % LEL)	<ul style="list-style-type: none"> Prohibit all hot works inside service ducts/chambers; and Ventilate to restore methane to < 0.5 % (v/v).
	> 1.0 % (v/v) (i.e. > 20 % LEL)	<ul style="list-style-type: none"> Prohibit entry to service ducts/chambers or evacuate personnel and stop work; and Increase ventilation to restore methane to < 0.5 % (v/v).
Carbon dioxide	> 0.5 %	Ventilate to restore carbon dioxide to < 0.5 %.
	> 1.5 %	<ul style="list-style-type: none"> Prohibit entry to service ducts/chambers or evacuate personnel and stop work; and Increase ventilation to restore carbon dioxide to < 0.5 %.
Oxygen	< 19 %	Ventilate to restore oxygen to > 19 %.
	< 18 %	<ul style="list-style-type: none"> Prohibit entry to service ducts/chambers or evacuate personnel and stop work; and Increase ventilation to restore oxygen to > 19 %.

4.5 Landfill Gas Protection Measures

The *Final Environmental Impact Assessment Report* has recommended the following protection measures regarding LFG hazard:

- All relevant workers should be briefed with LFG hazard and be aware of the potential presence of LFG during excavations;
- Portable gas detectors should be used to check the levels of methane, carbon dioxide and oxygen in depressions, trenches, and other excavations prior to entry and periodically;
- Atmosphere within service ducts/chambers should be checked for methane, carbon dioxide and oxygen prior to entry and on a regularly basis. The frequency of the monitoring shall be determined by a Safety Officer or an authorized qualified person;
- Adequate fire extinguisher, fire-resistant clothing and breathing apparatus should be provided on site during the construction phase;
- Smoking, naked flames and other sources of ignition should be prohibited within 15 m of any excavations and service ducts/chambers. Signs such as 'No Smoking' and 'No Naked Flame' should be in place in the vicinity of excavations and service ducts/chambers;
- Hot works such as welding and flame-cutting should only be carried out in open areas with at least 15m away from any excavations and service ducts/chambers unless these are controlled by a 'Permit to Work' procedure which is authorized by a Safety Officer or an authorized qualified person;
- All electrical equipment to be used in excavations and service ducts/chambers should be intrinsically safe.

The implementation schedule for the protection measures is presented in [Appendix B3](#).

5.0 LANDSCAPE

5.1 General

The design, implementation and maintenance of landscape mitigation measures should be checked to ensure that they are fully realized and that potential conflicts between the proposed landscape measures and any other project works and operational requirements are resolved at the earliest possible date and without compromise to the intention of the mitigation measures.

Monitoring Task	Monitoring Report	Form of Approval	Frequency
<ul style="list-style-type: none"> Monitoring of design works against the recommendations of the landscape and ecological impact assessments within the EIA should be undertaken at the end of master planning, detailed design and tender stages, to ensure that they fulfil the intentions of the mitigation measures. Any subsequent changes to the design, including design changes on site should also be checked. 	Written assessment of designs, by IEC	Written confirmation from IEC	As designs are produced
<ul style="list-style-type: none"> Monitoring of the contractor's operations during the construction period. 	Report on Contractor's compliance, by ER	Counter-signature of report by ET Leader	Weekly
<ul style="list-style-type: none"> Monitoring of the planting works during the 24-month Establishment Period after completion of the construction works. 	Report on Contractor's compliance, by ER	Counter-signature of report by ET Leader	3 months
<ul style="list-style-type: none"> Monitoring of the long term management of the planting works in the period up to 10 years after completion of the construction works. 	Report on Contractor's compliance, by Maintenance Agency	Counter-signature of report by Client	12 months

5.2 Monitoring Details

Design

The landscape measures proposed within the EIA to mitigate the landscape and visual impacts of the scheme should be embodied into the detailed landscape design drawings and contract documents including the protection of existing woodland area and trees, the transplant of existing trees, and the planting of new trees and shrubs. Designs should be checked to ensure that the measures are fully incorporated and that potential conflicts with civil engineering, geo-technical, structural, lighting, signage, drainage, underground utility and operational requirements are resolved prior to construction.

The Client should prepare a detailed 10-Year Management Programme for the long term maintenance of the planting works following the Establishment Periods. The Programme should include: evaluation and objectives for management, details of the operations to be undertaken to achieve these objectives, and outline of work programmes.

Construction & Establishment Period

The implementation of landscape construction works and maintenance operations during the subsequent 24 month Establishment Period must be supervised by fully qualified Landscape Resident Site Staff. The employment of Landscape RSS is cited in the EIA as a mitigation measure, and their involvement should be monitored.

Measures to mitigate landscape and visual impacts during construction should be checked to ensure compliance with the intended aims of the measures.

The extent of the agreed works areas should be regularly checked during the construction phase. Any trespass by the Contractor outside the limit of the works, including any damage to existing trees and woodland shall be reported to the appropriate authorities.

The progress of the engineering works should be regularly reviewed on site to identify the earliest practical opportunities for the landscape works to be undertaken.

Area of Works	Items to be Monitored
General	
Advance planting	<ul style="list-style-type: none"> monitoring of implementation and maintenance of planting, and against possible incursion, physical damage, fire, pollution, surface erosion, etc.
Protection of all trees and woodland blocks to be retained	<ul style="list-style-type: none"> identification and demarcation of trees / vegetation to be retained, erection of physical protection (e.g. fencing), monitoring against possible incursion, physical damage, fire, pollution, surface erosion, etc.
Clearance of existing vegetation	<ul style="list-style-type: none"> identification and demarcation of trees / vegetation to be cleared, checking of extent of works to minimise damage, monitoring of adjacent areas against possible incursion, physical damage, fire, pollution, surface erosion, etc.
Transplanting of trees	<ul style="list-style-type: none"> identification and demarcation of trees / vegetation to be transplanted, monitoring of extent of pruning / lifting works to minimise damage, timing of operations, implementation of all stages of preparatory and translocation works, and maintenance of transplanted vegetation, etc.
Plant supply	<ul style="list-style-type: none"> monitoring of operations relating to the supply of specialist plant material (including the collecting, germination and growth of plants from seed) to ensure that plants will be available in time to be used within the construction works.
Soiling, planting, etc.	<ul style="list-style-type: none"> monitoring of implementation and maintenance of soiling and planting works and against possible incursion, physical damage, fire, pollution, surface erosion, etc.
Establishment Works, etc.	<ul style="list-style-type: none"> monitoring of implementation of maintenance operations during Establishment Period.
Decorative treatment of site hoarding	<ul style="list-style-type: none"> implementation and maintenance, to ensure compliance with agreed designs.

Architectural treatment of retaining walls, noise enclosures / barriers elevated road structures and other engineering works.	<ul style="list-style-type: none"> implementation and maintenance of mitigation measures, to ensure compliance with agreed designs.
Night time lighting	<ul style="list-style-type: none"> implementation and maintenance of screening measures, control of use and period of lighting to ensure minimization of night time glare

Long Term Management

The success or otherwise of all planting works intended to mitigate the visual and landscape impact of the road, the noise barriers and street lighting shall be monitored during the first ten years of the operational phase of the project. Any areas of vegetation which have failed to establish or where areas of excessive erosion have occurred, should be corrected by the appropriate maintenance authorities at the earliest opportunity. Monitoring should include the long term maintenance of the planting works under the detailed 10-Year Management Programme.

5.3 Event and Action Plan for Landscape Works

Design

Action Level	Environmental Team Leader	Independent Checking (Engineer)	Project Engineer	Project Landscape Architect
Non Conformity (with Design Standards and Specification)	<ul style="list-style-type: none"> Identify Source Inform PE and Client Discuss remedial actions with PE, PLA and Client, Verify remedial actions when complete. 	<ul style="list-style-type: none"> Check IEC's report Discuss remedial actions with PE, PLA and IEC. 	<ul style="list-style-type: none"> Notify PLA Discuss remedial actions with PLA, IEC, and Client, Ensure remedial designs are fully incorporated 	<ul style="list-style-type: none"> Amend designs, Discuss remedial actions with PE, IEC, and Client.
Where non-conformity can not be resolved through design modification	<ul style="list-style-type: none"> Identify Source Inform PE and Client Discuss necessary modification and resubmission of EIA with PE, PLA and Client, Verify remedial actions when complete. 	<ul style="list-style-type: none"> Check IEC's report Discuss proposed modifications to the EIA with PE, PLA and IEC. Seek approval for revised EIA from EPD. 	<ul style="list-style-type: none"> Notify PLA Discuss necessary modification and resubmission of EIA with PLA and IEC, and Client, Prepare revised EIA document for re-submission 	<ul style="list-style-type: none"> Discuss necessary modification and resubmission of EIA with PE, IEC, and Client, Prepare landscape inputs to revised EIA document for re-submission

Construction & Establishment Periods

Action Level	Environmental Team Leader	Independent Checking (Engineer)	Engineer's Representative	Contractor
Exceedance on one occasion	<ul style="list-style-type: none"> Identify Source Inform IEC and ER Discuss remedial actions with IEC, ER and Contractor Monitor remedial actions until rectification has been completed 	<ul style="list-style-type: none"> Check report Check Contractor's working method Discuss with ET and Contractor on possible remedial measures Advise ER on effectiveness of proposed remedial measures. Check implementation of remedial measures. 	<ul style="list-style-type: none"> Notify Contractor Ensure remedial measures are properly implemented 	<ul style="list-style-type: none"> Amend working methods Rectify damage and undertake any necessary replacement
Repeated Exceedance	<ul style="list-style-type: none"> Identify Source Inform IEC and ER Increase monitoring frequency Discuss remedial actions with IEC, ER and Contractor Monitor remedial actions until rectification has been completed If exceedance stops, cease additional monitoring 	<ul style="list-style-type: none"> Check monitoring report Check Contractor's working method Discuss with ET and Contractor on possible remedial measures Advise ER on effectiveness of proposed remedial measures Supervise implementation of remedial measures. 	<ul style="list-style-type: none"> Notify Contractor Ensure remedial measures are properly implemented 	<ul style="list-style-type: none"> Amend working methods Rectify damage and undertake any necessary replacement

Long Term Management

Action Level	Maintenance Agency	Client		
Exceedance	<ul style="list-style-type: none"> Identify Source Discuss remedial actions with Client Monitor remedial actions until rectification has been completed 	<ul style="list-style-type: none"> Check report Discuss with Maintenance Agency possible remedial measures Supervise implementation of remedial measures. 		

6.0 SITE ENVIRONMENTAL AUDIT

6.1 Site Inspections

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.

The ET 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.

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 shall make reference to the following information in conducting the inspection:

- a) the EIA recommendations on environmental protection and pollution control mitigation measures;
- b) works progress and programme;
- c) individual works methodology proposals (which shall include proposal on associated pollution control measures);
- d) the contract specifications on environmental protection;
- e) the relevant environmental protection and pollution control laws; and
- f) previous site inspection results.

The Contractor shall update the ET 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 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 to report on any remedial measures subsequent to the site inspections.

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 EM&A.

A mitigation implementation status form and a site inspection form are provided in Appendices C1 and C2, respectively.

6.2 Compliance with Legal and Contractual Requirements

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.

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.

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

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.

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.

Upon receipt of the advice, the Contractor shall undertake immediate action to remediate 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.

A regulatory compliance form is presented in Appendix C3.

6.3 Environmental Complaints

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 ER 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).
- i) Record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

During the complaint investigation work undertaken by the ET, the Contractor and ER shall co-operate with the ET 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.

A complaint log sheet is provided in Appendix C4.

ET should provide a flow chart of the complaint response procedures including those received from EPD as well as from other sources. The flow chart should address complaint receiving channels, responsible parties/contacts for information/action, the investigation processes, procedures for the implementation of mitigation measures, guidelines for communication and public relation with the complainant.

7.0 REPORTING

7.1 General

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. All the monitoring data (baseline and impact) shall also be submitted in diskettes in a format agreed by ER and EPD.

7.2 Baseline Monitoring Report

The ET shall prepare and submit a Baseline Environmental Monitoring Report (where appropriate) within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to each of the three parties: the Contractor, the ER and the EPD. The ET shall liaise with the relevant parties on the exact number of copies they want. The form and content of the report, and the representation of baseline monitoring data shall be in a format to the satisfaction of EPD and include, but not be limited to 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) An updated construction programme with milestones of environmental protection/mitigation activities annotated
- e) Monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - name of laboratory and type of equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency and duration; and
 - QA/QC results and detection limits
- f) Details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period; and
 - other factors which might affect the results
- g) Determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data
- h) Revisions for inclusion in the EM&A Manual
- i) Comments and conclusions.

7.3 EM&A Reports

The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET. 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. Each monthly report shall be submitted to the relevant parties including the Contractor, the IEC, the ER, EPD and related government departments. Before submission of the first EM&A report, the ET 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. The ET shall review the number and location of monitoring stations and parameters to monitor every 6 months or on an as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

7.4 First Monthly EM&A Report

The first monthly EM&A report shall include at least but not be limited to the following:

- (a) Executive summary (1-2 pages)
 - breaches of Action and Limit levels
 - complaint log
 - notifications of any summons and successful prosecutions;
 - reporting changes
 - future key issues.
- (b) Basic project information
 - project organisation including key personnel, contact names and telephone numbers
 - construction programme with fine turning of construction activities showing the interrelationship with environmental mitigation measures for the month
 - management structure
 - works undertaken during the month
- (c) Environmental status
 - works undertaken during the month with illustrations such as location of works
 - drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring stations.
- (d) Summary of EM&A requirements
 - 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.
- (e) Implementation status
 - advice on the implementation of environmental protection and pollution control/mitigation measures, as recommended in the

- project EIA study report, summarised in the updated implementation schedule.
- (f) Monitoring results (in both hard and diskette copies)
- monitoring methodology
 - name of laboratory and types of equipment used and calibration details;
 - parameters monitored
 - monitoring locations
 - monitoring date, time, frequency, and duration
 - weather conditions during the period
 - any other factors which might affect the monitoring results
 - QA/QC results and detection limits
 - all monitoring results should be tabulated with exceedances highlighted for ease of referencing
- (g) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
- record of all noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
 - record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary
 - record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary
 - review of the reasons for, and the implications of, non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures
 - description of the actions taken in the event of noncompliance and deficiency reporting and any follow-up procedures related to earlier noncompliance.
- (h) Others
- an account of the future key issues as reviewed from the works programme and work method statements;
 - advice on the solid and liquid waste management status; and
 - submission of implementation status proforma, environmental protection proforma, regular compliance proforma, site inspection proforma and complaint log, etc, summarising EM&A of the period.

7.5 Subsequent EM&A Reports

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

- (a) Executive Summary (1-2 pages)
- breaches of Action and Limit levels
 - complaint log
 - notification of any summons and successful prosecutions
 - reporting changes
 - future key issues.
- (b) Environmental status

- construction programme with fine tuning of construction activities showing the interrelationship with environmental protection/mitigation measures for the month
 - works undertaken during the month with illustrations including key personnel contact names and telephone numbers
 - drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring stations.
- (c) Implementation status
- 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.
- (d) Monitoring results (in both hard and diskette copies)
- monitoring methodology
 - name of laboratory and types of equipment used and calibration details;
 - parameters monitored
 - monitoring locations
 - monitoring date, time, frequency, and duration
 - weather conditions during the period
 - any other factors which might affect the monitoring results
 - QA/QC results and detection limits
 - all monitoring results should be tabulated with exceedances highlighted for ease of referencing
- (e) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
- record of all noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
 - record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary
 - record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary
 - review of the reasons for, and the implications of, non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures
 - a description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- (f) Others
- an account of the future key issues as reviewed from the works programme and work method statements
 - advice on the solid and liquid waste management status.

- (g) Appendix
 - Action and Limit levels
 - graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
 - 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 statistics on complaints, notifications of summons and successful prosecutions
 - outstanding issues and deficiencies

7.6 Quarterly EM&A Summary Reports

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. Apart from these, the first quarterly summary report should also confirm that the monitoring work is proving effective and that is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works.

- (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)
 - 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
 - any other factors which might affect the monitoring results
- (g) Advice on the solid and liquid waste management status

- (h) A summary of non-compliance (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) 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
- (m) 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
- (n) Proponents' contacts and any hotline telephone number for the public to make enquiries.

Apart from the above, the first quarterly summary report should also confirm that the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works.

7.7 Final EM&A Report

The termination of EM&A programme shall be determined on the following basis:

- (a) Completion of construction activities and insignificant environmental impacts of the remaining outstanding construction works
- (b) Trends analysis to demonstrate the narrow down of monitoring exceedances due to construction activities and the return of ambient environmental conditions in comparison with baseline data
- (c) No environmental complaint and prosecution involved.

The proposed termination should be endorsed by the ER, IEC and the project proponent prior to final approval from the EPD.

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

- (a) An executive summary (1-2 pages)

- (b) Basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the entire construction period
- (c) A brief summary of EM&A requirements including:
 - monitoring parameters
 - environmental quality performance limits (Action and Limit levels)
 - 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 proformas
- (e) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring stations
- (f) Graphical plots and the statistical analysis of the trends of monitored parameters over the construction project for representative monitoring stations annotated against:
 - the major activities being carried out on site during the period
 - weather conditions during the period
 - any other factors which might affect the monitoring results
 - the return of ambient environmental conditions in comparison with baseline data
- (g) Compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies
- (h) Provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis
- (i) Advice on the solid and liquid waste management status
- (j) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limits levels)
- (k) A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate
- (l) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance
- (m) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken

- (n) Review the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness)
- (o) A summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results
- (p) Review the practicality and effectiveness of the EIA process and EM&A programme (e.g. effectiveness and efficiency of the mitigation measures) recommend any improvement in the EM&A programme
- (q) A conclusion to state the return of ambient and/or the predicted scenario as per EIA findings

7.8 Data Keeping

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 document. 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.

7.9 Interim Notifications of Environmental Quality Limit Exceedances

With reference to Event/Action Plans in Tables 2.3, 3.4 and 4.2, when the environmental quality limits are exceeded, the ET shall immediately notify the IEC, ER & EPD, as appropriate. The notification shall be followed up with advice to ER and EPD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. An interim notification form is shown in Appendix D for reference.

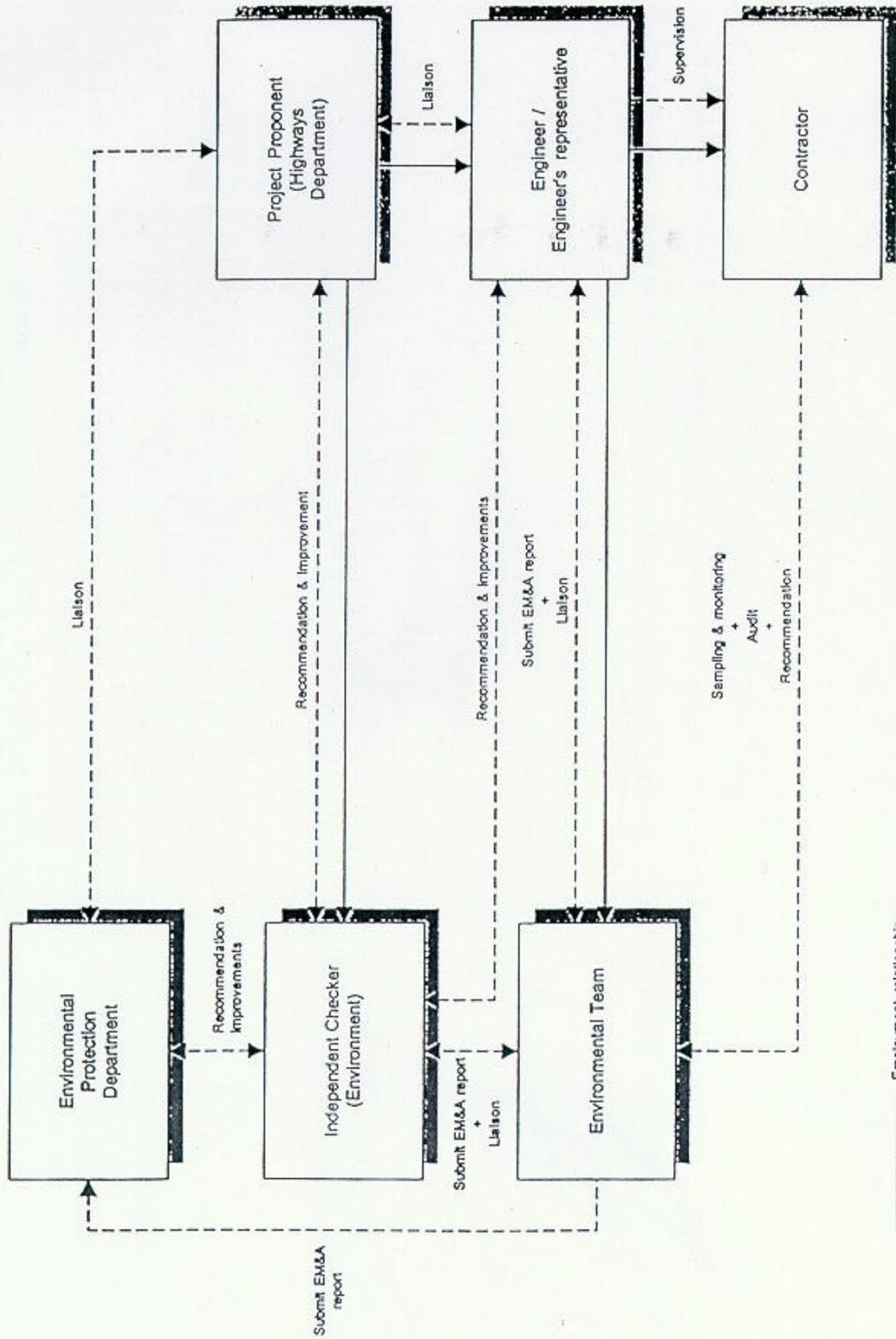


FIGURES



Site Location Plan

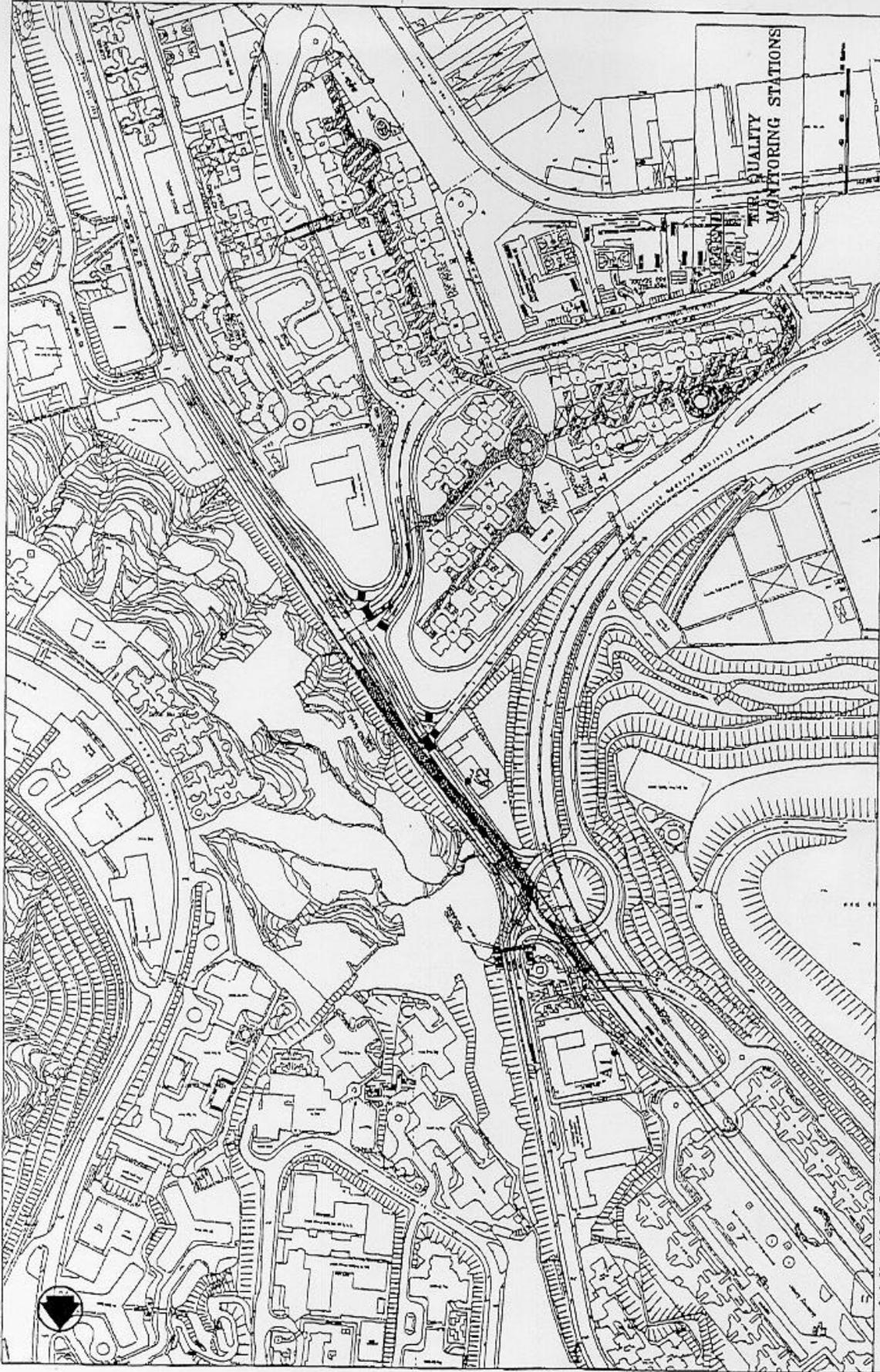
Figure 1.1



— Employment relationship
 - - - Working relationship

PROJECT ORGANISATION

FIGURE No. 1.2



Lei Yue Mun Road Underpass, Modification at Junction with Yau Tong Road and Associated Improvement Works

FIGURE No.

2.1

PROPOSED AIR QUALITY MONITORING LOCATION

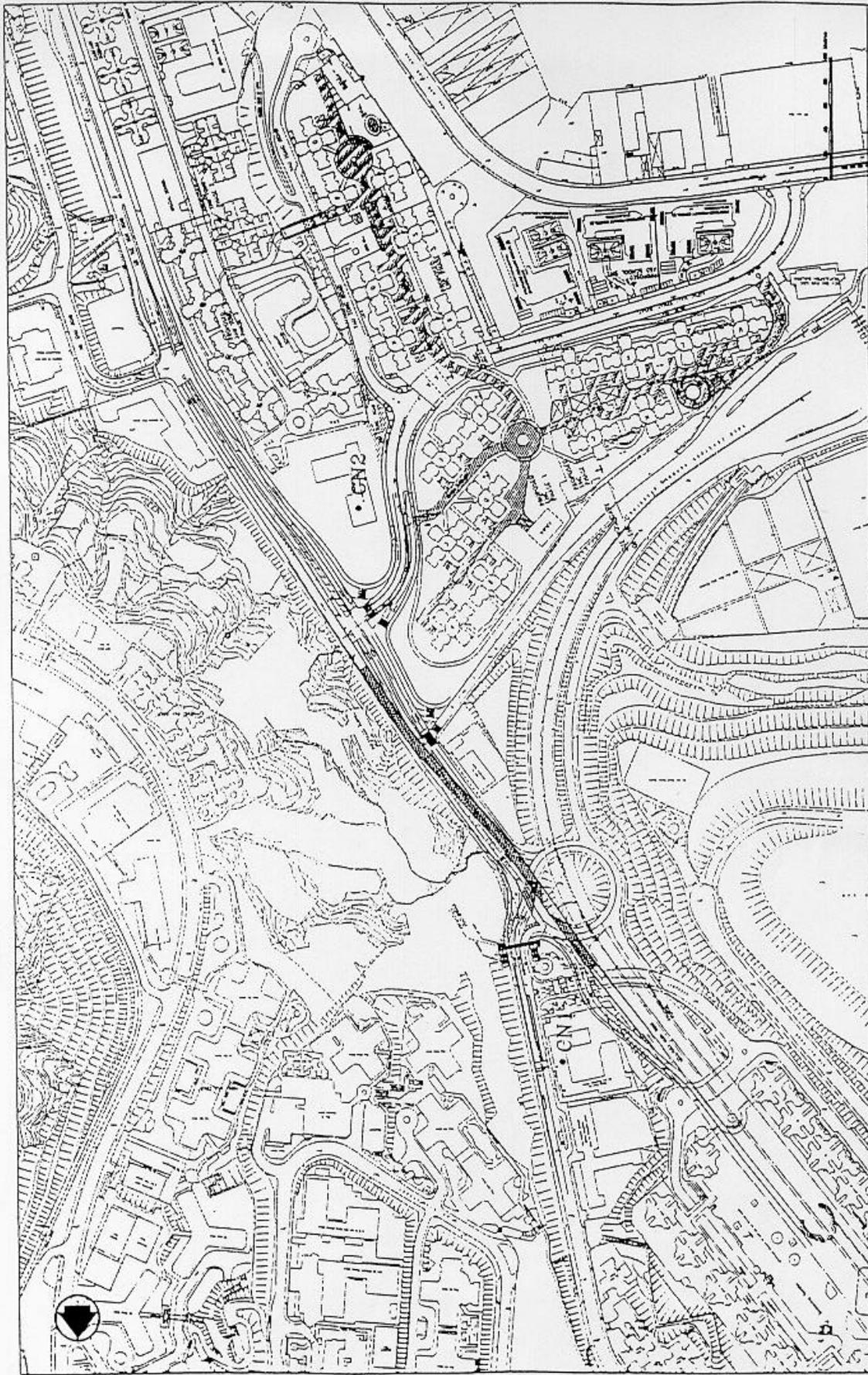
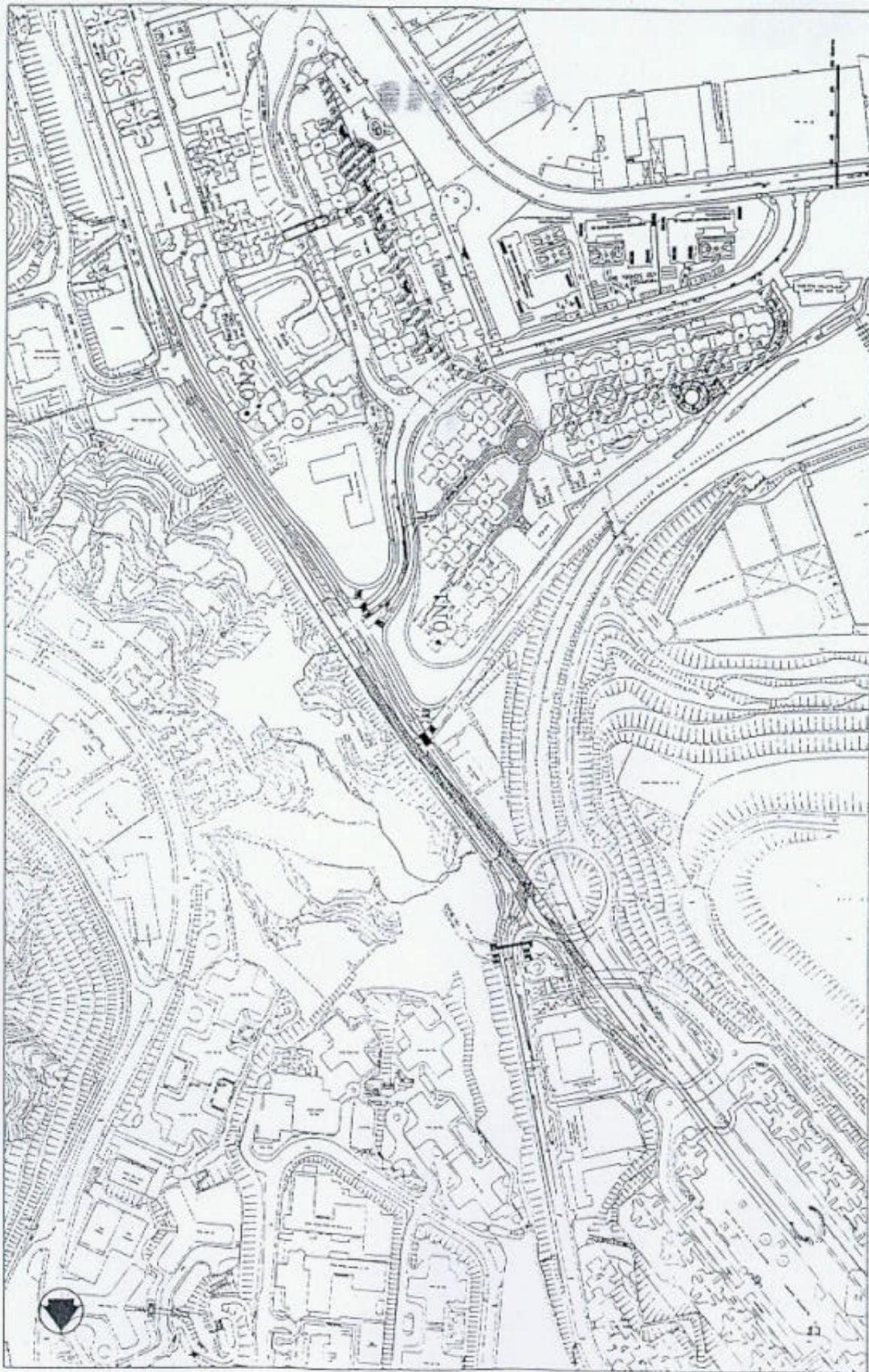


FIGURE No. Figure 3.1

Lai Yue Mun Road Underpass, Modification at Junction with Yau Tong Road and Associated Improvement Works

PROPOSED NOISE MONITORING LOCATIONS DURING CONSTRUCTION PHASE

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LeI Yue Mun Road Underpass, Modification at Junction with Yu Tong Road and Associated Improvement Works

Figure 3.2

FIGURE No.

PROPOSED NOISE MONITORING LOCATIONS DURING OPERATION PHASE



APPENDIX A
ENVIRONMENTAL MONITORING DATA RECORDING SHEETS

Appendix A1 Data Sheet for TSP Monitoring

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

	Name & Designation	Signature	Date
Field Operator	: _____	_____	_____
Laboratory Staff	: _____	_____	_____
Checked by	: _____	_____	_____

Appendix A2 Noise Monitoring Field Record Sheet

Monitoring Location		
Description of Location		
Date of Monitoring		
Measurement Start Time (hh:mm)		
Measurement Time Length (min.)		
Noise Meter Model/Identification		
Calibrator Model/Identification		
Measurement Results	L ₉₀ (dB(A))	
	L ₁₀ (dB(A))	
	L _{eq} (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 A3

Operational Stage Traffic Noise Monitoring – Field Survey Record Sheet
(page 1 of 2)

A. General

Monitoring location / Reference No.	
Person-in-charge	
Date and Day of monitoring	
Measurement time	From to
Description of location (incl. floor level) (attach plan separately)	
Microphone position	

B. Weather Conditions

Weather Conditions	
Temperature °C	
Wind speed ms ⁻¹	

C. Equipment

Instrument	Type	Serial No.	Setting
Sound level meter			
Calibrator			

D. Calibration

Before measurement:	After measurement:
---------------------	--------------------

Appendix A3

Operation Stage Traffic Noise Monitoring – Field Survey Record Sheet
(page 2 of 2)

E. Raw Data

Time	Traffic data*				Noise level (30 min) DB(A)				Average speed kph A/b c/d #
	Near side		Far side		L ₁₀	L ₉₀	L _{eq}	L _{max}	
	LV	HV	LV	HV					

Note: LV - light vehicle (i.e. private car, motorcycle, taxis and van)
 HV - heavy vehicle (i.e. other than LV)
 * - traffic count for a duration of 15 minutes
 # - a/b|c/d=near side LV/near side HV | far side LV/far side HV

F. Others

Mitigation measures in place near measurement location	
Other noise source(s) during monitoring	
Remarks	

G. Personnel

	Name	Designation	Signature	Date
Recorded by				
Checked by				



APPENDIX B
MITIGATION MEASURES IMPLEMENTATION SCHEDULES

Appendix B1 Implementation Schedule for the Construction Dust Mitigation Measures

EIA Ref	EM&A Ref*	Environmental Protection Measures/Mitigation Measures	Location	Timing	Implementation Agent	Implementation Stages **			
						Des	C	O	Dec
Construction Dust									
4.5	2.8	Watering the works area at least twice a day	Work site	During construction phase	The contractor		√		
4.5	2.1-2.6	Construction dust monitoring	As described in the EM&A Manual	Refer to the EM&A Manual for details	The contractor and Environmental Team		√		

Appendix B2 Implementation Schedule for the Noise Mitigation Measures

EIA Ref	EM&A Ref**	Environmental Protection Measures/Mitigation Measures	Location	Timing	Implementation Agent	Implementation Stages **			
						Des	C	O	Dec
Construction Noise									
3.5	3.8	Where available, the Contract shall use quiet PMEs or model of plants that are quieter than those specified in the EPD's Technical Memorandum (GW-TM) for undertaking construction works.	At active construction locations.	During construction phase	The contractor		√		
3.5	3.8	Where practicable, movable noise barriers should be used for hydraulic breaker, mobile crane, rock drill, excavator, backhoe, hand-held breaker, dump truck and poker vibrator.	At active construction locations.	During construction phase	The contractor		√		
3.7	3.1-3.5	Construction Noise Monitoring	As described in the EM&A Manual	Refer to the EM&A Manual for details	The contractor and Environmental Team		√		
Road Traffic Noise									
3.6	3.8	Low noise road surfacing (LNRS)	Along the newly constructed open roads	Prior to commencement of operation	Highways Department/ The contractor				√
3.6	3.8	Two sections of canopies (about 105m) and a semi-enclosure (About 50m)	Along the section of Lei Yue Mun Road in front of EHC Housing Development Phase 1	Prior to commencement of operation	Highways Department/ The contractor				√
3.6	3.8	A 7.7m high and 3m horizontal cantilevered noise barrier of about 115m in length	Along northbound of Lei Yue Mun Road in front of St. Antonius Primary School	Prior to commencement of operation	Highways Department/ The contractor				√
3.6	3.8	A 70 m canopy	Along northbound of Lei Yue Mun Road fronting Yau Tong Housing Development Phase 3	Prior to commencement of operation	Highways Department/ The contractor				√
3.7	3.7	Road traffic noise monitoring	As described in the EM&A Manual	Refer to the EM&A Manual	The contractor and Environmental Team				√

Appendix B3 Implementation Schedule for the Landfill Gas Protection Measures

EIA Ref	EM&A Ref*	Environmental Protection Measures/Mitigation Measures	Location	Timing	Implementation Agent	Implementation Stages **			
						Des	C	O	Dec
Landfill Gas Hazard									
5.13	4.5	Portable gas detectors should be used to check the levels of methane, carbon dioxide and oxygen in depressions, trenches, and other excavations prior to entry and periodically. Atmosphere within manholes or chambers should be checked for methane, carbon dioxide and oxygen prior to entry during operational phase	Within the Landfill Consultation Zone	During construction phase	All contractors		✓		
5.13	4.5	Adequate fire extinguisher, fire-resistant clothing and breathing apparatus should be provided on site during the construction phase Smoking, naked flames and other sources of ignition should be prohibited within 15 m of any excavations and service ducts/chambers. Signs such as 'No Smoking' and 'No Naked Flame' should be in place in the vicinity of excavations and service ducts/chambers	Within the Landfill Consultation Zone	During construction phase	All contractors		✓		
5.13	4.5	Hot works such as welding and flame-cutting should only be carried out at open areas that are at 15 m or more away from any excavations and service ducts/chambers unless these are controlled by a 'Permit to Work' procedure which is authorized by a Safety Officer or an authorized qualified person All electrical equipment to be used in excavations and service ducts/chambers should be intrinsically safe	Within the Landfill Consultation Zone	During construction and operation phase	All contractors/ Highways Department/ Utility companies		✓		✓
5.13	4.5	Landfill gas monitoring	As described in the EM&A Manual	Refer to the EM&A Manual for details	All contractors/ Highways Department/ Utility companies		✓		✓

Appendix B4 Implementation Schedule for the Landscape and Visual Measures

EIA Ref	EM&A Ref*	Environmental Protection Measures/Mitigation Measures	Location	Timing	Implementation Agent	Implementation Stages **		
						Des	C	O
7.7	5.2 & 5.3	Screen hoarding will be used to mitigate visual impacts for those viewing the Works from ground level.	Work site	During construction phase	Highways Department	✓		
7.7	5.2 & 5.3	Preservation (by transplanting if necessary) of any trees identified as being of particular landscape value.	Work site	During construction phase	Highways Department	✓		
7.7	5.2 & 5.3	Protection of existing trees and vegetation to Standards defined by Government (SILTech).	Work site	During design and construction phase	Highways Department	✓		
7.7	5.2 & 5.3	The new carriageways and road structures along Lei Yue Mun Road should be designed and built to minimise excavation into the existing hillside above.	Work site	During construction phase	Highways Department	✓		
7.7	5.2 & 5.3	Conservation of existing CDG or CDV recovered from the site for re-use in landscape restoration.	Work site	During construction phase	Highways Department	✓		
7.7	5.2 & 5.3	Planting of stabilised slopes above Lei Yue Mun Road. Design of Slope works in accordance with latest Technical Guidelines on the Landscape Treatment and Bioengineering of Man-made slopes and Retaining Walls.	Work site	During design and operation phase	Highways Department	✓		✓
7.7	5.2 & 5.3	New street tree and roadside planting both as screening for highways structures and as replacement for roadside trees lost.	Work site	During design and operation phase	Highways Department	✓		✓
7.7	5.2 & 5.3	Proposed sitting out area	Work site	During design and operation phase	Highways Department	✓		✓
7.7	5.2 & 5.3	Architectural design and colouring of highways structures	Work site	During design phase	Highways Department	✓		
7.7	5.2 & 5.3	Architectural design and colouring of noise canopies and semi-enclosure	Work site	During design phase	Highways Department	✓		
7.7	5.2 & 5.3	Architectural design and colouring of footbridge. The strict definition of utility corridors and the phrasing of structural designs of new highway features to maximise the amount of space available for planting	Work site	During design phase	Highways Department	✓		
7.7	5.2 & 5.3	Design of pedestrian footpaths	Work site	During design phase	Highways Department	✓		



APPENDIX C
ENVIRONMENTAL FORMS



APPENDIX D
INTERIM NOTIFICATIONS OF ENVIRONMENTAL
QUALITY LIMITS EXCEEDANCES

Appendix D Interim Notifications of Environmental Quality Limits Exceedances

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

Prepared by: _____

Designation: _____

Signature: _____

Date: _____

Location Plan

