4. Construction Phase EM&A Manual

4.1 Policy

The Engineer's Representative (ie. resident engineer) and the Contractor shall adopt the Environmental Policy Statements, as promulgated by the Project Proponent for the construction of the project in order to the foster a sound EM&A programme to protect the environment in accordance with environmental protection conditions, EIA/EA study recommendations, *etc.* set out in Section 4.4 below. Policy statements shall be adopted from typical examples given in Section 2.1 and Appendix B1.

4.2 Purpose of the Construction Phase EM&A Manual

The purpose of the Construction Phase Environmental Monitoring and Audit (EM&A) Manual is to guide the setup of an EM&A programme during a project's construction phase to ensure compliance with the environmental protection conditions, Environmental Impact Assessment (EIA) study recommendations, relevant environmental protection, and pollution prevention and control legislation. The Construction Phase EM&A Manual will be used to assess the effectiveness of, *inter alia,* the implementation of the recommended environmental impact mitigation measures and to identify the need for any additional mitigation measures or remedial action.

The Construction Phase EM&A Manual outlines the monitoring and audit programme to be undertaken for the construction of the development project. It aims to provide systematic procedures for the minimization and amelioration of environmental impacts associated with the construction works, the effective monitoring and audit of such impacts and the assessment of performance of any mitigation measures.

The Hong Kong Planning Standards and Guidelines, relevant EIA/EA study requirements and recommendations, any related ACE conditions and endorsed public comments on the development project, ProPECC Notes, etc. comprise the environmental standards and guidelines to be used in the preparation of the Construction Phase EM&A Manual.

The Construction Phase EM&A Manual shall contain the following :

(a) duties of the Environmental Team (ET) Leader, the Independent Checker (Environment) (ICE), Engineer's Representative and Contractor, in relation to the project's environmental monitoring and audit requirements during construction;

(b) information on the project organisation and programming of construction activities;

(c) the project construction schedule and the necessary environmental monitoring and audit programme to track the environmental impacts;

(d) requirements for the review of pollution sources and working procedures in the event of non-compliance of the project's environmental performance criteria;

(e) environmental monitoring protocols and their technical requirements;

(f) environmental auditing procedures;

(g) requirements for the documentation of environmental monitoring and audit data, and appropriate reporting procedures; and

(h) complaint resolution procedures.

[For the purpose of the Construction Phase EM&A manual, the "Architect/Engineer" shall refer to the Architect/Engineer as defined in the Contract and the Architect/Engineer's Representative (A/ER), in cases where the Architect/Engineer's powers have been delegated to the A/ER, in accordance with the Contract.]

A flow chart of the general Construction Phase EM&A activities is shown in Figure 4.1.

4.3 Project Details

4.3.1 Background

This section of the Construction EM&A Manual describes the relevant background to the project. The details of project construction and the inter-relationship of this project with other phases of the development (if applicable) should also be addressed. The requirements of the project EM&A programme shall be cross referenced to the project environmental protection conditions, EIA/EA study requirements, et al, for all phases of project implementation, and shall be fully documented in the project Implementation Schedule. It is essential for the Construction Phase EM&A Manual to use scaled layout plans to illustrate; the locations of works (including any off site works areas, spoil disposal sites, etc.), any issues/aspects and details of the existing surrounding environment and the sensitive receivers, that are likely to have a bearing on the environmental performance of the project.

4.3.2 Project Organization

The project organisation, its lines of communication and the hierarchy of environmental management in relation to the overall project management structure,

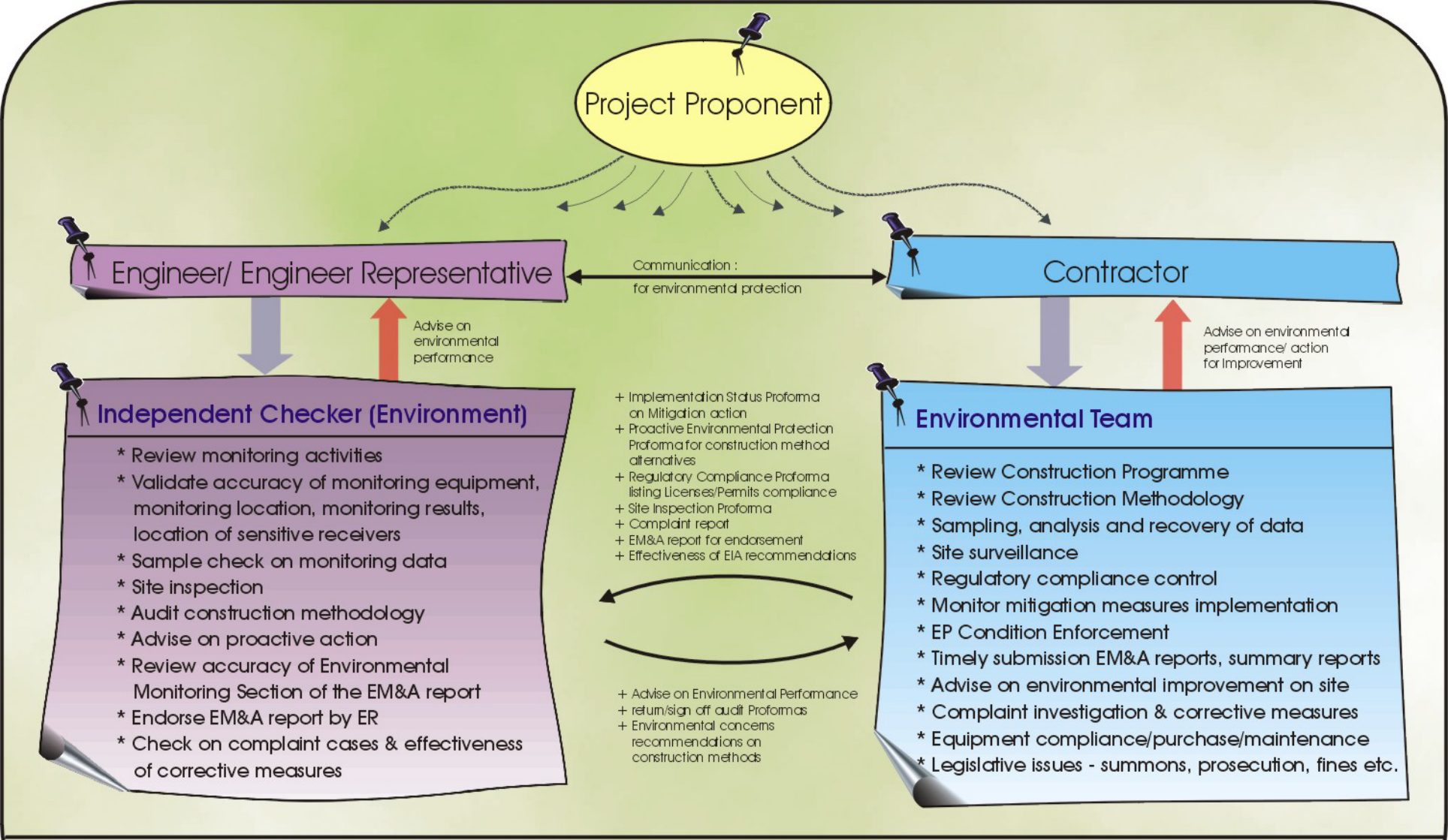

Figure 4.1 Construction Phase Environmental Monitoring & Audit Procedure

shall be included in the Construction Phase EM&A Manual.

4.3.3 Construction Programme

A works programme for the project is required to illustrate project activities, their associated environmental impacts and the means for effective mitigation of such impacts (see sample programme in Figure 4.2). The programme shall identify the appropriate timing and sequence for the implementation of the required environmental protection/mitigation measures. The ET Leader shall make reference to the works progress and programme during the construction stage, to schedule the EM&A works. The Contractor shall provide the relevant works information to the ET Leader for formulating the EM&A schedule. The construction programme and related EM&A schedule shall be updated in the baseline/monthly report submissions, as necessary. A programme chart shall be used to illustrate the details.

4.4 EIA Recommendations and EM&A Requirements

All Environmental Protection conditions, EIA/EA study recommendations and requirements, ACE conditions, and any endorsed public comments related to construction phase of the development project, shall be included in the Construction Phase EM&A Manual in a tabulated format for easy reference (ie. Implementation Schedule, see Appendix D1)

4.5 Environmental Team

The ET Leader and the ET shall be employed to conduct the EM&A programme and ensure the Contractor's compliance with the project's environmental performance requirements during construction. The duties are:

(a) sampling, analysis and statistical evaluation of monitoring parameters with reference to the EIA/EA study recommendations and requirements, (the monitoring requirements given at Appendix D2 are for reference only. Specific project EM&A programmes, derived from approved EIA/EA studies, may vary from the requirements given at Appendix D2);
(b) environmental site surveillance;
(c) audit of compliance with environmental protection, and pollution prevention and control regulations;
(d) monitor the implementation of environmental mitigation measures;
(e) monitor compliance with the environmental protection clauses/specifications in the Contract;
(f) review construction programme and comment as necessary;
(g) review construction methodology and comment as necessary;
(h) complaint investigation, evaluation and identification of corrective measures;
(i) liaison with Independent Checker (Environmental) on all environmental

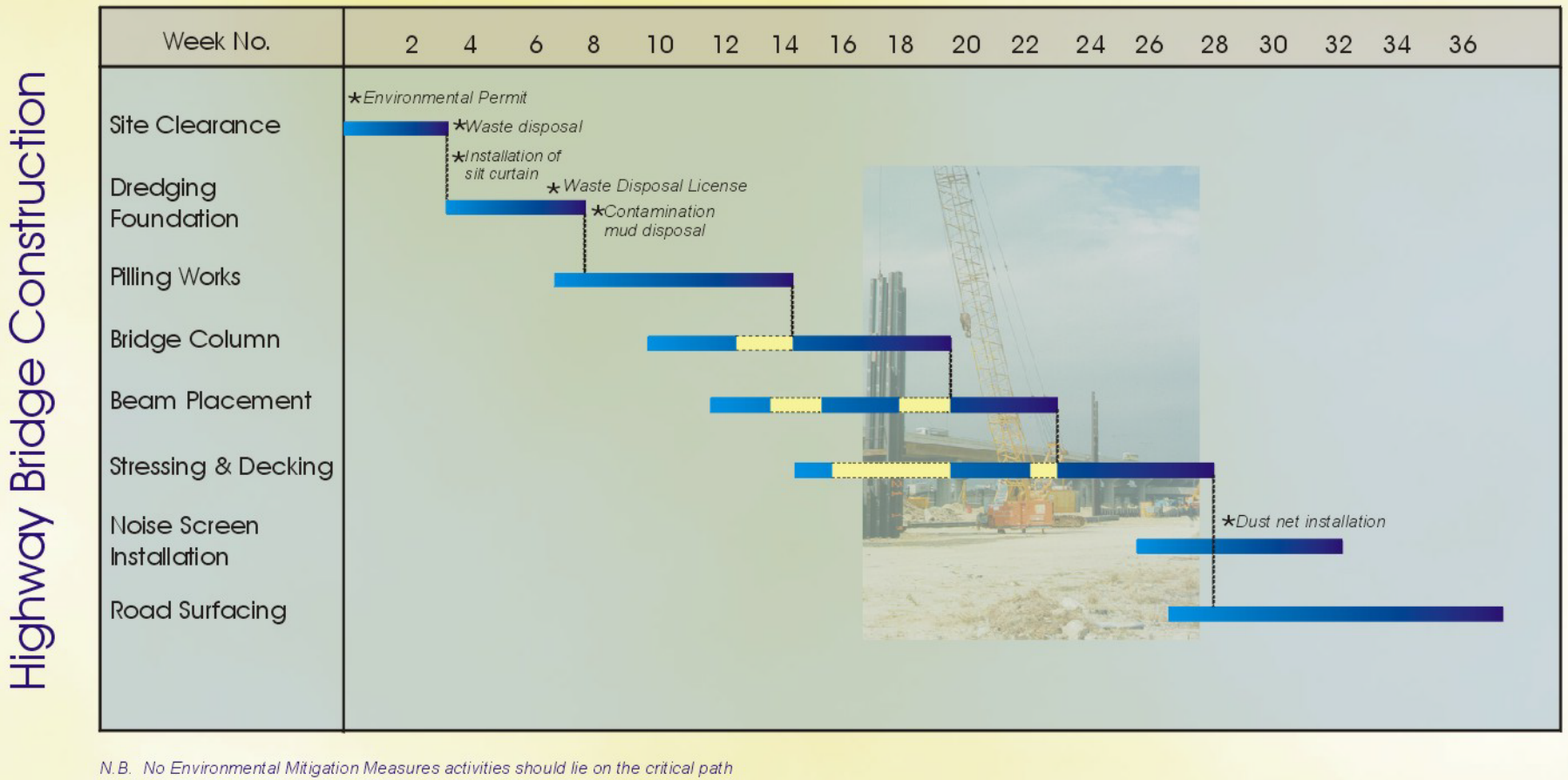

Figure 4.2 Sample Construction Programme with Environmental Protection /Mitigation Measures Milestones

performance matters, and timely submission of all relevant EM&A proforma (see Appendix D1) for IC(E)'s approval;

(j) advice to the Contractor on environmental improvement, awareness, enhancement matters, etc., on site; and

(k) timely submission of the EM&A report to the Project Proponent and the Director of Environmental Protection.

The ET shall be led and managed by the ET leader. The ET leader shall have relevant education, training, knowledge, experience and professional qualifications subject to the approval of the Architect/Engineer's Representative and the Director of Environmental Protection.

Suitably qualified staff shall be included in the ET, and resources for the implementation of the EM&A programme shall be allocated in time under the Contract, to enable fulfilment of the project's EM&A requirements as specified in the Construction Phase EM&A Manual.

4.6 Independent Checker (Environment)

The Independent Checker (Environment) (IC(E)) shall advise the Engineer's Representative on environmental issues related to the project. The role of the Checker shall be independent from the management of construction works; but, the Checker shall be empowered to audit the environmental performance of construction. The Checker shall have project management experience in addition to the requirements of the ET leader stated in Section 4.6. The appointment of the Checker is subject to the approval of the Engineer's Representative.

The main duty of the IC(E) is to carry out environmental audit of the construction project; this shall include, inter alia, the followings:

(a) review and audit all aspects of the EM&A programme;

(b) validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers;

(c) carry out random sample check and audit on monitoring data and sampling procedures, etc;

(d) conduct random site inspection;

(e) audit the EIA/EA recommendations and requirements against the status of implementation of environmental protection measures on site;

(f) review the effectiveness of environmental mitigation measures and project environmental performance;

(g) on a needs basis, audit the Contractor's construction methodology and agree the least impact alternative in consultation with the ET leader and the Contractor;

(h) check complaint cases and the effectiveness of corrective measures;

(i) review EM&A report submitted by the ET leader; and
(j) feedback audit results to ET by signing off relevant EM&A proformas.

4.7 Technical Requirements for Monitoring: Location, Sampling, Frequency and Laboratory Analysis

The Construction EM&A Manual's coverage of the project's requirements for environmental monitoring and audit shall be derived in detail for the approved EIA/EA study Final Report, as described in Section 4.4. For a typical construction site in Hong Kong, checklist requirements for air, noise, water and waste monitoring are provided in Appendix D2.

(a) In accordance with the requirements of the Construction Phase EM&A Manual:

(i) all sources of environmental impacts due to the activities of the development shall be identify and quantified and documented in the EM&A reports;

(ii) all environmentally sensitive areas as a result of the development project shall be identified and documented in the EM&A reports;

(iii) environmental monitoring is a systematic collection of data:

- Baseline Monitoring: refers to the measurement of environmental parameters during a representative pre-project period for the purpose of determining the nature and ranges of natural variation and to establish, where appropriate, the nature of changes and to demonstrate the suitability of the proposed impact, control and reference monitoring stations;

- Impact Monitoring: involves the measurement of environmental parameters during project construction and implementation so as to detect changes, if there is any, in these parameters which can be attributed to the project; and

- Compliance Monitoring: takes the form of sampling to ensure regulatory requirements and standards are observed.

(b) For the setting up of a field laboratory, no less requirement than HOKLAS accreditation is required, and approval for such field facility shall be sought from the Director of Environmental Protection.

4.8 Site Surveillance

Site surveillance provides a direct means to assess and ensure the project's environmental protection and pollution control measures are in compliance with the contract specifications. Site Surveillance shall be undertaken regularly and routinely by the Environmental Team to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are implemented in accordance with EIA/EA recommendations. With well defined pollution control and impact mitigation specifications and a established efficient and remedial action reporting system, site inspection is an effective "tool" to ensure acceptable environmental performance on the construction site.

The ET Leader is responsible for formulation of the environmental site inspection, deficiency and remedial action reporting system, and for carrying out the site inspection works. He shall in consultation with the IC(E), prepare a procedure for the site inspection, deficiency and remedial action reporting requirements; and submit to the Contractor for agreement and to the A/ER for approval, within 21 days of commencement to the construction contract..

Regular site inspections shall be carried out at least once per week for all works areas. The inspections shall cover the environmental situation, pollution control and mitigation measures within the Site; they shall also review the environmental situation outside the Site area which is likely to be affected, directly or indirectly, by the site activities. The ET Leader shall make reference to the following information in conducting the inspection:

(a) the EIA/EA recommendations and requirements on environmental protection and pollution control mitigation measures;
(b) works progress, programme, site/aerial photos and site plans;
(c) individual construction works methodology proposals (which shall include proposals on associated pollution control measures);
(d) the contract specifications for environmental protection and pollution prevention control;
(e) the relevant environmental protection and pollution control laws, ProPECC Notes (see Appendix B2); and
(f) previous site inspection results.

The Contractor shall update the ET Leader with all relevant information of the construction contract for him to carry out the site inspections. The inspection report results and its recommendations for any necessary improvements in the project's environmental performance shall be submitted, in a site inspection proforma, to the IC(E) and the Contractor within 24 hours, for reference and the taking of immediate remedial action. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and remedial action reporting system (formulated by the ET Leader) to report on any remedial measures subsequent to the site inspections.

Ad hoc site inspections shall also be carried out by the ET and/or IC(E) if major unacceptable or unforeseen 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.

4.9 Environmental Compliance

There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution prevent and control laws in Hong Kong with which the construction activities shall comply.

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 can be prevented.

The Contractor shall regularly copy relevant documents to the ET Leader so that the checking of a project's environmental performance can be carried out effectively. The documents to be submitted by the Contractor shall include at least the updated Work Progress Reports, the Works Programme, application for any necessary licence/permits under relevant environmental protection laws, and all the valid licence/permits received to date. The site diary shall also be available for the ET Leader's inspection upon his request.

After reviewing the documents, the ET Leader shall advise the Contractor of any non-compliance with the project contractual and legislative requirements on environmental protection and pollution control. The Contractor shall require to take follow-up and appropriate remedial actions. If the ET Leader's review concludes that the current status of licence/permit application and any planned environmental protection and pollution control works may not cope with the works programme, or potential violation of environmental protection and pollution control requirements may arise, he shall advise the Contractor and the A/ER accordingly. The review shall be copied to IC(E) for any follow-up action.

Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The A/ER shall follow up to ensure that appropriate action has been taken by the Contractor in order that the project's environmental protection and pollution control requirements are fulfilled.

4.10 Choice of Construction Method

At times during the construction phase the Contractor may submit method statements for various aspects of construction (NB. This state of affairs would only apply to those construction methods that the EIA/EA study has not imposed conditions; for construction methods that have been assessed in the EIA/EA study the Contractor is bound to follow the requirements and recommendations in the EIA/EA study). Contractor's options for alternative construction methods may introduce adverse environmental impacts into the

project. It is the responsibility of the Environmental Team Leader and the Environmental Team, in accordance with established standards, guidelines and EIA/EA study recommendation and requirements as per Section 4.4 above, to review and determine the adequacy of the environmental protection and pollution control measures in the Contractor's proposal in order to ensure no unacceptable impacts would result. To achieve this end, the Environmental Team Leader shall provide a completed copy of the Proactive Environmental Protection Proforma (see Appendix D1) to the Independent Checker (Environment) for approval. The Independent Checker (Environment) should audit the review of the construction method and endorse the proposal on the basis of no adverse environmental impacts as per Section 4.4 requirements and/or any established standards or guidelines.

4.11 Variation of Works

The project proponent shall distinguish project changes from the original proposal as described in the EIA/EA study and notify the Director of Environmental Protection for further action.

4.12 Complaint Procedure

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 IC(E) immediately;
(b) investigate the complaint to determine its validity, and to assess whether the source of the problem is due to project works;
(c) if a complaint is valid and due to project works, identify mitigation measures in consultation with the IC(E);
(d) if mitigation measures are required, advise the Contractor accordingly;
(e) review the Contractor's implementation of the identified and required mitigation measures, and the current 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 complaint if necessary, and ensure that any valid reason for complaint does not recur through proposed amendments to work methods, procedures, machines and/or equipment, etc.;
(h) report the investigation results and the subsequent actions to the complainant (If the source of complaint is identified through EPD, the results should be reported within the time frame assigned by EPD); and
(i) log a record of the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

During the complaint investigation work, the Contractor and A/ER shall cooperate with the ET Leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures (in consultation with the IC(E), see Section 4.12c above) are required following the investigation, the Contractor shall promptly carry out the measures. The ER shall ensure that the measures have been carried out by the Contractor.

The Construction Phase EM&A Manual shall include a flow chart of the complaint response procedures that addresses; complaint receiving channels, responsible parties/contacts for information/action, the investigation process, procedures for the implementation of mitigation/remedial action, guidelines for communication and public relation with the complainant etc.

4.13 Documentation

All documentation is required to be filed in a traceable and systematically manner. Site document, such as, monitoring field records, laboratory analysis records, meeting minutes, correspondences etc., shall be cross-referenced by the ET leader and be ready for inspection upon request. All Construction Phase EM&A results and findings shall be documented in the Construction Phase EM&A reports prepared by the ET and endorsed by IC(E) prior to disseminate to the Contractor, ER and the Director of Environmental Protection. The content and frequency of the EM&A reporting shall be determined in the EIA/EA stage. For a typical construction project in Hong Kong, no less requirements should be documented in the Construction Phase EM&A report than the checklist as per the appendix requirements of Section 2.7.

All documentation to the Director of Environmental Protection shall be in paper form and/or electronic form (in the format in agreement with the Director) upon request. Prior to submission, the water quality data software format shall be agreed with EPD. All documents and data shall be kept for at least one year after the completion of the construction contract. All submissions (reports, data, and correspondences etc.) to the Director of Environmental Protection shall be liable to use freely for the purposes of communicating environmental data and the owner of information shall claim no copyright. Any request to treat all or part of a submission in confidence will be respected, but if no such request is made it will be assumed that the submission is not intended to be confidential.