

12.0 ENVIRONMENTAL MONITORING AND AUDIT

12.1 Objectives

The objective of this chapter is to outline the procedures of the EM&A programme for monitoring the environmental performance of the Project construction activities 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 that may be required during the Construction Phase of the Project. An noise EM&A programme will also be required during the operation phase.

The Hong Kong Government's applicable environmental regulations for noise, air quality and water quality, the Hong Kong Planning Standards and Guidelines, the EIAO Technical Memorandum and recommendations in the Investigation for Widening and Reconstruction of Tai Po Road (Shatin Section) EIA study have served as guidance documents in the preparation of these recommendations. This chapter fulfils the requirements of the Study Agreement, Clause 6.14.4.5, and follows the approach recommended in EPD's Generic EM&A Manual.

A separate EM&A Manual has been prepared which gives full details of the EM&A.

This chapter provides the following information as specified in the Agreement:

- (i) Identification and recommendations for monitoring requirements for all phases of development, including:
 - identification of sensitive receivers;
 - monitoring locations;
 - monitoring parameters and frequencies;
 - monitoring equipment to be used;
 - programmes for baseline monitoring and impact monitoring; and
 - data management of monitoring results.
- (ii) The organisation management structure and procedures for auditing of the Project and implementation of mitigation measures that are recommended for the Project;
- (iii) The environmental quality performance limits for compliance auditing for each of the recommended monitoring parameters to ensure compliance with relevant environmental quality objectives, statutory or planning standards;
- (iv) Organisation and management structure and procedures for reviewing the design submissions, monitoring results and auditing the compliance of the monitoring data with the environmental quality performance limits, contractual and regulatory requirements and environmental policies and standards;
- (v) Event and Action plans for impact and compliance procedures;
- (vi) Complaints handling, liaison and consultation procedures; and

- (vii) Interim notification of exceedances, reporting procedures, report formats and reporting frequency including periodical quarterly summary reports and annual reviews to cover all construction, post-Project and operational phases of the development as required.

12.2 Project Organisation

For the purpose of this Report, the Highways Department of the Hong Kong Special Administrative Region Government is referred to as the "Employer" and the "Engineer" is defined as the person who will be responsible for the supervision of the construction of the Project on behalf of the Employer. The Engineer will nominate an Engineer's Representative and Resident Site Staff.

As part of the Resident Site Staff, an Environmental Specialist is to be employed along with support staff for carrying out the environmental monitoring including field measurements, sampling, laboratory testing, analysis of monitoring work results, reporting and auditing. The Environmental Specialist shall be competent and shall have relevant environmental monitoring and audit experience on projects of a similar scale and nature.

The Environmental Specialist will provide an assessment of all environmental work and the Contractor's implementation of environmental mitigation measures required as part of the EIA.

The Contractor may be delegated responsibility for the collection of samples and laboratory testing for the environmental monitoring works as required in this Manual but if this is done then all the work should be under the supervision of the Environmental Specialist.

12.3 Construction Programme

The construction works for the widening and reconstruction works are anticipated to commence in late 2002 or early 2003 and will cover a total period of approximately three and a half years finishing by the year 2006. The construction activities are expected to be carried out for 12 hours per day between the hours of 7:00 and 19:00. There may be a need for limited works in the evenings and at night but these works will be subject to requirements of a Construction Noise Permit issued under the Noise Control Ordinance. The environmental monitoring works should start at the commencement of the construction contract and up to the issue of the completion certificate and cover any restricted period works as appropriate.

12.4 Noise

12.4.1 Noise Parameters

The construction noise levels shall be measured in terms of the A-weighted equivalent continuous sound pressure level (Leq). Leq (30 min) shall be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays. For all other time periods, Leq (5 min) shall be employed for comparison with the EIAO criteria.

L_{10} (1hour) shall also be employed for comparison with EIAO criteria during operational phase. Other information such as traffic flow counts, percentage of heavy vehicles (all vehicles with an unladen weight exceeding 1525 kg) and average speed shall also be obtained during the measuring period for operational noise.

As supplementary information for data auditing, statistical results such as L_{10} and L_{90} shall also be obtained for reference and shall be recorded by the Environmental Specialist. A sample data record sheet is shown in Figure 12.1 for reference.

12.4.2 Monitoring Equipment

As given in the Technical Memorandum (TM) issued under the NCO, sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring.

Immediately prior to and following each noise measurement the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0dB.

Noise measurements shall not be made in fog, rain, wind with a steady speed exceeding 5ms^{-1} or wind with gusts exceeding 10ms^{-1} . The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in ms^{-1} .

The Contractor shall be responsible for the provision of the monitoring equipment. The Contractor 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.

12.4.3 Monitoring Locations

The recommended locations for establishing representative noise monitoring stations are shown in Figure 12.2 along with the proposed construction programme. The specific locations of the monitoring stations are to be determined by the Environmental Specialist and approved by DEP prior to monitoring. The monitoring stations to be monitored during each section of the construction works are shown on Figure 12.2. If the status or locations of noise sensitive receivers change after issuing this manual, the Environmental Specialist shall propose the updated monitoring locations and seek agreement from DEP of the proposal to amend the monitoring locations.

When alternative monitoring locations are proposed, the monitoring locations shall be chosen based on the following criteria:

- (i) Monitoring at sensitive receivers close to the major site activities which are likely to have noise impacts;

- (ii) Monitoring at the noise sensitive receivers as defined in the Technical Memorandum; and
- (iii) Assurance of minimal disturbance to any occupants during monitoring.

The monitoring station shall normally be at a point 1m from the exterior of the sensitive receivers building facade and be at a position 1.2m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen and a correction to the measurements shall be made.

After carrying out noise measurements, noise levels shall be corrected in accordance with Section 2.10, 2.11 and 2.13 of the "Technical Memorandum on Noise From Construction Works Other Than Percussive Piling".

The baseline monitoring and the impact monitoring shall be carried out at the same positions. The Contractor shall establish the construction equipment list and construction schedule which shall be checked by the Engineer's Representative. The timing of the noise impact monitoring work shall be developed by the Environmental Specialist based on the Contractor's construction schedule.

For the traffic noise monitoring in the operational phase, three representative monitoring locations (ON1 - 6/F & 21/F, ON2 - 6/F & 16/F, ON3 - 3/F) are proposed as shown in Figure 12.2b and 12.2d, respectively. The status and locations of noise sensitive receivers may change after issuing the EM & A manual. If such cases exist, the Environmental Specialist shall proposed updated monitoring locations and seek approval from contractor and agreement from EPD of the proposal. The monitoring location shall normally be at a point 1m from the exterior of the sensitive building facade and be at a position 1.2m above the floor level. An alternative position near the noise sensitive receivers with the same noise exposure characteristics may be chosen if there is problem with access to the normal monitoring position. The Environmental Specialist shall agree with the Contractor on the monitoring position and corrections adopted.

12.4.4 Baseline Monitoring

Baseline noise measurements shall be carried out at each monitoring station prior to the commencement of the construction work over a 24 hour period. The baseline monitoring shall be carried out daily for a period of at least two weeks and shall be taken no earlier than three weeks prior to construction works being carried out.

In no circumstance should construction works be carried out within the range of the monitoring stations during the two weeks of baseline monitoring. Any non Project related construction activities in the vicinity of the stations during the baseline monitoring shall be noted and the source and location recorded.

12.4.5 Impact Monitoring

Noise monitoring shall be carried out at each of the designated monitoring stations once every 6 days after construction has commenced.

During construction works, one set of measurements between 0700-1900 hours on normal weekdays shall be taken. If construction works are extended to include works during the hours of 1900-0700, additional weekly impact monitoring shall be carried out during evening and nighttime works and applicable permits shall be obtained by the Contractor.

In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Action Plan in Section 12.4.6 shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be unrelated to the construction activities.

12.4.6 Event and Action Plan for Noise

The Action and Limit levels for construction noise are defined in Table 12.1. Should non-compliance of the criteria occur, action in accordance with Section 12.6.3 shall be carried out for exceedance of the Action Level and the Action Plan shown in Figure 12.3 shall be carried out for exceedance of the limit level.

Table 12.1: Action and Limit Levels for Construction Noise

| Time Period | Action | Limit |
|--|---|------------------|
| 0700-1900 hrs on normal weekdays | When one documented complaint is received | 75* dB(A) |
| 0700-2300 hrs on holidays; and 1900-2300 hrs on all other days | | 60/65/70** dB(A) |
| 2300-0700 hrs of next day | | 45/50/55** dB(A) |
| * reduce to 70 dB(A) for schools and 65 dB(A) during school examination ** to be selected based on Area Sensitivity Rating. | | |

12.4.7 Noise Mitigation Measures

The EIA report has recommended construction noise control and mitigation measures to reduce noise levels from Project construction. The Contractor shall be responsible for the design and implementation of the measures. The recommended construction noise mitigation measures are summarised below:

- (i) the construction activities should be carried out in the daytime period (07.00-19.00) wherever practical;
- (ii) silencers should be installed at the exhaust pipes of the dump trucks, air compressors, mobile cranes, excavators, lorries;
- (iii) mufflers should be installed on pneumatic breakers;
- (iv) acoustic enclosures should be installed for pumps and generators;

- (v) construction of temporary noise barriers along the construction site boundary to screen the equipment;
- (vi) The contractor should avoid work in the area of schools during examinations;
- (vii) good site practice to limit noise emissions at source;
 - minimising the numbers of plant operating in critical areas close to NSRs.
 - avoidance of simultaneous noisy activities;
 - selection of quiet plant and working methods

Mitigation in the form of noise enclosures around noisy activities will require consideration during any evening and night time working, if such work is required. The design of the temporary noise enclosures will be the responsibility of the Contractor who will be required to submit his design to the Engineer for approval before carrying out the work. The design will also have to be submitted to DEP, as the Authority under the Noise Control Ordinance, with the Contractor's application for a Construction Noise Permit.

If the above measures are not sufficient to restore the construction noise quality to an acceptable level, upon advice from the Environmental Specialist, the Contractor shall liaise and gain approval from the Engineer on other mitigation measures proposed to reduce noise levels to an acceptable level and carry out these measures. The measures may include but not be limited to amendments to the construction schedule to restrict noisy equipment to certain time periods and restricting the type of equipment that can be used during construction at any one time.

12.4.8 Operational Phase Monitoring

Three noise measurements for 30 minutes each shall be carried out by the Environmental Specialist at each of the selected noise monitoring points during peak hours so that there will not be a situation in which the flow is too low to enable a fair comparison.

Measurement of noise noise should be compared with the predicted noise level using the counted traffic data at the time of measurement.

The Environmental Specialist will comment on the discrepancies and report to EPD for reference if it is necessary.

There will be no Event and / or Action Plan applicable to traffic noise monitoring during the operational phase.

12.5 Air Quality

12.5.1 Air Quality Parameters

Monitoring of the Total Suspended Particulates (TSP) levels shall be carried out to ensure that construction works are not generating dust which exceeds the acceptable level. Timely action should be taken to rectify the situation if an exceedance is detected.

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

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, any other special phenomena and work progress of the concerned site shall be recorded. A sample data sheet is shown in Figure 12.4.

12.5.2 Monitoring Equipment

A high volume sampler in compliance with the following specifications shall be used for carrying out the 1-hr and 24-hr TSP monitoring:

- (i) 0.6-1.7 m³/min (20-60 SCFM) adjustable flow range;
- (ii) equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
- (iii) installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
- (iv) capable of providing a minimum exposed area of 406 cm² (63 in²);
- (v) flow control accuracy: +/- 2.5% deviation over 24-hr sampling period;
- (vi) equipped with a shelter to protect the filter and sampler;
- (vii) incorporating an electronic mass flow rate controller or equivalent device;
- (viii) equipped with a flow recorder for continuous monitoring;
- (ix) provided with a peaked roof inlet;
- (x) equipped with a manometer;
- (xi) able to hold and seal the filter paper to the sampler housing in a horizontal position;
- (xii) easily changed filter; and
- (xiii) capable of operating continuously for 24-hr period.

The high volume samplers 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. Calibration of dust monitoring equipment shall be carried out upon installation and thereafter at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognised primary standard and be calibrated annually. The

calibration data shall be properly documented for future reference. All the data shall 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 recorded in the data sheet as described in Section 12.5.1.

If it is proposed to use a direct reading dust meter to measure 1-hr TSP levels, sufficient information shall be provided to the Engineer to prove that the instrument is capable of achieving a comparable result with the high volume sampler. The instrument shall also be calibrated regularly, and the 1-hr sampling shall be checked periodically by the high volume sampling to check the validity and accuracy of the results measured by the direct reading method.

Wind data monitoring equipment shall also be obtained at appropriate locations for logging wind speed and wind direction near to the dust monitoring locations.

For installation and operation of wind data monitoring equipment, the following points shall be observed:

- (i) the wind sensors should be installed on masts at an elevated level 10 m above ground so that they are clear of obstructions or turbulence caused by the buildings;
- (ii) the wind data should be captured by a data logger to be down-loaded for processing at least once a month;
- (iii) the wind data monitoring equipment should be re-calibrated at least once every six months; and
- (iv) wind direction should be divided into 16 sectors of 22.5 degrees each.

12.5.3 Laboratory Measurement/Analysis

A clean laboratory with constant temperature and humidity control and equipped with necessary measuring and conditioning instruments shall be used for sample analysis and equipment calibration and maintenance. The laboratory shall be HOKLAS accredited for the measurements to be made.

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 Engineer. The Contractor shall provide the Engineer with one copy of Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for 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-hr 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.

12.5.4 Monitoring Locations

The air quality sensitive receivers as determined by the EIA and recommended dust monitoring locations are shown in Figure 12.5. The specific locations of the monitoring stations are to be determined by the Environmental Specialist and approved by DEP prior to monitoring. The status and locations of dust sensitive receivers may change after the issue of this manual. If this happens, the Environmental Specialist shall propose updated monitoring locations and seek agreement from DEP on the proposal.

When alternative monitoring locations are proposed, the following preferred locations and factors shall be considered:

- (i) the site boundary or locations close to the major dust emission source;
- (ii) close to the sensitive receptors; and
- (iii) prevailing meteorological conditions.

The Environmental Specialist shall define the position of the high volume samplers. When positioning the samplers, the following points shall be noted:

- (i) a horizontal platform with appropriate support to secure the samplers against gusty wind shall be provided;
- (ii) the distance between the sampler and an obstacle, such as buildings, shall be at least twice the height that the obstacle protrudes above the sampler;
- (iii) a minimum of 2 metres of separation from walls, parapets and penthouses is required for rooftop samplers;
- (iv) a minimum of 2 metre separation from any supporting structure, measured horizontally is required;
- (v) no furnace or incinerator flue is nearby;
- (vi) airflow around the sampler is unrestricted;
- (vii) any wire fence and gate to protect the sampler, shall not cause any obstruction during monitoring;
- (viii) permission must be obtained to set up the samplers and to obtain access to the monitoring stations;
- (ix) a secured supply of electricity is needed to operate the samplers; and

- (x) no two samplers should be placed less than 2 metres apart.

Prior to Project construction, the construction schedule shall be established and the dust monitoring schedule shall be developed by the Environmental Specialist.

12.5.5 Baseline Monitoring

Baseline monitoring shall be carried out at representative locations as shown on Figure 12.5 for at least 14 consecutive days prior to the start of the construction works to obtain daily 24-hr TSP samples. 1-hr sampling shall also be carried out at least 3 times per day during the same period. Monitoring shall take place within a 3 weeks period prior to the commencement of construction works.

During the baseline monitoring, there should not be any construction or dust generation activities in the vicinity of the monitoring stations.

In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, the monitoring shall be carried out at alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall be approved by DEP.

In the event that insufficient baseline monitoring data or questionable results are obtained, the Environmental Specialist shall liaise with the DEP to agree on an appropriate set of data to be used as a baseline reference.

Ambient conditions may vary seasonally and shall be reviewed at three monthly intervals. If the Environmental Specialist considers that the ambient conditions have been changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be at times when the Contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should a change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, shall be revised. The revised baseline levels and air quality criteria shall be agreed with the DEP.

12.5.6 Impact Monitoring

Impact monitoring shall be carried out 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 four of the designated 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 at four locations when the highest dust impact occurs. The stations to be monitored should be selected based on the prevailing wind direction and their proximity to the active construction works.

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

In case of non-compliance with the air quality criteria, more frequent monitoring, as specified in the Action Plan in Section 12.5.7, shall be conducted within 24 hours after the non compliance is detected. This additional monitoring shall be

continued until the excessive dust emission or the deterioration in air quality is rectified.

12.5.7 Event and Action Plan for Air Quality

The baseline monitoring results will form the basis for determining the air quality criteria for the impact monitoring. The Environmental Specialist shall compare the impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. Table 12.2 shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance with the air quality criteria occur, the Environmental Specialist, the Engineer and the Contractor shall undertake their specified actions in accordance with the Action Plan shown in Figures 12.6a to 12.6d.

Table 12.2: Action and Limit Levels for Air Quality

| Parameters | Action | Limit |
|--|--|-------|
| 24 Hour TSP Level in mg/m ³ | For baseline level < 108 mg/m ³ , Action level = average of baseline level plus 30% and Limit level For baseline level > 108 mg/m ³ and baseline level < 154 mg/m ³ , Action level = 200 mg/m ³ For baseline level > 154 mg/m ³ , Action level = 130% of baseline level | 260 |
| 1 Hour TSP Level in mg/m ³ | For baseline level < 154 mg/m ³ , Action level = average of baseline level plus 30% and Limit level For baseline level > 154 mg/m ³ and baseline level < 269 mg/m ³ , Action level = 350 mg/m ³ For baseline level > 269 mg/m ³ , Action level = 130% of baseline level | 500 |

12.5.8 Dust Mitigation Measures

The EIA report has recommended dust control and mitigation measures. The Contractor shall be responsible for the design and implementation of the measures below.

- (i) watering of unpaved roads, which results in road dust suppression by forming moist cohesive films among the discrete grains of road surface material. An effective watering programme, i.e. twice daily watering with complete coverage, is estimated to reduce erosion on unpaved roads by 50%;
- (ii) watering of open areas every 1.5 hours is estimated to reduce dust emissions by 70%;
- (iii) watering should be implemented to control dust where breaking of oversize rock/concrete is required. Water spray should be used during the handling of fill material at the site and at active cuts, excavation and fill sites where dust is likely to be created;

- (iv) dropping heights for excavated materials should be controlled to a practical height to minimize the fugitive dust arising from unloading;
- (v) materials being transported by truck should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport;
- (vi) all stockpiles of aggregate or spoil should be enclosed or covered and water applied in dry or windy condition;
- (vii) effective water sprays should be used on the site at potential dust emission sources;

If the above measures are not sufficient to restore the air quality to acceptable levels upon the advice of the Environmental Specialist, the Contractor shall liaise with the Environmental Specialist on other mitigation measures, propose these measures to the Engineer for approval, and implement the measures.

12.6 Water Quality Monitoring

12.6.1 Water Quality Inspections

The monitoring of the Contractor's compliance with water quality requirements through a sampling and laboratory analysis programme will be difficult to implement by sampling in the receiving environment due to the closed nature of the receiving system and the complexity of the inputs into the storm water system between the project area and the point of discharge into the Shing Mun River Channel. A more practicable approach is to carry out regular site inspection of the construction works to determine compliance with the recommended mitigation measures.

12.6.2 Monitoring Activities

The inspection should pay particular attention to:

- (i) The functioning of on site surface water collection channels and sediment traps.
- (ii) The functioning of interception channels at the boundary of the works areas.
- (iii) The covering of stockpiles of fill and construction materials and the routing of any run off through the sediment traps.
- (iv) The pumping procedures for emptying trenches and other excavations and the use of silt traps prior to the discharge of the water to the storm water system.
- (v) The use of washwater for hosing down concrete mixing and delivery vehicles and other vehicles leaving the site and the routine of excess water from the facility through sediment traps.

- (vi) The operation of the plant maintenance areas to control small spillages and the correct management of the fuel storage bunded area.
- (vii) The connection of the site office wastewater discharge to an existing foul sewer if appropriate or the operation of the kitchen wastewater grease trap and the regular emptying of the chemical toilets.
- (viii) The operation of the roof rain water collection and drainage system.

12.6.3 Monitoring Locations

The monitoring area for carrying out site inspections should include the construction site as well as the surrounding environment.

12.6.4 Event Action Plan

The monthly monitoring and audit report should contain details of the observations made during each site visit and should include an indication when the mitigation measures were being implemented correctly. Failure to comply with the required mitigation measures and the consequent discharge of water which does not comply with the WPCO licence should be reported in the monthly reports as a non-compliance.

12.7 Site Environmental Audit

12.7.1 Site Inspections

Site inspections 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.

The Environmental Specialist is responsible for carrying out site inspections.

Regular site inspections shall be carried out at least three times per week. The areas of inspection shall not be limited to the site area and should also include the environmental conditions outside the site which are likely to be affected, directly or indirectly, by the site activities.

The Environmental Specialist shall make reference to the following information while conducting the inspections:

- (i) the EIA recommendations on environmental protection and pollution control mitigation measures as stated in the EIA report;
- (ii) work progress and programme;
- (iii) individual works methodology proposals;
- (iv) the contract specifications on environmental protection;
- (v) the relevant environmental protection and pollution control laws;
- (vi) previous site inspection results; and

- (vii) environmental monitoring data.

The Contractor shall update the Environmental Specialist with all relevant information on the construction works prior to carrying out the site inspections. The site inspection results and associated recommendations on improvements to the environmental protection and pollution control works shall be submitted by the Environmental Specialist to the Contractor as soon as practicable for reference and for taking immediate action. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection.

Ad hoc site inspections shall also be carried out if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint or as part of the investigation work as specified in the Action Plan for environmental monitoring and audit.

12.7.2 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 with which the construction activities shall comply.

In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the Engineer for approval shall be vetted by the Environmental Specialist to see whether sufficient environmental protection and pollution control measures have been included.

The Environmental Specialist 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 can be prevented.

The Contractor shall regularly copy relevant documents to the Engineer so that the checking work can be carried out. The document shall include at minimum the updated Work Progress Reports, the updated Works Programme, the application letters for different licences/permits under the environmental protection laws and all valid licences/permits.

After reviewing the document, the Environmental Specialist shall advise the Engineer 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. The Environmental Specialist shall advise the Contractor and the Engineer on the current status on licence/permit application and any environmental protection and pollution control preparation works that may not cope with the works programme or may result in potential violation of environmental protection and pollution control requirements.

Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The Engineer and Environmental Specialist 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.

12.7.3 Environmental Complaints

Complaints shall be referred to the Environmental Specialist for carrying out complaint investigation procedures.

The Environmental Specialist shall undertake the following procedures upon receipt of the complaints:

- (i) log complaint and date of receipt into the complaint database;
- (ii) investigate the complaint and discuss with the Contractor to determine its validity and to assess whether the source of the problem is due to works activities;
- (iii) if a complaint is considered valid by the Engineer or DEP and due to the works, the Contractor shall identify mitigation measures;
- (iv) if mitigation measures are required, the Environmental Specialist shall advise the Contractor accordingly;
- (v) review the Contractor's response on the identified mitigation measures and the updated situation;
- (vi) if the complaint is transferred from DEP, submit interim report to DEP on status of the complaint investigation and follow-up action within the time frame assigned by DEP;
- (vii) undertake additional monitoring and audit to verify the situation if necessary and ensure that any valid reason for complaint does not recur;
- (viii) report the investigation results and the subsequent actions on the source of the complaint for responding to complainant (If the source of complaint is DEP, the results should be reported within the time frame assigned by DEP); and
- (ix) record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

During the complaint investigation work, the Contractor shall cooperate with the Environmental Specialist 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 measures. The Environmental Specialist shall check that the measures have been carried out by the Contractor.

12.8 Reporting

12.8.1 General

The following reporting requirements are based upon a paper documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with DEP. The reports are required to be

prepared by the Environmental Specialist and shall be approved in writing by DEP.

12.8.2 Baseline Monitoring Report

The Environmental Specialist shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of baseline monitoring.

Copies of the Baseline Environmental Monitoring Report shall be submitted to the Contractor and the DEP. The Environmental Specialist shall liaise with the relevant parties on the exact number of copies required.

The baseline monitoring report shall include at least the following:

- (i) up to half a page executive summary;
- (ii) background information;
- (iii) Figures showing locations of the baseline monitoring stations;
- (iv) monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - name of laboratory and equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency and duration; and
 - QA/QC results and detection limits.
- (v) details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period;
 - other factors which might affect the results;
- (vi) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data;
- (vii) revisions for inclusion in the EM&A Manual; and
- (viii) comments and conclusions.

12.8.3 Monthly EM&A Reports

The results and findings of all EM&A work required in this Manual shall be recorded in the Monthly EM&A Reports prepared by the Environmental Specialist. The Monthly EM&A Reports shall be prepared and submitted within 10 working days of the end of each reporting month, with the first report due one month and 10 days after construction commences.

Copies of each Monthly EM&A Report shall be submitted to the Contractor and the DEP. Before submission of the first EM&A Report, the Environmental Specialist shall liaise with the parties on the exact number of copies and format of the reports in both hard copy and electronic medium.

The Environmental Specialist shall review the monitoring programme every 6 months or on as needed basis in order to cater for any changes in the surrounding environment and nature of works in progress and shall document all observation in the monthly report.

12.8.4 First Monthly EM&A Report

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

- (i) 1-2 pages executive summary;
- (ii) basic Project information including a synopsis of the Project organisation (including key personnel, contact names and telephone numbers), a Figure of the Project area showing the environmentally sensitive receivers and the locations of monitoring and control stations, programme, management structure and the work undertaken during the month;
- (iii) a brief summary of EM&A requirements including:
 - all monitoring parameters;
 - environmental quality performance limits (Action and Limit levels);
 - Event-Action Plans;
 - environmental mitigation measures, as recommended in the Project EIA study final report;
 - environmental requirements in contract documents;
- (iv) advice on the implementation status of environmental protection and pollution control/mitigation measures as recommended in the Project EIA study report and summarised in the updated implementation schedule;
- (v) Figures showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (vi) monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - name of laboratory and equipment used and calibration details;
 - parameters monitored;
 - monitoring locations;
 - monitoring date, time, frequency, and duration; and
 - QA/QC results and detection limits.
- (vii) graphical plots of trends of monitored parameters at the representative monitoring stations annotated against the following:
 - major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
- (viii) advice on the solid and liquid waste management status;
- (ix) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

- (x) a review of the reasons for and the implications of noncompliance including a review of pollution sources and working procedures;
- (xi) a description of the actions taken in the event of noncompliance and deficiency reporting and any follow-up procedures related to earlier noncompliance;
- (xii) a summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints; and
- (xiii) an account of the future key issues as assessed from the works programme and work method statements.

12.8.5 Subsequent Monthly EM&A Reports

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

- (i) title page
- (ii) executive summary (1-2 pages):
 - breaches of all Action and Limit levels;
 - complaint log;
 - reporting changes; and
 - future key issues
- (iii) contents page
- (iv) environmental status:
 - Figure showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
 - summary of non-compliance with the environmental quality performance limits; and
 - summary of complaints
- (v) environmental issues and actions
 - review issues carried forward and any follow-up procedures related to earlier non-compliance (complaints and deficiencies);
 - description of the actions taken in the event of noncompliance and deficiency reporting;
 - recommendations (should be specific and target the appropriate party for action); and
 - implementation status of the mitigatory measures and the corresponding effectiveness of the measures
- (vi) future key issues
- (vii) 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: major activities being carried out on site during the period; weather conditions during

- the period; and any other factors which might affect the monitoring results;
- monitoring schedule for the present and next reporting period;
- cumulative complaints statistics; and
- details of complaints, outstanding issues and deficiencies.

12.8.6 Quarterly EM&A Summary Reports

The Environmental Specialist shall submit Quarterly EM&A Summary Reports which should be around 5 pages (including about 3 of text and tables and 2 of figures) and shall contain at minimum the following information:

- (i) up to half a page executive summary;
- (ii) basic Project information including a synopsis of the Project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;
- (iii) a brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (Action and Limit levels); and
 - environmental mitigation measures, as recommended in the Project EIA study final report;
- (iv) advice on the implementation status of environmental protection and pollution control/mitigation measures as recommended in the Project EIA study report and summarised in the updated implementation schedule;
- (v) Figures showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (vi) graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
 - the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
- (vii) advice on the solid and liquid waste management status;
- (viii) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (ix) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- (x) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

- (xi) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (xii) comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
- (xiii) proponents' contacts and any hotline telephone number for the public to make enquiries.

12.8.7 Annual/Final EM&A Review Reports

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

- (i) Executive Summary (1-2 pages);
- (ii) Figures showing the project area any environmental sensitive receivers and the locations of the monitoring and control stations;
- (iii) basic project information including a synopsis of the project organization, contacts for key management staff and a synopsis of work undertaken during the course of the project or past twelve months;
- (iv) a brief summary of EM&A requirements including:
 - environmental mitigation measures as recommended in the project EIA study final report;
 - environmental impact hypotheses tested;
 - environmental quality performance limits (Action and Limit Levels);
 - all monitoring parameters;
 - Event-Action Plans;
- (v) a summary of the implementation status of environmental protection and pollution control/mitigation measures as recommended in the project EIA study report and summarised in the updated implementation schedule;
- (vi) graphical plots and the statistical analysis of the trends of monitored parameters over the course of the projects including the post-project monitoring (or the past twelve months for annual reports) for all monitoring stations annotated against:
 - the major activities being carried out on site during the period;
 - weather conditions during the period, and
 - any other factors which might affect the monitoring results;
- (vii) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (viii) a review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- (ix) a description of the actions taken in the event of non-compliance;

- (x) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (xi) a summary record of notifications of summonses 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;
- (xii) a review of the validity of EIA predictions and identification of shortcomings in the EIA recommendations; and
- (xiii) a review of the effectiveness and efficiency of the mitigation measures;
- (xiv) a review of the success of the EM&A programme to identify any deterioration and to initiate prompt effective mitigatory action when necessary cost effectively.

12.8.8 Data Keeping

The site documents 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 documents shall be kept by the Environmental Specialist and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the documents. The monitoring data shall also be recorded in magnetic media, and the software copy shall be available upon request. All the documents and data shall be kept for at least one year after completion of the construction contract.

12.8.9 Interim Notifications of Environmental Quality Limit Exceedances

With reference to Event/Action Plans, when the environmental quality limits are exceeded, the Environmental Specialist shall immediately notify the Contractor, the Engineer and DEP, as appropriate. The notification shall be followed up with advice to each party on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in Figure 12.7.