Agreement No. CE 54/2015 (EP) Lei Yue Mun Waterfront Enhancement Project – Environmental and Traffic Impact Assessment Studies - Investigation

Environmental Monitoring and Audit Manual

(Final)

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1 Introduction

1.1 Project Background

1.1.1.1 Since 2000, the Tourism Commission (TC) has been implementing the Tourism District Enhancement Programme to enrich Hong Kong's appeal to visitors. Lei Yue Mun (LYM), being one of the most popular tourist attractions in Hong Kong for its pleasant seaside ambience and excellent seafood, had been identified to accord priority for improvement under the Programme. The TC completed several initial minor improvements along the LYM waterfront in 2003 and planned to further improve the facilities along the LYM waterfront area.The Lei Yue Man Waterfront Enhancement Project (the Project) consists of two components:

- Construction of a Public Landing Facility and Improvement Works to Existing Lookout Points and Viewing Platform; and
- Development of a Waterfront Promenade and Related Improvement Works.

1.1.1.2 As the Project will involve dredging operation less than 500m from the nearest boundary of an existing coastal protection area, it has been identified as a designated project according to Item C.12 (a) (vii) in Part I, Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO):

"A dredging operation exceeding 500,000m^3 or a dredging operation which is less than 500m from the nearest boundary of an existing or planned coastal protection area."

1.1.1.3 A project profile (No. PP-525/2015) was submitted to the Environmental Protection Department (EPD) on 23 June 2015 and an Environmental Impact Assessment (EIA) Study Brief (No. ESB-287/2015) for the Project was issued by EPD on 30 July 2015. AECOM Asia Company Limited (AECOM) was commissioned by Civil Engineering and Development Department (CEDD) to undertake the EIA study for the Project.

1.2 Project Scope and Programme

1.2.1.1 The scope of the Project components comprises the following works elements:

Construction of a Public Landing Facility and Improvement Works to Existing Lookout Points and Viewing Platform (by CEDD)

- Construction of a promenade with a public landing facility (i.e. landing steps) which is capable of accommodating vessels up to 30m long with a draft of about 3m;
- Construction of a breakwater;
- Dredging of seabed to provide sufficient water depth for navigation of vessels; and
- Improvement works for five existing lookout points and an existing viewing platform to improve their structural capacity.

Development of a Waterfront Promenade and Related Improvement Works (by ArchSD)

- Construction of a carp-shaped platform and a pavilion with children play area;
- Beautification works for the promenade, five lookout points and an existing viewing platform to improve their visual appearance; and

- Streetscape improvement works.

1.2.1.2 Locations of the Project works are shown in **Figure 1.1**. A tentative construction programme is presented in **Appendix A** for reference.

1.3 Purpose of the Manual

1.3.1.1 The purpose of this Environmental Monitoring and Audit (EM&A) Manual (hereinafter refer to as the "Manual") is to guide the set-up of an EM&A programme to ensure compliances 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 mitigations measures or remedial actions.

1.3.1.2 This Manual outlines the monitoring and audit programme for the proposed Project. It aims to provide systematic procedures for monitoring, auditing and minimizing environmental impacts associated with the Project activities.

1.3.1.3 This Manual contains the following information:

- Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), Environmental Team (ET) and Independent Environmental Checker (IEC) with respect to the environmental monitoring and audit requirements during the course of the Project;
- Project organisation for the Project;
- The basis for, and description of the broad approach underlying the EM&A programme;
- Requirement with respect to the construction programme schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- Details of the methodologies to be adopted, including all field laboratories and analytical procedures, and details on quality assurance and quality control programme;
- Definition of Action and Limit Levels;
- Establishment of Event and Action Plans;
- Requirements for reviewing pollution sources and working procedures required in the event of non-compliance with the environmental criteria and complaints;
- Requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures; and
- Requirements for reviewing the EIA predictions and the effectiveness of the mitigation measures / environmental management systems and the EM&A programme.

1.4 Structure of the EM&A Manual

1.4.1.1 This EM&A Manual comprises the following Sections:

- Section 1 – Introduction
- Section 2 – Project Organisation
- Section 3 – Air Quality Impact
- Section 4 – Noise Impact

- Section 5 – Water Quality Impact
- Section 6 – Sewerage and Sewage Treatment Implications
- Section 7 – Waste Management Implications
- Section 8 – Land Contamination
- Section 9 – Ecological Impact (Terrestrial and Marine)
- Section 10 – Fisheries Impact
- Section 11 – Landscape and Visual Impacts
- Section 12 – Site Environmental Audit
- Section 13 – Reporting
- Section 14 - Conclusion

2 Project Organisation

2.1.1.1 The roles and responsibilities of the various parties involved in the EM&A process and the organisational structures of the organisations responsible for implementing the EM&A programme are outlined below. The proposed Project organisation and lines of communication with respect to EM&A works are shown in **Figure 2.1**.

Engineer or Engineer's Representative (ER)

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

- Supervise the Contractor's activities and ensure that the requirements in the Environmental Permit (EP), the approved EIA Report, EM&A Manual and other government's standards are fully complied with;
- Inform the Contractor when action is required to reduce environmental impacts in accordance with the Event and Action Plans;
- Comply with the agreed Event Contingency Plan in the event of any exceedance;
- Participate in joint site inspections and audits undertaken by the ET; and
- Adhere to the procedures for carrying out complaint investigation.

The Contractor

2.1.1.3 The Contractor shall report to the ER. The duties and responsibilities of the Contractor include:

- Implement the EIA's recommendations and requirements;
- Provide assistance to ET in carrying out relevant environmental monitoring;
- Accompany joint site inspection undertaken by the ET and undertake correction actions;
- Submit proposals on mitigation measures in case of exceedances of Action and Limit Levels in accordance with the Event and Action Plans;
- Implement measures to reduce impacts where Action and Limit Levels are exceeded; and
- Adhere to the procedures for carrying out environmental complaint investigation.

Environmental Team (ET)

2.1.1.4 The ET Leader and the ET shall be employed by project proponent to conduct the EM&A programme and to ensure the Contractor's compliance with the Project's environmental performance requirements. The ET Leader shall be an independent party from the Contractor and have relevant professional qualifications, or have sufficient relevant EM&A experience subject to the approval of the ER and the Environmental Protection Department (EPD). The ET shall be led and managed by the ET Leader. The ET Leader shall possess at least 7 years of experiences in EM&A and / or environmental management. The duties and responsibilities of the ET are to:

- Monitor various environmental parameters as required in this EM&A Manual;

- Carry out regular site inspections to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and initiate proactive action to pre-empt problems; carry out ad hoc site inspections if significant environmental problems are identified;
- Audit and prepare reports on the environmental monitoring data and the site environmental conditions;
- Analyse the EM&A data and review the success of EM&A programme to confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions, and to identify any adverse environmental impacts arising and report EM&A results to the IEC, and the ER;
- Report on the environmental monitoring and audit results to the IEC, Contractor, the ER and EPD or its delegated representative;
- Recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit Levels in accordance with the Event and Action Plans;
- Review the proposals of remedial measure from the Contractor in the case of exceedances of Action and Limit Levels, in accordance with the Event and Action Plans;
- Advise Contractor on environmental improvement, awareness, enhancement matters, etc.;
- Timely submission on the EM&A report to the Project Proponent and the EPD; and
- Adhere to the procedures for carrying out environmental complaint investigation.

Independent Environmental Checker (IEC)

2.1.1.5 The IEC shall be employed by the project proponent prior to the commencement of the construction of the Project. The IEC shall be independent party from the Contractor and the ET and shall advise the ER on environmental issues related to the Project. The IEC shall possess at least 7 years of experience in EM&A. The duties and responsibilities of the IEC are to:

- Review and audit in an independent, objective and professional manner in all aspects of the EM&A programme performed by the ET;
- Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers;
- Audit the EIA recommendations and EP requirements against the status of implementation of environmental protection measures on site;
- Review the effectiveness of environmental mitigation measures and project environmental performance;
- On as-needed basis, verify and certify the environmental acceptability of the Environmental Permit (EP) holder's construction methodology, relevant design plans and submissions under the EP;
- Carry out random sample check and audit on monitoring data and sampling procedure;
- Conduct random site inspection (at least once a month);
- Verify the investigation results of environmental complaints cases and the effectiveness of corrective measures;

- Verity EM&A report that has been certified by the ET Leader; and
- Provide feedback on the audit results to the ET or the EP holder according to Event and Action Plans in the Manual.

2.1.1.6 Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibilities, as required under the EM&A programme for the duration of the Project.

3 Air Quality Impact

3.1 Introduction

3.1.1.1 Potential air quality impacts arising from the construction and operation phases of the Project were assessed in the EIA Report. No adverse air quality impact from construction of the Project would be anticipated with the implementation of dust suppression measures as stipulated under the Air Pollution Control (Construction Dust) Regulation (Cap 311R). Nevertheless, regular site environmental audit is recommended to ensure the implementation of recommended mitigation measures during construction phase.

3.1.1.2 During the operation phase, the potential air quality impacts associated with the induced marine traffic from the project would be minor and unlikely to cause adverse air quality impacts to the nearby Air Sensitive Receivers (ASRs). Therefore, no EM&A requirement is deemed necessary.

3.2 Mitigation Measures

3.2.1.1 Mitigation measures for construction phase air quality impacts have been recommended in the EIA Report. All the recommended mitigation measures are detailed in the implementation schedule in **Appendix B**. The Contractor should be responsible for the design and implementation of the mitigation measures.

3.3 Audit Requirements

3.3.1.1 Weekly site inspection and audit should be conducted during the construction phase of the Project to ensure the recommended mitigation measures are properly implemented.

4 Noise Impact

4.1 Introduction

4.1.1.1 Potential noise impacts arising from the construction of the Project were assessed in the EIA Report. Noise monitoring is proposed to be conducted during construction phase.

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

4.2 Noise Parameters

4.2.1.1 The construction noise level should be measured in terms of the 30-minute A-weighted equivalent continuous sound pressure level (L_{eq}). $L_{eq\,(30\,min)}$ should be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays.

4.2.1.2 Supplementary information for data auditing and statistical results such as L_{10} and L_{90} should also be obtained for reference. A sample data record sheet is shown in **Appendix C1** for reference.

4.3 Monitoring Locations

4.3.1.1 The proposed noise monitoring stations for the construction phase are listed in **Table 4.1** and shown in **Figure 4.1**. The locations of noise monitoring stations and the works activities may change after issuing this Manual. For such occasion, the ET Leader shall propose with justification for changes to monitoring locations or other requirements of the EM&A programme, taking into account the following considerations and seek approval from the IEC and EPD:

a) locate close to the major site activities which are likely to have noise impacts;

b) locate close to the most affected existing NSRs; and

c) take into account the possibility of minimizing disturbance to occupants at the NSRs during monitoring.

Table 4.1 Proposed Noise Monitoring Stations for Baseline and Impact Monitoring

Station	Noise Assessment Point ID in EIA Report	Noise Monitoring Station
NM1	HRPCV1	Village house in Lei Yue Mun Hoi Pong Road Central
NM2	HPRE81	No.81, Lei Yue Mun Hoi Pong Road East
NM3	LYMP	Jockey Club Lei Yue Mun Plus
NM4	HPRE21C	No. 21C, Lei Yue Mun Hoi Pong Road East

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

4.4 Monitoring Equipment

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

4.4.1.2 Noise measurements shall not be made in 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.

4.4.1.3 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. The equipment installation location shall be proposed by the ET Leader and agreed with the IEC and EPD.

4.5 Baseline Monitoring for Construction Noise

4.5.1.1 Baseline noise monitoring shall be carried out daily in all identified monitoring stations for 2 weeks prior to the commissioning of the construction works. The baseline noise levels should be measured for a continuous period of at least 14 consecutive days at a minimum logging interval of 30 minutes for daytime (between 0700 and 1900 hours of normal weekdays) and 15 minutes (as three consecutive $L_{eq, (5\ minutes)}$ readings) for evening time (between 1900 and 2300 hours on normal weekdays), general holidays including Sundays (between 0700 and 2300 hours) and night-time (between 2300 and 0700 on all days). A schedule of the baseline monitoring shall be submitted to the IEC for approval before the monitoring starts.

4.5.1.2 During the baseline monitoring, there shall not be any construction activities in the vicinity of the monitoring stations.

4.5.1.3 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with EPD and in consultation with the IEC to agree on an appropriate set of data to be used as a baseline reference.

4.6 Impact Monitoring for Construction Noise

4.6.1.1 Construction noise monitoring should be carried out at the designated monitoring station when there are Project-related construction activities being undertaken within a radius of 300 m from the monitoring stations. The monitoring frequency should depend on the scale of the construction activities. An initial guide on the monitoring is to obtain one set of 30-minute measurement at each station between 0700 and 1900 hours on normal weekdays at a frequency of once a week when construction activities are underway.

4.6.1.2 If construction works are extended to include works during the hours of 1900 to 0700, additional weekly impact monitoring shall be carried out during evening and night-time works. Applicable permits under NCO shall be obtained by the Contractor.

4.6.1.3 In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Action Plan in **Table 4.3** 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.

4.7 Event and Action Plan

4.7.1.1 The Action and Limit levels for construction noise are defined in **Table 4.2**. Should non-compliance of the criteria occur, action in accordance with the Action Plan in **Table 4.3** shall be carried out.

Table 4.2 Action and 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) for residential premises and places of public worship
		70 dB(A) for schools and 65 dB(A) during examination period

Notes:

- If works are to be carried out during restricted hours, the conditions stipulated in the Construction Noise Permit (CNP) issued by the Noise Control Authority have to be followed.

Table 4.3 Event and Action Plan for Construction Noise

EVENT	ACTION			
	ET	IEC	ER	Contractor
Action Level	1. Notify IEC, ER and Contractor; 2. Carry out investigation; 3. Report the results of investigation to the IEC, ER and Contractor; 4. Discuss with the Contractor and formulate remedial measures; and 5. Increase monitoring frequency to check mitigation effectiveness.	1. Review the analysed results submitted by the ET; 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly; and 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; and 4. Ensure remedial measures are properly implemented.	1. Submit noise mitigation proposals to IEC, ET and ER; and 2. Implement noise mitigation proposals.
Limit Level	1. Identify source; 2. Inform IEC, ER, EPD and Contractor; 3. Repeat measurements 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 and actions taken for the exceedances; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; and 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; and 3. Supervise the implementation of remedial measures.	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 properly implemented; and 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.	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; and 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

4.8 Mitigation Measures

4.8.1.1 The construction noise assessment results indicate that, in the absence of any mitigation measures, there would be exceedance of the construction noise criteria at some of the NSRs. Various mitigation options including good site practice, use of quiet powered mechanical equipment, and noise barriers were recommended in the EIA. The Contractor should be responsible for the implementation of these measures. The implementation schedule for the recommended mitigation measures is presented in **Appendix B**.

4.8.1.2 In the event of exceedances or complaints, the Contractor should review the effectiveness of these mitigation measures and propose, design and implement alternative or additional measures as appropriate. The Contractor should liaise with the ET on alternative or additional remedial measures, if appropriate, and the proposal of the measures should be submitted to the ER and IEC for approval. The Contractor should implement the agreed remedial measures properly.

4.9 Audit Requirements

4.9.1.1 Weekly site audit should be carried out during construction phase by the ET to ensure proper implementation of the recommended noise mitigation measures and good site practices detailed in **Appendix B**.

5 Water Quality Impact

5.1 Introduction

5.1.1.1 As identified in the EIA Report, suspended sediment is the most critical water quality parameter caused by the dredging works. Marine water quality monitoring should be carried out during the dredging and filling operation to ensure that any unacceptable increase in suspended solids / turbidity and decrease in dissolved oxygen due to the dredging activities could be readily detected and timely action be taken to rectify the situation.

5.2 Water Quality Parameters

5.2.1.1 Dissolved Oxygen (DO), turbidity and Suspended Solids (SS) levels should be monitored at designated marine water quality monitoring stations during the dredging (both capital and maintenance) and filling operation of the Project. DO and turbidity should be measured in situ whereas SS should be determined by laboratory.

5.3 Monitoring Stations

5.3.1.1 The proposed water quality monitoring stations are listed in **Table 5.1** and shown in **Figure 5.1**. The monitoring stations proposed in this section are indicative subject to further review before commencement of the water quality monitoring works. The status and locations of water quality monitoring stations and the works activities may change after issuing this Manual. For such occasion, the ET Leader shall propose with justification for changes to monitoring locations or other requirements of the EM&A programme, taking into account the following considerations and seek approval from the IEC and EPD:

a) at locations close to and preferably at the boundary of the mixing zone of the major site activities as indicated in the EIA Report, which are likely to have water quality impacts;

b) close to the sensitive receivers which are directly or likely to be affected;

c) for monitoring locations located in the vicinity of the sensitive receivers, care shall be taken to cause minimal disturbance during monitoring; and

d) two or more control stations which shall be at locations representative of the project site in its undisturbed condition. Control stations shall be located, as far as is practicable, both upstream and downstream of the works area.

Table 5.1 Proposed Marine Water Quality Stations for Baseline and Impact Monitoring

Monitoring Station	ID in EIA Report	Description	Easting	Northing
C1	-	Control Station	842134	816765
C2	-	Control Station	842946	816172
M1	C2	Coral Communities (Impact Monitoring Station)	842062	817247
M2	-	100m away from the dredging site (Impact Monitoring Station)	842329	816615
M3	C3	Coral Communities (Impact Monitoring Station)	842639	816410
M4	VT3	Sam Ka Tsuen Typhoon Shelter (Impact Monitoring Station)	842515	816878

5.4 Monitoring Equipment

5.4.1 Dissolved Oxygen and Temperature Measuring Equipment

5.4.1.1 The instrument should be a portable and weatherproof DO measuring instrument complete with cable and sensor, and use a DC power source. This equipment should be capable of measuring:

- a DO level in the range of 0-20 mg/L and 0 -200% saturation; and
- a temperature of 0-45 degree Celsius.

5.4.1.2 It should have a membrane electrode with automatic temperature compensation complete with a cable (for example, YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument). Sufficient stocks of spare electrodes and cables should be available for replacement where necessary.

5.4.1.3 Should salinity compensation not be built-in to the DO equipment, *in-situ* salinity should be measured to calibrate the DO equipment prior to each DO measurement.

5.4.2 Turbidity Measurement Instrument

5.4.2.1 Turbidity should be measured *in-situ* by the nephelometric method. The instrument should be portable and weatherproof using a DC power source complete with cable, sensor and comprehensive operation manuals. It should have a photoelectric sensor capable of measuring turbidity between 0 – 1000 NTU (for example, Hach model 2100P or an approved similar instrument). The cable should not be less than 25m in length. The meter should be calibrated in order to establish the relationship between NTU units and the levels of suspended solids. The turbidity measurement should be carried out on split water sample collected from the same depths of suspended solids samples.

5.4.3 pH Measurement Instrument

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

5.4.4 Sampler

5.4.4.1 A water sampler is required. It should comprise a transparent PVC cylinder, with a capacity of not less than 2 litres, which can be effectively sealed with latex cups at both ends. The sampler should have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth (for example, Kahlsico Water Sampler or an approved similar instrument).

5.4.5 Water Depth Detector

5.4.5.1 A portable, battery-operated echo sounder should be used for the determination of water depth at each designated monitoring station. If echo sounder is not applicable due to low water depth, various sized stainless steel rulers would be used to determine the water depth. These units can either be held or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

5.4.6 Salinity

5.4.6.1 A portable, salinometer capable of measuring salinity in the range 0 – 40 mg/L shall be provided for measuring salinity of the water at each monitoring location.

5.4.7 Sample Containers and Storage

5.4.7.1 Water samples for SS should be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4 ^{0}C without being frozen) and delivered to the laboratory and analysed as soon as possible after collection. Sufficient volume of samples should be collected to achieve the detection limit.

5.4.8 Monitoring Position Equipment

5.4.8.1 A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication and Radio Technical Commission for maritime (RTCM) Type 16 error message 'screen pop-up' facilities (for real-time auto-display of error messages and DGPS corrections from the Hong Kong Hydrographic Office), or other equipment of similar accuracy, should be provided and used during water quality monitoring work to ensure that the water sampling locations are correct before taking measurements.

5.4.9 Calibration of In-Situ Instruments

5.4.9.1 All *in-situ* monitoring instruments should be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use and subsequently re-calibrated at three monthly intervals throughout all stages of the water quality monitoring programme. Responses of sensors and electrodes should be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter should be carried out before measurement at each monitoring location.

5.4.9.2 For the on-site calibration of field equipment, the BS 127:1993, Guide to Field and On-Site Test Methods for the Analysis of Water should be observed.

5.4.9.3 Sufficient stocks of spare parts should be maintained for replacements when necessary. Backup monitoring equipment should also be made available so that monitoring can proceed uninterrupted even when some equipment is under maintenance, calibration, etc.

5.5 Laboratory Measurement / Analysis

5.5.1.1 Analysis of SS level should be carried out in a HOKLAS or other international accredited laboratory. Water samples of about 1000ml should be collected at the monitoring stations for carrying out the laboratory SS determinations. The determination work should start within 24 hours after collection of the water samples. The analyses should follow the American Public Health Association (APHA) Standard Methods for the Examination of Water and Wastewater or an equivalent method subject to the approval of EPD. The suggested testing method and lowest detection limit are provided in **Table 5.2.**

Table 5.2 Analytical Methods to be applied to Marine Water Quality Samples

Determinant	Suggested Method	Suggested Detection Limit
Suspended Solids	APHA 2540D1	1 mg/L or better

Notes:

1. APHA American Public Health Association Standard Methods for the Examination of Water and Wastewater

5.5.1.2 The testing of SS should be HOKLAS accredited (or if not, approved by EPD) and comprehensive quality assurance and control procedures in place in order to ensure quality and consistency in results.

5.5.1.3 The ET should provide the Contractor with a copy of the relevant chapters of the "Standard Methods for the Examination of Water and Wastewater" updated edition and any other relevant document for his reference.

5.5.1.4 Detailed testing methods, pre-treatment procedures, instruments use, Quality Assurance / Quality Control (QA/QC) details (such as blank, spike recovery, number of replicate samples per batch, etc.), detection limit and accuracy shall be submitted to EPD for approval prior to the commencement of monitoring programme. EPD may also request the laboratory to carry out analysis of known standards provided by EPD for quality assurance. The QA / QC shall be in accordance with the requirements of HOKLAS or international accredited scheme. The QA/ QC results shall be reported. The testing methods and related proposal should be checked and certified by IEC before submission to EPD for approval.

5.5.1.5 Additional duplicate samples may be required by EPD for inter laboratory calibration. Remaining samples after analysis should be kept by the laboratory for 3 months in case repeat analysis is required. If in-house or non-standard methods are proposed, details of the method verification may also be required to submit to EPD. In any circumstance, the sample testing should have comprehensive quality assurance and quality control programmes. The laboratory should prepare to demonstrate the programme to EPD or EPD's representatives when requested.

5.6 Baseline Monitoring

5.6.1.1 Baseline conditions for the marine water quality should be established and agreed with EPD prior to the commencement of marine works during construction phase and operation phase (maintenance dredging). The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of the construction works and to demonstrate the suitability of the control and proposed monitoring stations.

5.6.1.2 The baseline conditions should be established by measuring turbidity, dissolved oxygen (DO) and suspended solids (SS) at the selected monitoring stations. The baseline monitoring schedule should be submitted to EPD at least 2 weeks prior to the commencement of monitoring. EPD should also be notified immediately for any changes in schedule.

5.6.1.3 Measurements should be taken at all designated monitoring stations, 3 days per week, at mid-flood and mid-ebb tides for at least 4 weeks prior to the commencement of dredging and sand filling works. There should not by any marine construction activities in proximity to the stations during the baseline monitoring. The interval between 2 sets of monitoring should not be less than 36 hours. Duplicate *in-situ* measurements and water sampling should be carried out in each sampling event. For selection of tides for *in-situ* measurement and water sampling, tidal range of individual flood and ebb tides should be not less than 0.5m.

5.6.1.4 The baseline monitoring report should be submitted to EPD at least 4 weeks before the commencement of the construction works for agreement. The baseline monitoring report should be certified by the IEC before submission to EPD.

5.7 Impact Monitoring

5.7.1.1 During the dredging (both capital and maintenance) and filling operation of the Project, water quality impact monitoring should be undertaken 3 days per week, at mid-flood and mid-ebb tides, with sampling / measurement at the designated monitoring stations as shown in **Table 5.1**. The locations for impact monitoring should be the same as those for baseline monitoring.

5.7.1.2 The interval between two sets of monitoring should not be less than 36 hours except where there are exceedances of Action and / or Limit Levels, in which case the monitoring frequency will be increased. The proposed monitoring frequency and water quality parameters are presented in **Table 5.3**. Duplicate *in-situ* measurements and water sampling should be carried out in each sampling event. For selection of tides for *in-situ* measurement and water sampling, tidal range of individual flood and ebb tides should be not less than 0.5m.

Table 5.3 Proposed Marine Water Quality Monitoring Frequency and Parameters

Activities	Monitoring Frequency[1]	Key Parameters[2]
During the 4-week baseline monitoring period	Three days per week, at mid-flood and mid-ebb tides	Turbidity, Dissolved Oxygen (DO), Suspended Solids (SS)
During the dredging and filling operation of the Project	Three days per week, at mid-flood and mid-ebb tides	Turbidity, Dissolved Oxygen (DO), Suspended Solids (SS)

Notes:

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

5.7.1.3 The water quality monitoring schedule should be submitted to EPD at least 1 week before the first day of the monitoring month. EPD should be notified immediately of any changes in schedule. If the monitoring data collected at the designated stations indicate that the Action or Limit Levels as shown in **Table 5.4** is exceeded, appropriate actions should be taken in accordance with the Event and Action Plan in **Table 5.5**.

5.7.2 Field Log

5.7.2.1 Other relevant data should also be recorded, including monitoring location / position, time, water depth, sampling depth, pH, salinity, DO saturation, water temperature, tidal stages, weather conditions and any special phenomena or work underway nearby.

5.7.2.2 A sample data record sheet is shown in **Appendix C2** for reference.

5.8 Event and Action Plan

5.8.1.1 The water quality assessment criteria, namely Action and Limit Levels are shown in **Table 5.4**. These criteria should be applied to ensure that any deterioration of water quality is readily detected and timely action is taken to rectify the situation. Should the monitoring results of the water quality parameters at any designated monitoring station exceed the water quality criteria, the actions in accordance with the Event and Action Plan summarized in **Table 5.5** shall be carried out.

Table 5.4 Action and Limit Levels for Marine Water Quality

Parameters	Action Level	Limit Level
[1]SS in mg/L	Depth-average SS ≥ 95%-ile of baseline data or 120% of control station's SS at the same tide of the same day	Depth-average SS ≥ 99%-ile of baseline data or 130% of control station's SS at the same tide of the same day and specific sensitive receiver water quality requirements (e.g. required SS level for concerned seawater intakes)
DO in mg/L	Surface & Middle ≤5%-ile of baseline data for surface and middle layers Bottom ≤5%-ile of baseline data for bottom layer	Surface & Middle ≤4 mg/L or 1%-ile of baseline data for surface and middle layers Bottom ≤2 mg/L or 1%-ile of baseline data for bottom layer
[1]Turbidity in NTU	Depth-average Turbidity ≥ 95%-ile of baseline data or 120% of control station's turbidity at the same tide of the same day	Depth-average Turbidity ≥ 99%-ile of baseline data or 130% of control station's turbidity at the same tide of the same day

Remarks:

1. “Depth-averaged” is calculated by taking the arithmetic means of reading of all sampling depths.
2. For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
3. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
4. All the figures given in the table are used for reference only and EPD may amend the figures whenever it is considered as necessary.

Table 5.5 Event and Action Plan

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action level being exceeded by one sampling day	1. Repeat *in-situ* measurement to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform IEC and Contractor; 4. Check monitoring data, all plants, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC and Contractor; 6. (The above actions should be taken within 1 working day after the exceedance is identified) 7. Repeat measurement on next day of exceedance.	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 4. (The above actions should be taken within 1 working day after the exceedance is identified)	1. Discuss with IEC on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented. 3. Assess the effectiveness of the implemented mitigation measures 4. (The above actions should be taken within 1 working day after the exceedance is identified)	1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plants and equipment; 4. Consider changes of working methods; 5. Discuss with ET and IEC and propose mitigation measures to IEC and ER; 6. Implement the agreed mitigation measures. 7. (The above actions should be taken within 1 working day after the exceedance is identified)
Action level being exceeded by more than one consecutive sampling days	1. Repeat *in-situ* measurement to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform IEC and Contractor; 4. Check monitoring data, all plants, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC and Contractor; 6. Ensure mitigation measures are implemented; 7. Prepare to increase the monitoring frequency to daily; 8. (The above actions should be taken within 1 working day after the exceedance is identified) 9. Repeat measurement on next working day of exceedance.	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 4. (The above actions should be taken within 1 working day after the exceedance is identified)	1. Discuss with IEC on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented; 3. Assess the effectiveness of the implemented mitigation measures. 4. (The above actions should be taken within 1 working day after the exceedance is identified)	1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plants and equipment; 4. Consider changes of working methods; 5. Discuss with ET and IEC and propose mitigation measures to IEC and ER within 3 working days; 6. Implement the agreed mitigation measures. 7. (The above actions should be taken within 1 working day after the exceedance is identified)

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Limit level being exceeded by one sampling day	1. Repeat *in-situ* measurement to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform IEC, Contractor and EPD; 4. Check monitoring data, all plants, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit level. 8. (The above actions should be taken within 1 working day after the exceedance is identified)	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 4. (The above actions should be taken within 1 working day after the exceedance is identified)	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Assess the effectiveness of the implemented mitigation measures. 5. (The above actions should be taken within 1 working day after the exceedance is identified)	1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plants and equipment; 4. Consider changes of working methods; 5. Discuss with ET, IEC and ER and Propose mitigation measures to IEC and ER within 3 working days; 6. Implement the agreed mitigation measures
Limit level being exceeded by more than one consecutive sampling day	1. Repeat *in-situ* measurement to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform IEC, Contractor and EPD; 4. Check monitoring data, all plants, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit level for 2 consecutive days. 8. (The above actions should be taken within 1 working day after the exceedance is identified)	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 4. (The above actions should be taken within 1 working day after the exceedance is identified)	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Assess the effectiveness of the implemented mitigation measures. 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the dredging and sand filling work until no exceedance of Limit level. 6. (The above actions should be taken within 1 working day after the exceedance is identified)	1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plants and equipment; 4. Consider changes of working methods; 5. Discuss with ET, IEC and ER and Propose mitigation measures to IEC and ER within 3 working days; 6. Implement the agreed mitigation measures; 7. As directed by the ER, to slow down or stop all or part of the dredging and sand filling work.

5.9 Mitigation Measures

5.9.1.1 Mitigation measures for water quality control have been recommended In the EIA Report. The Contractor should be responsible for the design and implementation of these measures. Recommended mitigation measures to minimise the adverse impacts on water quality during the construction activities are listed in the implementation schedule given in **Appendix B**.

5.9.1.2 The requirements of the environmental audit programme are set out in **Section 12** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

5.9.1.3 In the event of complaints or non-compliance / area of improvement being observed, the ET and the Contractor should review the effectiveness of these mitigation measures, design alternative or additional mitigation measures as appropriate and propose to the IEC for approval and implement these alternative or additional measures.

5.10 Audit Requirements

5.10.1.1 Weekly site audit should be carried out during construction phase by the ET to ensure proper implementation of the recommended good site practices and mitigation measures detailed in **Appendix B**. In the event that the recommended mitigation measures are not fully or properly implemented, deficiency should be recorded and reported to the site management. Suitable actions are to be carried out to:

- investigate the problems and the causes;
- issue action notes to the Contractor which is responsible for the works;
- implement remedial and corrective actions immediately;
- re-inspect the site conditions upon completion of the remedial and corrective actions; and
- record the event and discuss with the Contractor for preventive actions.

6 Sewerage & Sewage Treatment Implications

6.1 Introduction

6.1.1.1 An assessment on potential sewerage and sewage treatment implications arising from the Project has been assessed. Since adverse impact on sewerage and sewage treatment facilities associated with the Project would not be anticipated, no EM&A requirement is considered necessary.

6.2 Mitigation Measures

6.2.1.1 The implementation schedule of the relevant mitigation measures is presented in **Appendix B**.

7 Waste Management Implications

7.1 Introduction

7.1.1.1 Construction and Demolition (C&D) materials, general refuse and floating refuse from workforce, chemical waste and dredged marine sediments would be generated during the construction phase. It is the Contractor's responsibility to ensure that all the waste arising from the Project are handled, stored and disposed of in accordance with good waste management practices, relevant legislation and waste management guidelines. Provided that these wastes are handled, transported and disposed of using approved methods and that the recommended good site practices and relevant legislation are strictly followed, adverse environmental impacts would not be expected.

7.1.1.2 As there would be limited quantities of waste to be generated from the operation of the Project, no adverse environmental impacts is anticipated with the implementation of good waste management practices. Monitoring and audit programme for the operation phase of the Project would not be required.

7.2 Mitigation Measures

7.2.1.1 The mitigation measures recommended in the EIA Report should form the basis of the site Waste Management Plan (WMP) to be developed by the Contractor during the construction stage.

7.2.1.2 It is recommended that the waste generated during the construction activities should be audited regularly by the ET to determine if waste is being managed in accordance with approved procedures and the site WMP. The audit should look at all aspects of on-site waste management practices including waste generation, storage, recycling, transport and disposal. Apart from site inspection, documents including licences, permits, disposal and recycling records should be reviewed and audited for compliance with the legislations and contract requirements. In addition, the routine site inspections should check the implementation of the recommended good site practices and other waste management mitigation measures.

7.2.1.3 With the appropriate handling, storage and disposal of waste arising from the construction and operation of the Project as recommended in **Appendix B**, the potential adverse environmental impacts would be avoided or minimised. During site inspections, the ET should pay special attention to the issues relating to waste management and dredged material as well as check whether the Contractor has implemented the recommended good site practices and mitigation measures.

7.3 Audit Requirements

7.3.1.1 Weekly site audit and site inspection should be carried out during construction phase by the ER, ET and Contractor to ensure proper implementation of the recommended good site practices and mitigation measures detailed in **Appendix B**. The audits should concern all aspects of on-site waste management practices, including waste generation, storage, recycling, transport and disposal. Apart from site inspection, documents including licences, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation and contract requirements.

7.3.1.2 The requirements of the environmental audit programme are set out in **Section12** of this Manual. The audit programme should verify the implementation status and evaluate the effectiveness of the mitigation measures.

8 Land Contamination

8.1 Introduction

8.1.1.1 The land contamination assessment has examined the potential contaminating land uses within the Project area and investigated the potential impacts of the contamination on future use.

8.1.1.2 Based on the site appraisal, no potentially contaminating land use/ activities were identified. Therefore, no land contamination impact associated with present and past land uses/ activities is anticipated. No EM&A is required.

9 Ecological Impact (Terrestrial and Marine)

9.1 Introduction

9.1.1.1 Potential ecological impacts arising from the construction and operational phases of the Project were assessed in the EIA Report. Mitigation measures have been recommended to minimize the potential direct and indirect impacts to ecological resources. With the implementation of appropriate mitigation measures, no unacceptable ecological impact would be anticipated.

9.2 Mitigation Measures

9.2.1.1 Mitigation measures for ecological impacts have been recommend in the EIA Report to minimize potential direct and indirect impacts. The recommended mitigation measures are detailed in **Appendix B.**

9.3 Audit Requirements

9.3.1.1 During construction phase, implementation of the recommended mitigation measures should be regularly inspected. Site audits should be undertaken monthly during the construction phase of the Project to check the proper implementation and maintenance of recommended mitigation measures.

9.4 Coral Mitigation Plan

9.4.1.1 In order to minimize the direct loss of coral colonies, translocation (i.e. attached to movable boulders less than 50 cm in diameter) and/or other best practicable mitigation measures will be implemented for the directly affected coral colonies. The recipient site of coral mitigation should have the following characteristics:

- In the vicinity of Lei Yue Mun / Junk Bay where the marine conditions e.g. water depth, flow rate and temperature etc. are similar to the donor site.
- Presence of healthy coral communities of the same species.
- Sufficient space available for the newly translocated coral
- Not to be impacted by construction works

9.4.1.2 The coral mitigation should be undertaken prior to the commencement of marine works during the winter season (November-March) in order to avoid disturbance to the spawning period (i.e. July to October) of the affected coral colonies.

9.4.1.3 Prior to the mitigation works, the Environmental Team (ET) should arrange a detailed coral mapping to identify the extent and number of coral colonies (both movable and non-movable) that would be directly impacted by the proposed marine works and investigate the feasibility of translocation and/or other best practicable mitigation measures for these coral colonies (e.g. health status of coral colony and nature of the attaching substrata).

9.4.1.4 A detailed Coral Mitigation Plan, including a description on the methodology including translocation (e.g. pre-translocation survey, identification / proposal of coral recipient site(s)) or other best practicable mitigation measures, and post-mitigation monitoring programme, should be prepared

with reference to recently approved EIA Reports and subject to comment by the AFCD before commencement of the coral mitigation.

9.4.1.5 Upon the completion of translocation and/or other best practicable mitigation measures for the affected coral colonies, a post-mitigation monitoring should be conducted by experienced marine ecologist(s) with at least 5 years relevant experience to monitor the re-establishment of the translocated coral colonies. The post-mitigation monitoring should be conducted once every 3 months after completion for a period of 12 months. During the post-mitigation monitoring surveys, the general environmental conditions (e.g. weather, sea and tidal conditions) and condition of translocated coral colonies (e.g. species, size, growth form, health condition, observation of any die-off / abnormal conditions*)* should be recorded and included in *the Post-mitigation Coral Monitoring Reports.* A review on the post-mitigation monitoring survey findings is recommended to evaluate the effectiveness of translocation and re-establishment of coral colonies to recipient sites.

9.4.1.6 During operation phase, coral survey will be carried out to review and update the conditions of corals in the dredging area and its vicinity prior to each maintenance dredging. Subject to the findings of the coral survey, the impact on corals due to maintenance dredging will be reviewed and mitigation measures will be proposed as necessary.

10 Fisheries Impact

10.1 Introduction

10.1.1.1 The potential fisheries impact associated with the Project has been assessed in the EIA report. No unacceptable fisheries impact would be anticipated during the construction and operation phases of the Project and hence no specific monitoring for fisheries resources is considered necessary.

10.2 Mitigation Measures

10.2.1.1 Mitigation measures for water quality control recommended in Section 5 of the EIA Report would also serve to protect fisheries resources from indirect impacts. Details of the mitigation measures are presented in **Appendix B**.

10.3 Audit Requirements

10.3.1.1 No specific fisheries monitoring and auditing programme is required. Monitoring and audit requirements for water quality as detailed in Section 4 of this Manual would be applicable for the protection of the fisheries resources.

11 Landscape and Visual Impacts

11.1 Introduction

11.1.1.1 The EIA Report has recommended landscape and visual mitigation measures for the construction and operation phases of the Project. This section defines the audit requirements to confirm the recommended landscape and visual impact mitigation measures are effectively implemented.

11.1.1.2 Site audit on landscape and visual aspects of the Project should be carried out during the construction phase. Specific auditing during the operation phase of the Project is not required, with the mitigation measures recommended in the EIA implemented.

11.2 Baseline Review

11.2.1.1 Prior to the commencement of construction works, a baseline report shall be prepared to check, record and report the status of the landscape resources (LRs) and landscape character areas (LCAs) within the works areas and the visually sensitive receivers (VSRs) within the visual envelope. Any significant changes to the status of LRs, LCAs and VSRs since the approval of the EIA Report should be identified. The recommended landscape and visual mitigation measures should be reviewed if such change warrants a change in the design of the landscape and visual mitigation measures.

11.3 Mitigation Measures

11.3.1.1 The landscape and visual mitigation measures should be incorporated in the detailed design. The construction phase and operation phase mitigation measures proposed in the EIA Report are presented in the implemented schedule as given in **Appendix B**. Where feasible, the construction phase mitigation measures should be implemented as early as possible in order to minimise the landscape impacts in the construction phase while mitigation measures for the operation phase should be adopted during the detailed design and be built as part of the construction works so that they are in place on the date of commissioning of the Project.

11.3.1.2 Any potential conflicts among the proposed mitigation measures, the Project works, and operational requirements should also be identified and resolved as early as practicable. Any changes to the mitigation measures should be incorporated in the detailed design.

11.4 Audit Requirements

11.4.1.1 Site audits should be undertaken during the construction phase of the Project to check that the proposed landscape and visual mitigation measures are properly implemented and maintained as per their intended objectives. Site inspections should be undertaken by the ET at least once every two weeks during the construction period. Inspection findings shall be logged in a site monitoring report with any discrepancies or concerns regarding the implementation and effectiveness of mitigation measures highlighted.

12 Site Environmental Audit

12.1 Site Inspections

12.1.1.1 Site inspection provides a direct mean to trigger and enforce specified environmental protection and pollution control measures. Site inspection should be undertaken regularly during the construction phase to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented for the activities associated with the Project.

12.1.1.2 The ET Leader should be responsible for formulating and carrying out the environmental site inspection programme as well as the deficiency and remedial action reporting system. The ET Leader shall submit a proposal for site inspection and deficiency and remedial action reporting procedures to the Contractor for agreement, and to the ER for approval. The proposal for rectification, if any, should be prepared and submitted to the ET Leader and IEC by the Contractor.

12.1.1.3 Regular site inspections should be carried out at least once per week by the ER with the attendance of Contractor and ET during the construction phase. The areas of inspection should not be limited to the environmental conditions, pollution control and the mitigation measures within the works area. It should also review the environmental condition of locations that are beyond the site boundary but are likely to be affected directly or indirectly, by the activities in Project. During the inspection, the following information should be referred to:

- The EIA Report and EM&A recommendations on environmental protection and pollution control mitigation measures;
- Ongoing results of the EM&A programme;
- Works progress and programme;
- Individual works methodology proposals (which should include proposal on associated pollution control mitigation measures);
- Contract specifications on environmental protection and pollution prevention control;
- Relevant environmental protection and pollution control legislations; and
- Previous site inspection results undertaken by the ET and others.

12.1.1.4 The Contractor should keep the ER and ET Leader updated with all relevant information on the construction contract necessary for him / her to carry out the site inspections. Site inspection results and associated recommendations for improvements to the environmental protection and pollution control efforts should be recorded and followed up by the Contractor in an agreed time-frame. The Contractor should follow the procedures and time-frame stipulated in the environmental site inspection, and the deficiency and remedial action reporting system to be formulated by the ET Leader, to report on any remedial measures subsequent to the site inspections.

12.1.1.5 The ER, ET and Contractor should also carry out ad hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the Event and Action Plan for the EM&A programme.

12.2 Compliance with Legal and Contractual Requirements

12.2.1.1 There are statutory and contractual requirements on environmental protection and pollution control with which construction activities must comply.

12.2.1.2 To ensure that the works are in compliance with the contractual requirements, all method statements of works should be submitted by the Contractor to the ER for approval and to the ET Leader for vetting to determine if sufficient environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarized in **Appendix B**. Any proposed changes to the mitigation measures in **Appendix B** shall be certified by the ET Leader and verified by the IEC as conforming to the relevant information and recommendations contained in the EIA Report.

12.2.1.3 The ER and ET Leader should 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 laws can be prevented.

12.2.1.4 The Contractor shall provide update of relevant document to the ET Leader so that works checking could be carried out effectively. The document should at least include the updated Works Progress Reports, updated Works Programme, any application letters for different licences / permits under the environmental protection legislations, and copies of all valid licences / permits. The site diary should also be available for the inspection by the relevant parties.

12.2.1.5 After reviewing the documentation, the ET Leader should advise the Contractor of any non-compliance with contractual and legislative requirements on environmental protection and pollution control so that associated follow-up actions can be taken timely. If environmental protection and pollution control requirements are still violated after the follow-up actions, the ER and ET should advise the Contractor further to take remedial action to resolve the problem.

12.2.1.6 Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ER and ET shall follow up to ensure that appropriate action has been taken which satisfy contractual and legal requirements.

12.3 Environmental Complaints

12.3.1.1 The following procedures should be undertaken upon receipt of any environmental complaint:

i. The Contractor to log complaint and date of receipt onto the complaint database and inform the ER, ET and IEC immediately;

ii. The Contractor to investigate the complaint with the ER and ET to determine its validity, and assess whether the source of the problem is due to construction works of the Project, with the support of additional monitoring frequency and stations, if necessary;

iii. The Contractor to identify mitigation measures in consultation with the IEC, ET and ER if a complaint is valid and due to the construction works of the Project;

iv. The Contractor to implement the mitigation measures as required by the ER and to agree with the ET and IEC any additional monitoring frequency and stations, where necessary, for checking the effectiveness of the remedial measures;

v. The ER, ET and IEC to review the effectiveness of the Contractor's mitigation measures and the updated situation;

vi. The ET / Contractor to undertake additional monitoring and audit to verify the situation if necessary, and oversee that circumstances leading to the complaints do not recur;

vii. If the complaint is referred by the EPD, the Contractor to prepare interim report on the status of the complaint investigation and follow-up action stipulated above, including the details of the mitigation measures and additional monitoring identified or already taken, for submission to EPD within the time frame assigned by the EPD; and

viii. The ET to record the details of the complaint, results of the investigation, subsequent actions taken to address the complaints and updated situation including the effectiveness of the mitigation measures, supported by regular and additional monitoring results in the monthly EM&A reports.

13 Reporting

13.1 Introduction

13.1.1.1 Types of reports that the ET should prepare and submit include Baseline Monitoring Report, Monthly EM&A Reports and Final EM&A Review Report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly and final review EM&A reports should be made available to the Director of Environmental Protection (DEP).

13.1.1.2 Reports can be provided in an electronic medium upon agreeing the format with the ER and EPD. All the monitoring data (baseline and impact) should be submitted in electronic medium. Sample data sheets for noise and water quality monitoring are shown in **Appendices C1 to C2**.

13.2 Baseline Monitoring Report

13.2.1.1 The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report should be submitted to the IEC, ER, Contractor and EPD. The ET should liaise with the relevant parties on the exact number of copies require.

13.2.1.2 The Baseline Monitoring Report shall include at least the following information:

i. Up to half a page of executive summary;

ii. Brief description of project background information;

iii. Drawings showing locations of the baseline monitoring stations;

iv. Monitoring results (in both hard and diskette copies) together with the following information:
- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details;
- Parameters monitored;
- Monitoring locations (and depth);
- Monitoring date, time, frequency and duration; and
- Quality assurance (QA) / quality control (QC) results and detection limits.

v. Details of 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 monitoring results.

vi. Determination of the Action and Limit Level (AL Level) for each monitoring parameter and statistical analysis of the baseline data;

vii. Revision for inclusion in the EM&A Manual; and

viii. Comments and conclusions.

13.3 Monthly EM&A Report

13.3.1.1 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 ET and endorsed by the IEC. The monthly EM&A Reports shall be prepared and submitted within 10 working days at the end of each reporting month, with the first report due the month after construction commences. Copies of each monthly EM&A Report should be submitted to parties including the Contractor, ER, IEC and EPD. Before submission of the first monthly EM&A Report, the ET should liaise with the parties on the exact number of copies and format of the reports for both hard and electronic copies.

13.3.1.2 The ET Leader should review the number and location of monitoring stations and parameters every six months, or on as needed basis, in order to cater for any changes in the surrounding environment and the nature of works in progress.

13.4 First Monthly EM&A Report

13.4.1.1 The first monthly EM&A Report should include at least but not be limited to the following:

i. Executive summary (1-2 pages):
   - Breaches of Action and Limit Levels;
   - Complaint log;
   - Notifications of any summons and successful prosecutions;
   - Reporting changes; and
   - Future key issues.

ii. Basic project information:
   - Project organisation including key personnel's' contact and any hotline telephone number for the public to make enquiries;
   - Construction programme;
   - Management structure; and
   - Works undertaken during the reporting month.

iii. Environmental status:
   - Advice on the status of statutory environmental compliance, such as the status of compliance with the EP conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
   - Works undertaken during the reporting month with illustrations (e.g. location of works, etc.); and
   - Drawings showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations.

iv. Summary of EM&A requirements:
   - All monitoring parameters;
   - Environmental quality performance limits (Action and Limit Levels);
   - Event and Action Plans;
   - Environmental mitigation measures, as recommended of the EIA Report; and
   - Environmental requirements in contract documents.

v. Implementation status:
   - Advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA Report.

vi. Monitoring results (in both hard and diskette copies) together with the following information:

- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details;
- Monitoring parameters;
- Monitoring locations;
- Monitoring date, time, frequency and duration;
- Graphical plots of the monitored parameters;
- Major activities being carried out on site during the period;
- Weather conditions during the period;
- Any other factors which might affect the monitoring results; and
- QA / QC results and detection limits.

vii. Report on non-compliance, complaints, notifications of summons and status of prosecutions:

- Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit Levels);
- Record of all complaints received (written or verbal) including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- Record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigations, follow-up actions taken, results and summary;
- Review of the reasons for and the implications of non-compliances, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

viii. Others:

- An account of the future key issues as reviews from the works programme and method statements of works;
- Advice on the solid and liquid waste management status;
- A forecast of the works programme, impact predictions and monitoring schedule for the next reporting month;
- Compare the EM&A data in the reporting month with the EIA predictions and annotate with explanation for any discrepancies; and
- Comments (e.g. the effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

13.5 Subsequent Monthly EM&A Report

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

i. Executive summary (1-2 pages):

- Breaches of Action and Limit Levels;
- Complaint log;

- Notifications of any summons and successful prosecutions;
- Reporting changes; and
- Future key issues.

ii. Basic project information:

- Project organisation including key personnel's' contact and any hotline telephone number for the public to make enquiries;
- Construction programme;
- Management structure; and
- Works undertaken during the reporting month.

iii. Environmental status:

- Advice on the status of statutory environmental compliance, such as the status of compliance with the EP conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
- Works undertaken during the reporting month whit illustrations (e.g. location of works, etc.); and
- Drawings showing the Project area, any environmental sensitive receivers and the locations of the monitoring stations.

iv. Implementation status:

- Advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA Report.

v. Monitoring results (in both hard and diskette copies) together with the following information:

- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details;
- Monitoring parameters;
- Monitoring locations (and depth);
- Monitoring date, time, frequency and duration;
- Graphical plots of the monitored parameters in the month;
- Major activities being carried out on site during the period;
- Weather conditions during the period;
- Any other factors which might affect the monitoring results; and
- QA / QC results and detection limits.

vi. Report on non-compliance, complaints, notifications of summons and status of prosecutions:

- Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit Levels);
- Record of all complaints received (written or verbal) including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- Record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigations, follow-up actions taken, results and summary;

- Review of the reasons for and the implications of non-compliances, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

vii. Others:

- An account of the future key issues as reviews from the works programme and method statements of works;
- Advice on the solid and liquid waste management status;
- A forecast of the works programme, impact predictions and monitoring schedule for the next reporting month;
- Compare the EM&A data in the reporting month with the EIA predictions and annotate with explanation for any discrepancies; and
- Comments (e.g. the effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

viii. Appendix:

- Action and Limit Levels;
- Graphical plots of trends of the monitoring parameters over the past four reporting periods;
- Major Project activities being carried out on site during the reporting period;
- Weather conditions during the reporting period; Cumulative statistics on complaints, notifications of summons and successful prosecutions; and
- Outstanding issues and deficiencies.

13.6 Final EM&A Review Report

13.6.1.1 The "Guidelines for Development Projects in Hong Kong Environmental Monitoring and Audit" recommends that the termination of EM&A programme shall be determined on the following basis:

i. Completion of construction activities and insignificant environmental impacts of the remaining outstanding construction works;

ii. Trends analysis to demonstrate the narrow down of monitoring exceedances due to construction activities and, return of ambient environmental conditions in comparison with baseline data; and

iii. No environmental complaint and prosecution involved.

13.6.1.2 Prior to the proposed termination, it may be required to consult related local community. The proposed termination should be endorsed by the IEC, the ER and the Project Proponent followed by final approval from the Director of Environmental Protection.

13.6.1.3 The ET Leader should prepare and submit the Final EM&A Report, which should contain at least the following information:

i. Executive summary (1-2 pages):
ii. Drawings showing the Project area, environmental sensitive receivers and locations of the monitoring stations;
iii. Basic project information including a synopsis of the Project organisation, contacts of key management, and a synopsis of works undertaken during the course of the Project;
iv. A brief summary of EM&A requirements including:

- Environmental mitigation measures, as recommended in the EIA Report;
- Environmental impact hypotheses tested;
- Environmental quality performance limits (Actions and Limit Levels);
- All monitoring parameters; and
- Event and Action Plans;

v. A summary of the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA Report, summarized in the updated implementation schedule;

vi. Graphical plots and the statistical analysis of the trends of monitoring parameters over the course of the Project for all monitoring stations;

vii. Major Project activities being carried out on site during the reporting period;

viii. Weather conditions during the reporting period;

ix. Any other factors which might affect the monitoring results;

x. A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit Levels);

xi. A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;

xii. A description of the actions taken in the event of non-compliance;

xiii. A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

xiv. 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;

xv. A review of the validity of EIA predictions and identification of shortcomings of the recommendations proposed in EIA Report; and

xvi. Comments (for example, a review of the effectiveness and efficiency of the mitigations measures and of the performance of the environmental management system, that is , of the overall EM&A programme);

xvii. Recommendations and conclusions (for example, a review of success of the overall EM&A programme to cost-effectively identify deterioration and to initiate prompt effective mitigation action when necessary).

13.7 Data Keeping

13.7.1.1 No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the monthly EM&A reports. However, any such document should be properly maintained by the ET and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. Monitoring data should also be input into electronic format for checking upon request. All documents and data should be kept for at least one year following the completion of the construction contract.

13.8 Interim Notifications of Environmental Quality Limit Exceedances

13.8.1.1 With reference to the Event and Action Plans, when the environmental quality performance limits are exceeded and if they are proved to be valid, the ET should immediately notify the IEC, ER, Contractor and EPD, as appropriate. The notification should be followed up with advice to the IEC and EPD on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals. A sample template for the interim notifications is presented in **Appendix D**.

14 Conclusion

14.1.1.1 This Manual lists out the EM&A requirements for environmental aspects including air quality, noise, water quality, sewerage and sewage treatment, waste management, land contamination, ecology, fisheries, landscape and visual. The EM&A programme covers the construction and operation phases of the Project to monitor the environmental impacts on the neighbouring sensitive receivers. Regular monitoring and/or site inspection are recommended under different phases. The monitoring requirements for each environmental aspect are summarised in the **Table 14.1**.

Table 14.1 Summary of EM&A Requirements

Environmental Aspect	Environmental Monitoring and Audit	
	Construction Phase	Operation Phase
Air Quality	✓	✗
Noise	✓	✗
Water Quality	✓	✓(1)
Sewerage and Sewage Treatment	✗	✗
Waste Management	✓	✗
Land Contamination	✗	✗
Ecology	✓	✓(1)
Fisheries	✗	✗
Landscape and Visual	✓	✗

Note:
(1) EM&A to be conducted during maintenance dredging operation

14.1.1.2 Any non-compliance identified should be notified to all parties according to the Event and Action Plan and remediation measures should be undertaken. Complaints received should be investigated and problems related to construction works should be resolved till satisfaction. Baseline, monthly, quarterly and final EM&A reports shall be prepared to regularly report the monitoring results and evaluate the EM&A works.

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