


China Harbour Engineering Company (Group)

Contract No. CV/2002/09

**Tai O Development
Sheltered Boat Anchorage**

**Environmental Monitoring and Audit
Manual (Version 2.0)**

May 2003

Certified By 
(Environmental Team Leader)

REMARKS:

The information supplied and contained within this report is, to the best of our knowledge, correct at the time of printing.

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1 INTRODUCTION

Background

- 1.1 Tai O was formerly one of the largest fishing villages in Hong Kong and was a historical case for fishing boats in the western approaches of Lantau Island and the Pearl River estuary. However, the importance of the fishing industry in Tai O has declined in recent decades, which has resulted in a degradation of its population base.
- 1.2 The formation of the Tai O sheltered boat anchorage is fully supported by the Islands Provisional District Board members and is widely seen as a means of reviving the town's local fishing industry and contributing to the revitalization of Tai O.
- 1.3 Previous consultancies undertaken on behalf of the Civil Engineering Department (CED) to determine the feasibility of construction a sheltered boat anchorage (Agreement No. CE 41/98) Environmental and Drainage Impact Assessment for the Tai O Sheltered Boat Anchorage Study. The original development scheme comprised an 8 ha anchorage for 220 vessels and about 1 ha reclamation for boat maintenance facilities, parking area, bus terminus and a loading/unloading bay. For implementation of the scheme, the following reports, amongst others, have been produced:
 - (a) Tai O Sheltered Boat Anchorage – Mangrove Layout and Restoration Plan Final Report, July 1999; and
 - (b) Environmental Impact Assessment – Final Assessment Report and Environmental Monitoring and Audit (EM&A) Manual, May 2000.
- 1.4 The original development scheme has been gazetted under the Foreshore & Sea-bed (Reclamations) Ordinance in December 2000. Following public consultation and interdepartmental discussion, the scope of the scheme was revised in the adoption of the current development scheme with a reduced area of boat anchorage, shortened breakwater and reduced area of reclamation.
- 1.5 The project now comprises construction of a 4 ha sheltered boat anchorage for small boats/fishing vessels and a breakwater of about 350 m length, formation of about 0.22 ha of land for a future bus terminus, construction of a 0.23 ha promenade, site formation and associated engineering works for a mangrove planting area and restoration of the existing historic seawall.
- 1.6 An engineering design review of the sheltered boat anchorage original development scheme and subsequent revision has been undertaken. The Environmental Review Report (ERR) is therefore issued to review the findings of the EIA for Tai O Sheltered Boat Anchorage Environmental Impact and Drainage Impact Assessment (hereafter referred to as the EIA Report) based on the current development scheme.
- 1.7 An Environmental Permit No. EP-144/2002 was issued on 11 Sep 2002 for this project (EP) to the Civil Engineering Department as Permit Holder. Condition 2.3 of the EP requires an updated Environmental Monitoring and Audit Manual (Updated EM&A Manual) be prepared to include the latest EM&A requirements in accordance with the information and recommendation described in the ERR.

1.8 Cinotech Consultants Limited was commissioned by the China Harbour Engineering Company (Group) (hereafter called “the Contractor) to undertake the Environmental Monitoring and Audit (EM&A) works for the Project. This Updated EM&A Manual was prepared by Cinotech to fulfill the requirements of the EP.

Purpose of this Manual

- 1.9 The purpose of this Updated Environmental Monitoring and Audit (EM&A) Manual is to guide the setup of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) and Environmental Review Report (ERR) studies recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action.
- 1.10 This Manual outlines the monitoring and audit programme to be undertaken for the construction of Tai O Sheltered Boat Anchorage. It aims to provide systematic procedures for monitoring, auditing and minimising the environmental impacts associated with the construction works.
- 1.11 Hong Kong environmental regulations for noise, air quality, water quality and waste, the Hong Kong Planning Standards and Guidelines, and the recommendations in the EIA and ERR have served as environmental standards and guidelines in the preparation of this Manual.
- 1.12 This Manual contains the followings:
- (a) duties of the Contractor, the Engineer’s Representative (ER), the Independent Environmental Checker (IEC) and the Environmental Team (ET) with respect to the environmental monitoring and audit requirements during construction;
 - (b) information on project organisation and programming of construction activities for the project;
 - (c) requirements with respect to the construction schedule and the necessary environmental monitoring and audit programme to track the varying environmental impacts;
 - (d) definition of Action and Limit Levels;
 - (e) establishment of event and action plans;
 - (f) requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria; and
 - (g) requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures.

- 1.13 For the purpose of this Manual, the “Engineer” will refer to the Engineer as defined in the Contract and the Engineer’s Representative (ER), in cases where the Engineer’s powers have been delegated to the ER, in accordance with the Contract. The ET Leader, who will be responsible for and in charge of the ET of the construction and operational Phases of the Project, will refer to the person delegated the role of executing the environmental monitoring and audit requirements. IEC will undertake the auditing role.

Description of the Works

- 1.14 The general layout of the proposed Tai O sheltered boat anchorage development under current scheme is shown in **Figure 1.1**. The works include the following key components:
- Construction of a sheltered boat anchorage with an effective area of approximately 4 ha for approximately 110 small boats/fishing vessels;
 - Construction of a breakwater of around 350 m length;
 - Reclamation and formation of 0.22 ha of land for a future bus terminus;
 - Construction of a 0.23 ha promenade including landing steps;
 - Dredging and disposal of marine mud to lower the seabed within the sheltered boat anchorage, the associated fairways/access channels;
 - Restoration of existing historic seawall; and
 - Site formation and associated engineering works for a mangrove planting area.

Environmental Monitoring and Audit Requirements

- 1.15 The Environmental Review Report identified the likely environmental impacts during construction and operational phases of the current development scheme, including: noise (construction only), water quality, ecology and culture heritage. These impacts can be minimized to acceptable levels with the implementation of environmental mitigation measures. In order to ensure compliance with relevant environmental standards, baseline and compliance monitoring for noise and water quality is required and is described in detail in the subsequent sections. The proposed schedule for the implementation of recommended mitigation measures is shown in **Appendix A**.

Project Organizations

- 1.16 The proposed EM&A organization is shown in **Figure 1.2** of this Manual. The responsibilities of respective parties for the EM&A programme are listed in later Clauses.
- 1.17 The Environmental Team (ET) will be employed by the Contractor and undertake the EM&A works. The Independent Environmental Checker (IEC) will be engaged by the Employer audit the work of the ET. The IEC will not be in any way an associated body of the Contractor or the ET. The ET and the IEC Team Leader will have relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the Environmental Protection Department (EPD).

1.18 Appropriate staff will be included in the ET and IEC under the supervision of the ET/IEC Team Leader, to fulfill the EM&A duties specified in this Manual.

1.19 The duties and responsibilities comprise the following:

The Contractor

- Employ an Environmental Team (ET) to undertake EM&A works, including laboratory analysis and reporting of environmental monitoring and audit;
- provide assistance to the ET in carrying out environmental monitoring and audit;
- 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 impact where Action and Limit Levels are exceeded; and
- adhere to the procedures for carrying out complaint investigation in accordance with Sections 6.11 to 6.14 of this Manual.

Engineer or Engineer's Representatives

- Supervising the Contractor activities and ensure that the requirements in the EM&A Manual are fully complied with;
- inform the Contractor when action is required to reduce environmental impacts in accordance with the Event and Action Plans; and
- adhere to the procedures for carrying out complaint investigation in accordance with Sections 6.11 to 6.14 of this Manual.

Environmental Team (ET)

- Monitor the various environmental parameters as required in this Manual;
- analyze the environmental monitoring and audit data;
- review the EM&A programme to confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify and adverse environmental impacts arising;
- carry out site inspection to investigate and audit the Contractor's site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and effect proactive action to pre-empt problems;
- audit and prepare EM&A reports on the environmental monitoring data and site environmental conditions;
- report the environmental monitoring and audit results to the IEC, the Contractor, the ER and EPD;
- 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; and
- adhere to the procedures for carrying out complaint investigation in accordance with Sections 6.11 to 6.14 of this Manual.

Independent Environmental Checker (IEC)

- Employed by the Client to audit the results of the EM&A works carried out by the ET;
- review the EM&A works performed by the ET;
- audit the monitoring activities and results;
- report the audit results to the ER and EPD in parallel;
- reviewing EM&A reports submitted by the ET;
- review proposals on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans and advise the Engineer; and
- adhere to the procedures for carrying out complaint investigation in accordance with Sections 6.11 to 6.14 of this Manual;

Construction Programme

- 1.20 The tentative works programme for the project is presented in **Appendix B**.
- 1.21 The project programme is indicative only and is provided for information of the ET Leader to get an initial idea of the sequence of the works. The ET Leader will make reference to the actual works programme and progress during the construction stages to schedule the EM&A works, and the Contractor will provide the respective information to the ET Leader for formulating the EM&A schedule.

2 NOISE

- 2.1 The EIA Report identified that unacceptable noise levels at identified sensitive receivers may occur during the construction works unless specific mitigation measures are implemented. As such, noise monitoring will be conducted at representative sensitive receivers to ensure that the works proceed in manner that will not result in unacceptable noise levels.

Noise Monitoring Parameters

- 2.2 Monitoring and audit of construction noise levels will be carried out by the ET to ensure that any unacceptable noise impacts will be readily detected and timely and appropriate action be undertaken to rectify the situation.
- 2.3 The construction noise levels will be measured in terms of the A-weighted equivalent continuous sound pressure level (Leq). Leq(30 min) will be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays. For all other time periods, Leq(5 min) will be employed for comparison with the Noise Control Ordinance (NCO) criteria.
- 2.4 As supplementary information for data auditing, statistical results such as L_{10} and L_{90} will also be obtained for reference. Sample of field data sheet for noise monitoring is shown in **Appendix C** to this Manual for reference.

Monitoring Equipment

- 2.5 According 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 will be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement the accuracy of the sound level meter will be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0dB.
- 2.6 Noise measurements will not be made in the presence of fog, rain, wind with a steady speed exceeding 5 m/sec or wind with gusts exceeding 10m/sec. The wind speed will be checked with a portable wind speed meter capable of measuring the wind speed in m/sec.
- 2.7 The ET Leader will be responsible for the provision of the monitoring equipment and associated accessories and power supply. The ET Leader will 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 will be clearly labelled. The ET Leader will also liaise with the concerned parties for gaining access to the monitoring stations for the installation of the monitoring equipment and carrying out monitoring.

Monitoring Locations for Construction Noise

- 2.8 Construction phase noise monitoring stations are shown in **Figure 2.1** and detailed in Table 2.1.

Table 2.1 Locations for Construction Noise Monitoring Stations

Monitoring Stations	Locations
N1	No. 26B Shek Tsai Po
N9	Tai O Primary School
N11	Lung Tin Court, Wing Tin House
N17	Nam Chung Tsuen

- 2.9 Owing to the nature of the works, construction activities will shift from one location to another from time to time. The ET will select the monitoring locations from those in Table 2.1 based on the locations of the construction activities and seek approval from ER and agreement from the IEC and EPD. When alternative monitoring locations are proposed, the monitoring locations will be chosen based on the following criteria:-
- at locations close to the major site activities which are likely to have noise impacts;
 - close to the noise sensitive receivers. For the purposes of this section, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing art centre will be considered as noise sensitive receiver; and
 - for monitoring locations located in the vicinity of the sensitive receivers, care will be taken to cause minimal disturbance to the occupants during monitoring.
- 2.10 The monitoring station will normally be at a point 1 m from the exterior of the sensitive receivers building facade and be at a position 1.2 m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements will be made. For reference, a correction of + 3dB(A) will be made to the free field measurements. The ET Leader will 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 will be carried out at the same positions.

Baseline Monitoring for Construction Noise

- 2.11 The ET will carry out baseline monitoring prior to the commencement of the construction works. The baseline monitoring will be carried out daily for a period of at least two weeks. A schedule on the baseline monitoring for construction noise will be submitted to the ER for approval before the monitoring starts.
- 2.12 There will not be any construction activities in the vicinity of the stations during the baseline monitoring.
- 2.13 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader will liaise with IEC and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to the ER for approval.

Impact Monitoring for Construction Noise

- 2.14 Noise monitoring will be carried out at all the designated monitoring stations. The monitoring frequency will depend on the scale of the construction activities. The following is an initial guide on the regular monitoring frequency for each station on a per week basis when noise generating activities are underway:-
- one set of measurements between 0700-1900 hours on normal weekdays;
 - one set of measurements between 1900-2300 hours;
 - one set of measurements between 2300-0700 hours of next day; and
 - one set of measurements between 0700-1900 hours on holidays.
- 2.15 For the measurements (b), (c) and (d) above, one set of measurements will at least include 3 consecutive Leq(5 min) results if the construction works is carried during restricted hours. General construction work carrying out during restricted hours is controlled by CNP system under the NCO.
- 2.16 If a school exists near the construction activity, such as the noise monitoring station N9, noise monitoring will be carried out at the monitoring stations for the school during the school examination periods. The ET Leader will liaise with the school's personnel and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the construction.
- 2.17 In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Event/Action Plan in Section 2.19 of this Manual will be carried out. This additional monitoring will be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.
- 2.18 A schedule for the compliance monitoring will be submitted to the ER and IEC for approval before the monitoring starts.

Event and Action Plan for Construction Noise

- 2.19 The Action and Limit levels for construction noise are defined in Table 2.2. Will non-compliance of the criteria occur, action in accordance with the Event/Action Plan in Table 2.3, will be carried out.

Table 2.2 Action and Limit Levels for Construction Noise

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

Notes:

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

** to be selected based on Area Sensitivity Rating.

If works are to be carried out during restricted hours, the conditions stipulated in the construction noise.

Table 2.3 Event / Action Plan for Construction Noise

Event	ACTION			
	ET	IEC	ER	Contractor
Action Level	<ol style="list-style-type: none"> 1. Identify source, investigate the causes and propose remedial measures; 2. Notify IEC and Contractor; 3. Report the results of investigation to the ER and Contractor; 4. Discuss with the Contractor and formulate remedial measures; 5. Increase monitoring frequency to check mitigation effectiveness. 6. Review the proposed remedial measures by Contractor and advise the ER accordingly. 	<ol style="list-style-type: none"> 1. Review the analysed results submitted by the ET 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly 3. Supervise the implementation of remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures are properly implemented. 	<ol style="list-style-type: none"> 1. Submit noise mitigation proposals to IEC; 2. Implement noise mitigation proposals.
Limit Level	<ol style="list-style-type: none"> 1. Identify source; 2. Inform ER, IEC, EPD and Contractor; 3. Advise the ER on the effectiveness of the proposed remedial measures; 4. Repeat measurement to confirm findings; 5. Increase monitoring frequency to daily; 6. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring 9. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly. 	<ol style="list-style-type: none"> 1. Discuss amongst ER, ET and Contractor on the potential remedial actions; 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; 3. Supervise the implementation of the remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures properly implemented; 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals; 4. Resubmit proposals if problem still not under control; 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

Noise Mitigation Measures

- 2.20 **Figure 2.1** shows the locations of construction work-site areas. The proposed construction programme is presented in **Appendix B**. The implementation schedule for recommended mitigation measures is presented in **Appendix A**.
- 2.21 The Environmental Review Report has recommended construction noise control and mitigation measures during different construction phases.

Construction Noise Mitigation Proposal

- 2.22 Condition 2.4 of the EP requires the submission of a construction noise mitigation proposal to EPD at least two weeks before the commencement of construction of the Project to mitigate the construction noise impact arising from the Project on the Tai O Primary School at Tai O Market Street.
- 2.23 The proposal will indicate the exact locations and details of the temporary noise barriers and the arrangement of the number and type of equipment, procedure and sequence of construction.
- 2.24 In addition to the mitigation measures mentioned in the Construction Noise Mitigation Proposal, the good site practices listed below are also recommended to the Contractor to adopt, if possible, to further ameliorate the noise impacts. Although the noise mitigation effects are not easily quantifiable and the benefits may vary with site conditions and operating conditions, good site practices are easy to implement and do not impact upon the works schedule.
- Only well-maintained plant will be operated on-site and plant will be serviced regularly during the construction programme;
 - Silencers or mufflers on construction equipment will be utilized and will be properly maintained during the construction programme;
 - Mobile plant, if any, will be sited as far from NSRs as possible;
 - Machines and plant (such as trucks) that may be in intermittent use will be shut down between work periods or will be throttled down to a minimum;
 - Plant known to emit noise strongly in one direction will, whether possible, be orientated so that the noise is directed away from the nearby NSRs; and
 - Material stockpiles and other structures will be effectively utilized, wherever practicable, in screening noise from on-site construction activities.
- 2.25 If the above measures are not sufficient to restore construction noise quality to acceptable levels, the Contractor will liaise with the ET on other mitigation measures, proposes these measures to the ER for approval, and carry out the mitigation measures as necessary.

3 WATER QUALITY

Water Quality Parameters

- 3.1 In order to ensure that any deterioration in water quality can be readily detected and timely action taken to rectify the situation, a water quality monitoring programme is required. The following water quality parameters will be included in the monitoring programme during construction and operational phases.

Table 3.1 Water Quality Parameters

Phase	Water Quality Parameters
Construction	<ul style="list-style-type: none"> • Temperature (°C) • pH (pH unit) • turbidity (NTU) • water depth (m) • salinity (mg/L) • dissolved oxygen (DO) (mg/L and % of saturation) • suspended solids (SS) (mg/L)
Operation	<ul style="list-style-type: none"> • dissolved oxygen (DO) (mg/L and % of saturation) • pH (pH unit) • suspended solids (SS) (mg/L) • 5-day Biochemical Oxygen Demand (BOD₅) (mg/L) • ammoniacal nitrogen (NH₃-N) (mg/L) • total inorganic nitrogen (TIN) (mg/L) • oil and grease (mg/L) • E. coli (cfu/100mL) • Faecal coliform (cfu/100mL)

Monitoring Equipment

- 3.2 For water quality monitoring, the following equipments will be supplied by the ET and approved by the ER.

Dissolved Oxygen (DO) and Temperature Measuring Equipment

- 3.3 The instrument for measuring dissolved oxygen and temperature will be portable and weatherproof complete with cable, sensor, comprehensive operation manuals and use DC power source. It will be capable of measuring:
- a dissolved oxygen level in the range of 0-20 mg/L and 0-200% saturation; and
 - a temperature of 0-45 degree Celsius.
- 3.4 It will have a membrane electrode with automatic compensation complete with a cable.
- 3.5 Sufficient stocks of spare electrodes and cables will be available for replacement where necessary (e.g. YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).

- 3.6 *In situ* salinity will be measured to calibrate the DO equipment prior to each DO measurement if salinity compensation is not built-in in the DO equipment.

Turbidity

- 3.7 Turbidity will be measured *in situ* by the nephelometric method. The instrument will be portable and weatherproof using a DC power source complete with cable, sensor and comprehensive operation manuals. The equipment will be capable of measuring turbidity between 0-1000 NTU. The probe cable will not be less than 25m in length. The meter will be calibrated in order to establish the relationship between NTU units and the levels of SS.

Suspended Solids (SS)

- 3.8 A water sampler, consisting of a transparent PVC or glass cylinder of a capacity of not less than two litres which can be effectively sealed with cups at both ends will be used (Kahlsico Water Sampler 13SWB203 or an approved similar instrument). The water sampler will 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.
- 3.9 Water samples for SS will be collected in high density polythene bottles, packed in ice and delivered to HOKLAS accredited laboratory for analysis as soon as possible after collection.

Water Depth Detector

- 3.10 A portable, battery-operated echo sounder (Seafarer 700 or a similar approved instrument) will be used for the determination of water depth at each designated monitoring station. This unit can either be hand held or affixed to the underside of the survey boat, if the same vessel is to be used throughout the monitoring programme.

Salinity

- 3.11 A portable salinometer capable of recording within the range of 0-40 ppt will be used for salinity measurements.

Water Sampling for Laboratory Analysis

- 3.12 A water sampler as detailed in Section 3.8 will be used to collect samples for laboratory analysis.

Position System

- 3.13 A hand held or boat fixed type digital Global Positioning System (GPS) will be used to ensure that the correct location has been selected prior to sample collection.

Sample Container and Storage

- 3.14 Following collection, water samples for SS, BOD₅, NH₃-N, TIN, *E. coli* and faecal coliform analysis will be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4°C without being frozen), delivered to the laboratory

and analysed as soon as possible.

Calibration of In Situ Instruments

- 3.15 All *in situ* monitoring instruments will be checked, calibrated and certified by a laboratory accredited under HOKLAS or other international accreditation scheme before use, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring.
- 3.16 For the on site calibration of field equipment, the BS 1427:1993, "Guide to Field and on-site test methods for the analysis of waters" will be observed.
- 3.17 Sufficient stocks of spare parts will be maintained for replacements when necessary. Backup monitoring equipment will also be made available so that monitoring can proceed uninterrupted even when some equipment is under maintenance, calibration, etc.

Laboratory Analytical Methods

- 3.18 Analysis, including SS, BOD, NH₃-N, TIN, *E. coli* and faecal coliform, will be carried out in a HOKLAS or other international accredited laboratory. The following table shows the standard test methods of the proposed determinants for laboratory analysis.

Table 3.2 Methods for Laboratory Analysis for Water Samples

Parameters (Unit)	Suggested Method
SS (mg/L)	APHA 2540 D
BOD (mg/L)	APHA 5210 B
NH ₃ -N (mg/L)	APHA 4500-N H 3
TIN	APHA 4500-N
Oil and grease	APHA 5520C
<i>E. coli</i> (cfu/100mL)	DoE7.8 & 7.9
Faecal coliform (cfu/100mL)	DoE7.8 & 7.9

Notes:

APHA = American Public Health Association: Standard Methods for the Examination of Water and Wastewater Ed 19

DoE = The Bacteriological Examination of Drinking Water Supplier 1992

- 3.19 The testing laboratory will be HOKLAS accredited (or if not, approved by the ER) and comprehensive quality assurance and control procedures in place in order to ensure quality and consistency in results.
- 3.20 If a site laboratory is set up or a non-HOKLAS and non-international accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment, analytical procedures, and quality control will be approved by ER. All the analysis will be witnessed by the ER.
- 3.21 The ET will provide the ER with one 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.
- 3.22 For the testing methods of other parameters as recommended by EPD, detailed testing methods, pre-treatment procedures, instrument use, quality assurance/quality control

(QA/QC) details (such as blank, spike recovery, number of duplicate samples per batch, etc.), detection limits and accuracy will be submitted to EPD for approval prior to the commencement of monitoring programme. The QA/QC will be in accordance with the requirement of HOKLAS or international accredited scheme. The QA/QC results will be reported. EPD may also request the laboratory to carry out analysis of known standards provided by EPD for quality assurance. Additional duplicate samples may be required by EPD for inter laboratory calibration. Remaining samples after analysis will be kept by the laboratory for 3 months in case repeat analysis is required. If in-house or nonstandard methods are proposed, details of the method verification may also be required for submission to EPD. In any circumstance, the sample testing will have comprehensive quality assurance and quality control programmes. The laboratory will prepare to demonstrate the programmes to EPD.

Monitoring Locations

3.23 The water quality monitoring locations are shown in **Figure 3.1** and their locations are summarized in Table 3.3.

Table 3.3 Water Quality Monitoring Locations

Phase	ID	Location	Category	Co-ordinates	
				Easting	Northing
Construction Phase	W1	Outer Bay	Control Station (on ebb tide) Impact Station (on flood tide)	802250	813200
	W2	Outer Bay	Impact Station	801900	812710
	W3	Outer Bay	Impact Station	801850	812060
	W4	Outer Bay	Control Station (on flood tide)	802050	811530
	W5	Mouth of Tai O Creek	Impact Station	803844	812839
Operational Phase	W6	Inner Bay	Impact Station	803542	812492
	W7	Inner Bay	Control Station	802894	812601
	W8	Inner Bay	Control Station	803110	811906

3.24 During the construction phase it is not considered appropriate to monitor water quality inside Tai O Bay close to the dredging activities (although monitoring at Station W5 will be undertaken at the mouth of Tai O Bay in order to protect sensitive receivers upstream). A total of 4 stations have been located outside Tai O Bay - Stations W2 and W3 are impact stations, whilst Station W1 acts as a control station during the ebb tide and as an impact station during the flood tide, similarly Station W4 acts as a control station during the flood tide and as a impact station during the ebb tide. This reflects the movement of any sediment plume with the tides as illustrated by the water quality modelling exercise as detailed in the EIA Final Assessment Report (i.e. the sediment plume moves north during a flood tide and south during an ebb tide - Stations W1 and W4 thus alternate between control stations and impact stations).

3.25 During the operational phase, Station W6 will monitor the impact of the sheltered boat anchorage operation on water quality, whilst Stations W7 and W8 will act as controls

and aim to confirm the EIA FAR water quality modelling results which indicate that the anchorage operation will not impact upon water quality in the outer bay areas.

- 3.26 Prior to the commencement of the EM&A programme, the proposed water quality monitoring stations will be discussed and agreed with the ET Leader and EPD.

Baseline Monitoring

- 3.27 Baseline conditions for water quality will be established and agreed upon with EPD prior to the commencement of works. The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of the works and to demonstrate the suitability of the proposed impact, control and reference monitoring stations.
- 3.28 The baseline conditions will normally be established by measuring all the water quality parameters for the construction phase monitoring as illustrated in Table 3.1. The measurements will be taken at all designated monitoring stations (i.e. Stations W1 to W5), 3 days per week, at mid-flood and mid-ebb tides, at three depth locations (i.e. 1 m below surface, mid-depth and 1m from bed), for a period of 4 weeks prior to the commencement of marine works. The interval between two sets of monitoring will not be less than 36 hours and the baseline monitoring schedule will be submitted to EPD at least 1 week prior to the commencement of the baseline monitoring. Flow rates and sample depth will be also recorded, where appropriate. Also, all seasonal variations such as rainfall, tidal flow, typhoons and shipping activities will be assessed.
- 3.29 Measurements will be taken at 3 water depths, namely, 1m below water surface, mid-depth and 1m above sea bed, except where the water depth less than 6 m, the mid-depth station may be omitted. Will the water depth be less than 3 m, only the mid-depth station will be monitored. The ET will seek approval from EPD on all the monitoring stations.
- 3.30 There will not be any marine construction activities in the vicinity of the stations during the baseline monitoring.
- 3.31 In exceptional cases when insufficient baseline monitoring data or questionable results are obtained, the ET Leader will seek approval from EPD on an appropriate set of data to be used as baseline reference.

Impact Monitoring

- 3.32 During the course of the marine works, monitoring will be undertaken three days per week, at mid-flood and mid-ebb tides, with sampling/measurement at the designated monitoring stations (i.e. Stations W1 to W5). The interval between two sets of monitoring will 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.

- 3.33 Measurements will be taken at 3 water depths, namely, 1m below water surface, mid-depth and 1 m above sea bed, except where the water depth less than 6 m, the mid-depth station may be omitted. Will the water depth be less than 3 m, only the mid-depth station will be monitored.
- 3.34 Upon completion of all marine activities, a post project monitoring exercise on water quality will be carried out for four weeks in the same manner as the impact monitoring.
- 3.35 The Action/Limit levels will be derived with agreement from EPD following the completion of the baseline monitoring. The Action/Limit levels will be calculated as outlined in Table 3.4.

Table 3.4 Action /Limit Levels for Water Quality

Parameter (unit)	Action	Limit
Dissolved Oxygen (mg/L) (surface, middle, bottom)	<i>Surface and middle</i> 5%-ile of baseline for surface and middle layers <i>Bottom</i> 5%-ile of baseline for bottom layer	<i>Surface and middle</i> 4 mg/L or 1%-ile of baseline for surface and middle layers <i>Bottom</i> 2 mg/L or 1%-ile of baseline for bottom layer
SS (mg/L) Depth average	95%-ile of baseline data or 120% of upstream control station's SS at the same tide of the same day	99%-ile of baseline or 130% of SS readings at the upstream control station at the same tide of same day and specific sensitive receiver water quality requirements
Turbidity (NTU) (depth average)	95%-ile of baseline data or 120 % of upstream control station's turbidity at the same tide of the same day	99%-ile of baseline or 130% of turbidity at the upstream control station at the same tide of same day

Notes:

1. For DO, non-compliance of the water quality limit occurs when monitoring result is lower than the limit.
2. For SS & turbidity non-compliance of the water quality limits occur when monitoring result is higher than the limits.
3. All the figures given in the table are used for reference only and the EPD may amend the figures whenever it is considered as necessary

Event and Action Plan for Water Quality

- 3.36 When the monitoring results of the water quality parameters at any designated monitoring stations exceed the water quality criteria, the actions in accordance with the Action Plan in Table 3.5 will be carried out.

Table 3.5 Event and Action Plan for Water Quality during the Construction Phase

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
ACTION LEVEL				
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat in situ measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor and ER; 4. Check monitoring data, all plant, equipment and Contractor’s working methods. 5. Discuss mitigation measures with IEC and Contractor 6. Repeat measurement on next day of exceedance. 	<ol style="list-style-type: none"> 1. Discuss with ET and Contractor on the mitigation measures. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; and 2. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IEC on the proposed mitigation measures; and 2. Make agreement on the mitigation measures to be implemented. 	<ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant 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.
Action level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor; 4. Check monitoring data, all plant, equipment and Contractor’s working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Prepare to increase the monitoring frequency to daily; 8. Repeat measurement on next day of exceedance. 	<ol style="list-style-type: none"> 1. Discuss with ET and Contractor on the mitigation measures. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; and 2. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IEC on the proposed mitigation measures; and 2. Make agreement on the mitigation measures to be implemented. 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Inform the Engineer and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and 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.

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
LIMIT LEVEL				
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat measurement on next of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor, ER and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor's working methods. 2. Discuss with ET and Contractor on possible mitigation measures; 3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly; 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Discuss with IEC, ET and Contractor on the proposed mitigation. 3. Request Contractor to view the working methods. 4. Ensure mitigation measures are properly implemented. 	<ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 4. Discuss with ET, IEC and ER and propose mitigation measures to ER and IEC within 3 working days; 5. Implement the agreed mitigation measures.
Limit level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat measurement on next of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor, ER and EPD; 4. Check monitoring data, all plant, 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 two consecutive days; 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor's working methods. 2. Discuss with ET and Contractor on possible mitigation measures; 3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly; 4. Supervise the implementation of mitigation measures. 	<ol style="list-style-type: none"> 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. Ensure mitigation measures are properly implemented; 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance 2. Discuss with ET, IEC and ER and propose mitigation measures to ER and IEC within 3 working days; 3. Implement the agreed mitigation measures; 4. Resubmit proposals of mitigation measures if problem still not under control; 5. As directed by the Engineer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.

Operational Phase Monitoring

- 3.37 Following completion of the sheltered boat anchorage construction phase monitoring, Stations W6, W7 and W8 will be monitored on a monthly basis for the parameters for operational phase monitoring as detailed in Table 3.1. Water quality samples will be collected from the mid-water depth. Monitoring will be undertaken for 1 year following anchorage operation, thereafter the requirement for additional monitoring will be discussed and agreed with EPD.

Water Quality Mitigation Measures

- 3.38 The EIA report has recommended mitigation measures during construction and operational phases of the proposed development. The implementation schedule for recommended mitigation measures is presented in **Appendix A**.

Construction Phase

- 3.39 The Contractor will be responsible for the design and implementation of these mitigation measures. These include:

Dredging Best Practice

- Unnecessary disturbance to the sediments will be minimised by exerting care when lowering and lifting the grab;
 - all vessels used will be sized such that adequate clearance of the seabed is maintained at all stages of the tidal cycle and undue turbidity will not be generated by turbulence from vessel movement or propeller wash;
 - use of silt curtains where and when considered appropriate;
 - barges will be used which are fitted with tight fitting seals to their bottom openings to prevent leakage of material;
 - barge loading will be ensured accurately to avoid splashing of dredged material to the surrounding water;
 - grabs will be closed tightly and that hoist speeds will be suitably low;
 - barges or hoppers will not be filled to a level which will cause the overflow of materials or polluted water during loading or transportation. Adequate freeboard will be maintained to ensure that the decks are not washed by wave action;
 - large objects and debris will be removed manually prior to mechanical dredging to minimise losses from partially closed grabs;
 - dredging will be undertaken taking into account tidal conditions;
 - no visible foam, oil, grease, scum, litter or other objectionable matter will be present in the water within the site or dumping grounds;
 - appropriate monitoring of water quality will be undertaken to allow the implementation of appropriation action plans to prevent unacceptable water quality impacts; and
 - the number of hopper barges operating simultaneously with the grab dredgers in Tai O Bay will be restricted to two.
- 3.40 During dredging of contaminated sediments, additional mitigation measures are

required as follows:

- contaminated sediments will be dredged, transported and disposed of in approved dumping grounds in accordance with the Works Bureau Technical Circular No. 3/2000 (that supersedes EPD Technical Circular No. 1-1-92 and Works Branch Technical Circular No. 22/92) and No. 12/2000;
- contaminated sediments will be dredged by using grabs of no more than 8m³;
- specialized water tight grabs will be used to control sediment loss;
- wherever possible contaminated mud will be transported to marine disposal sites by split barges of not less than 750 m³ capacity, well maintained and capable of rapid opening and discharge at the disposal site;
- the barge loading will be monitored to ensure that loss of material does not take place during transportation; and
- on-site auditing of the equipment and plant will be required to ensure that it is used in the appropriate manner.

Reclamation

3.41 In order to ensure that silt-laden runoff from these areas does not occur during the works phase, the mitigation measures described in the “Practice Note for Professional Persons on Construction Site Drainage”, Professional Persons Environmental Consultative Committee, 1994 (ProPECC PN 1/94) will be followed as far as practicable. These practices include the following:

- the capacity of sediment tanks will be sufficient for settling wastewaters prior to disposal. The system capacity will be flexible and able to handle multiple inputs from a variety of sources and particularly suited to applications where the influent is pumped. Various physical and chemical filters can be added will refinement of the sedimentation process be required;
- the detailed design will be formulated such that construction works are programmed to minimise surface excavations during the rainy season (April to September). If excavation of soil cannot be avoided during the rainy season, or at any time of year when rainstorms are likely, exposed slope surfaces will be covered by a tarpaulin or other means. Other measures that need to be implemented before, during and after rainstorms are summarized in ProPECC PN 1/94;
- earthworks final surfaces will be well compacted and subsequent permanent work or surface protection works will be carried out immediately after final surfaces have been formed in order to prevent rainstorm erosion;
- all drainage facilities and erosion and sediment control structures will be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly following rainstorms. Deposited silt and grit will be removed regularly and disposed of to the salt pan area during periods of low-tide;
- measures will be taken to minimise the ingress of site drainage into excavations. If the excavation of trenches in wet periods is necessary, they will be dug and backfilled in short sections wherever practicable. Water pumped out from trenches or foundation excavations will be discharged via the silt removal facilities;
- both during and following construction of the reclamation areas, open stockpiles of inert construction materials (e.g. aggregates, sand and fill material) of more than 50m³ will be covered with a tarpaulin or similar fabric during rainstorms;
- stockpiles of cement and other construction material will be kept covered when not being used;

- manholes (including newly constructed ones) will always be adequately covered and temporarily sealed. Discharge of surface run-off into foul sewers must always be prevented to avoid overloading the foul sewerage system;
- all vehicles and plant will be cleaned before leaving the construction. An adequately designed and sited wheel washing bay will be provided at every site exit (if any) and wash-water will have sand and silt settled out and removed at least on a weekly basis. The section of access road leading to and exiting from the wheel-wash bay to the public road will be paved with sufficient backfill toward the wheel-wash;
- water used for construction purposes on site will, as far as practical, be recycled for use; information detailing storm run-off and wastewater discharge points and the corresponding maximum (or range of) volumes of discharges expected from the construction sites on a dry day will be provided in the WPCO licence application. The licence application to EPD will be submitted as early as possible before the commencement of any discharge;
- entry points into the surface drainage system will be fitted with oil interceptors;
- waste oils and other chemical waste as defined in the Waste Disposal (Chemical Waste) (General) Regulation will require disposal by an appropriate means and could require prenotification to EPD prior to disposal. An appropriate disposal facility could be the Chemical Waste Treatment Centre (CWTC) at Tsing Yi. If chemical wastes are to be generated, the Contractor will need to register with EPD as a chemical waste producer and observe the requirements for chemical waste storage, labelling, transportation and disposal; and
- the existing drainage system and sewerage system will be avoided from general construction site activities required for reclamation formation.

Salt Pan Infilling/Reworking

3.42 Many of the general construction site mitigation activities as detailed above are also applicable to activities occurring within the salt pan area. In order to further minimise the potential for the loss of material from the salt pans, the following mitigation measures will also be employed:

- material placement and reworking will only occur during low tidal conditions;
- material will be dredged using grab dredgers to minimise moisture content and allow rapid material consolidation;
- a low rate of sediment reworking will be practised in order to minimise sediment disturbance (e.g. placement of approximately 100 m³ of dredged material in the salt pans per day and reworking of approximately 230 m³ of material a day);
- placed mud will be mixed with the relatively coarser salt pan bed material to reduce erosion potential and enhance consolidation;
- all material placed in the salt pans will be spread and mixed with existing bed material before completion of the day's work such that there is no material stockpiling; and
- the outer seawall will be breached in order to reduce the velocity of water entering and leaving the salt pans and thus reduce the risk of erosion of newly placed or moved materials. Material from around the breached areas will be removed prior to reworking.

Worker Generated Waste

- 3.43 The construction work force will use the existing public toilet facilities next to the bus depot, or portable chemical toilets will be provided.

Operational Phase

- 3.44 The project proponent or the developer will be responsible to the following measures:

Boat Effluents – Sewage and Bilge Discharges

- Provision of notices and educational leaflets to prevent sewage and bilge discharges within the anchorage and to encourage segregation of wastes in any boat maintenance yards.

Litter

- Collection of floating refuse within anchorage by private contractor; and
- Collection of littoral refuse along the seawall edge of the outer seawall.

Urban Runoff

- The surface water from the eastern reclamation will be directed towards the mangrove planting area; and
- The surface runoff from the western reclamation will be directed to Tai O Bay through a dry weather interceptor.

Sewage Effluents

- Any sewage discharges from either of the new reclamation areas is connected to the existing trunk sewerage system.

Process Wastes

- A centralized wastewater collection and treatment facility will be included in the design.

- 3.45 The implementation schedules of mitigation measures for water quality control during construction and operational phases are presented in **Appendix A**.
- 3.46 If the above measures are not sufficient to restore the water quality to an acceptable level, the Contractor (during construction) or the project proponent (during operational phase) will liaise with the ET Leader on other mitigation measures, propose to ER and IEC for approval, carry out the mitigation measures.

4 ECOLOGY

Introduction

- 4.1 The purpose of ecological monitoring is to verify the predictions of the impact assessment, detect unpredicted ecological impacts, monitor the effectiveness of mitigation measures, and recommend action plans in response to unpredicted impacts and/or failed mitigation. A programme of ecological monitoring to achieve these objectives is outlined below. A summary of impacts, receivers, severity of impacts, mitigation requirements, and residual impacts is shown in Tables 4.1 and 4.2. An implementation schedule of recommended mitigation measures is provided in **Appendix A**.

Monitoring Programme

Construction Phase

Dredging of Anchorage, Approach Channels, Breakwater Site

- 4.2 Potential impacts of sedimentation on benthos and their habitats, and on dolphins will be controlled by the water quality monitoring programme outlined in Chapter 3 of this Manual. That programme will ensure that no unforeseen sedimentation impacts occur to these marine ecological receivers. No additional water quality monitoring measures are proposed specifically for ecological receivers.
- 4.3 Potential for vessel collisions with dolphins will be mitigated through best practice. Dredging supervisors will be advised of the possible occurrence of dolphins, the need to avoid them with dredging vessels, and the legal vessel speed limits in Tai O Bay. Similarly, the dredging supervisors will be advised of the potential occurrence of horseshoe crabs. In the event that horseshoe crabs are encountered during dredging, these will be released to an area remote from the dredging operations. The ET Leader will be responsible for advising dredging supervisors of best practice measures.

Modification of Bunds Within Salt Pans

- 4.4 The implementation of the revised bund modification scheme of the mangrove planting area as recommended under Section 10.10.2 of the Environmental Review Report (Final) will be monitored. Mitigation of impacts on flora will be achieved by providing mangrove layout maps to fill supervisors, demarcating the areas to be protected, and monitoring operator compliance. These actions will be carried out by the ET during preparation of the salt pans for filling. Compliance monitoring will be carried out on a daily basis during filling to ensure minimal impacts to existing vegetation (see below).

Placement of Dredged Material Into Salt Pans

- 4.5 The objective of this task is to monitor filling of dredged mud into the filled salt pans to minimize destruction of existing mangroves. This will be accomplished by daily monitoring of the filling process by the ET Leader or and on-site ecologist authorized by the ET Leader. The responsible individual is to be on-site during all hours of construction works within salt pans, and is to have authority to stop or redirect filling as needed. Monitoring will take place throughout the salt pans and will continue through to the end of the fill placement process. Specific tasks are:
- provide proposed layout plans to construction supervisors to ensure they understand the priority on mangrove protection;
 - protect mangroves as clusters and these clusters will be identified, numbered and mapped out before construction;
 - fence off the preserved cluster using nets (or screens) with bamboo sticks before construction to avoid encroachment or disturbance due to earthworks associated with placement of sediments and reinforcement of the bunds;
 - flag the identified preserved cluster to provide a visual reminder to construction workers;
 - check to monitor whether marked mangroves are encroached;
 - if encroached, notify filling supervisor, and correct operator methods; and
 - remove the flags and fences after earthworks are finished.

Breakwater Construction

- 4.6 Potential for vessel collisions with dolphins will be mitigated through best practice. Works supervisors will be advised of the possible occurrence of dolphins, the need to avoid them with construction vessels, and the legal vessel speed limits of 10 knots (1 knot = 1852 meter per hour) in Tai O Bay.
- 4.7 Design of the slopes of the breakwater is to include rip-rap (rock armour) facing according to the specifications listed in the EIA Report. The ET Leader is to monitor the design and implementation process to ensure that the proper rip-rap design and construction methods are used.

Operational Phase*Discharge of Sewage, Bilge and Other Wastes from Vessels*

- 4.8 Potential impacts of water quality degradation on marine fauna will be controlled by the water quality monitoring programme outlined in Chapter 3 of this Manual. That programme will ensure that no unforeseen water quality impacts occur to marine ecological receivers. No additional water quality monitoring measures are proposed specifically for ecological receivers.

Maintenance Dredging of Approach Channels

- 4.9 Potential impacts of sedimentation on benthos and their habitats, and on the ecology of the filled salt pans will be controlled by the water quality monitoring programme outlined in Chapter 3 of this Manual. That programme will ensure that no unforeseen sedimentation impacts occur to these receivers. No sediment monitoring measures are proposed specifically for ecological receivers.

Facilities Operation at Boatyard

- 4.10 Any boatyards that are developed on the reclamation areas will need to treat any wastewater generated prior to its discharge. Given this requirement, no specific ecological monitoring programme is proposed.

Table 4.1 Summary of Construction Phase Impacts and Mitigation Measures

Impact Source	Receiver	Potential Impact	Severity	Mitigation Measure	Residual Impact
Dredging of anchorage, approach channels and breakwater site	Benthic fauna (including horseshoe crabs) and subtidal habitats at and near dredging site	±1.3 ha of permanent habitat loss and ±22 ha of temporary degradation. Mortality of benthos and temporary reduction in habitat area for dolphins due to sedimentation	Minor	1. Control sedimentation as per Section 3 of this Manual. 2. Release horseshoe crabs in unaffected areas of Tai O Bay. 3. Advise dredging supervisors to avoid dolphins when operating dredging vessels. 4. Advise dredging supervisors of the legal speed limit for in Tai O Bay.	Acceptable
	Dolphins in and around Tai O Bay		Minor		
	Vessel collisions with dolphins		Minor		
Modification of bunds within salt pans	Mangroves	Mortality and short-term habitat loss of ±0.1 ha	Minor	5. Provide mangrove layout map to fill supervisors. 6. Demarcate portions of bunds to be protected during filling. 7. Monitor operator compliance in protecting demarcated zones.	Acceptable
Placement of dredged material into salt pans	Salt pan flora		Minor	8. Monitor operator compliance in protecting demarcated zones. 9. Notify fill supervisor when encroachment occurs, and correct operator methods.	Acceptable
	Intertidal and benthic fauna of salt pans	Mortality of some benthos and short term feeding habitat loss to birds of ±0.1ha	Insignificant		
	Birds using salt pans		Insignificant		
Breakwater construction	Benthic organisms and dolphins in Tai O Bay	Sedimentation, noise and disturbance	Minor	10. Ensure design includes rip-rap (rock armour) meeting EIA. Mitigate dolphin impacts using best current practice. Advise dredging supervisors of the possible occurrence of dolphins, the need to avoid them with dredging vessels, and the legal vessel speed limits in Tai O Bay.	Acceptable

Table 4.2 Summary of Operational Phase Impacts and Mitigation Measures

Impact Source	Receiver	Potential Impact	Severity	Mitigation Measure	Residual Impact
Discharge of sewage, bilge and other wastes from boats	Subtidal and intertidal fauna of Tai O Bay and its shores, including the salt pans	Degradation of water quality, physiological stress on biota	Minor	11. Implement water quality control measures listed in Section 3 of this Manual	Acceptable
Maintenance dredging of approach channels	Benthic fauna along channels	Smothering	Minor	12. Implement water quality control measures listed in Section 3 of this Manual	Acceptable
	Salt pan ecology	Sedimentation	Insignificant	13. Implement water quality control measures listed in Section 3 of this Manual	Acceptable
Operation of boat maintenance facilities on new reclamations	Subtidal fauna of Tai O Bay	Pollution, leading to reduced reproduction or survivorship	Would depend on type/scale of activities	14. Implement water quality control measures listed in Section 3 of this Manual. Any process wastes must be treated prior to discharge.	Acceptable

5 CULTURAL HERITAGE

Introduction

- 5.1 The review on the cultural heritage impact assessment concludes that the proposed changes of the engineering design relative to that assumed in the EIA Report would not result in cultural heritage impact worse than that predicted in the EIA Report.
- 5.2 The findings and recommended mitigation measures and conclusions are considered still valid, with the exception of the retention of the existing outer seawall as recommended in the EIA Report. In view of the safety problem and poor condition of the existing outer seawall, the whole outer seawall is required to be restored. The key features of the salt pan outer seawall area shown in **Figure 5.1**.
- 5.3 As recommended in the EIA report, a Watching Brief is required during the dredging activities in order to ensure that any marine archaeological material is protected during the dredging works.

Protection Measures for the Outer Seawall

- 5.4 Owing to the safety reason and poor condition of the existing outer seawall, the engineering design of the current development scheme confirmed that the entire seawall is necessary to be reconstructed. It is therefore unnecessary to formulate an environmental reporting plan for inspecting and protecting the outer seawall.
- 5.5 As recommended by the Antiquities and Monuments Office (AMO), the material used for railings or parapets of the new seawall will be of traditional types in order to match the nature of the seawall as a historic feature. The clear width of the walking path will be maintained to be about 2 m, similar to the original seawall with additional width for the railings or parapets on each side provided.

Watching Brief

- 5.6 In order to protect any marine archaeological material in Tai O Bay, a watching brief will be maintained during the proposed dredging works. A watching brief is a standard archaeological practice and is defined as follows:

“a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons within a specified area or site on land or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed” (Institute of Field Archaeologists (1997) Standard Guidance for archaeological Watching Briefs).

- 5.7 The Watching Brief conducted by a qualified Marine Archaeologist is required during the dredging operation. The Marine Archaeologist will obtain a licence from AMO before undertaking the Watching Brief. Will marine archaeological materials be identified, AMO will be contacted immediately to seek guidance. Appropriate mitigation measures will be designed and implemented by the project proponent.

Scope of Works

- 5.8 The scope of works will comprise the monitoring of all dredging operations within the site and include the followings:
- (a) Review of the existing information;
 - (b) conduct any additional survey;
 - (c) recommend and carry out monitoring and precautionary measures during the dredging operations;
 - (d) carry out diving inspections;
 - (e) identify and prepare records of archaeological deposits and prepare a report on findings;
 - (f) advise AMO of findings of Watching Brief;
 - (g) propose mitigation or recovery strategy, if required;
 - (h) carry out approved mitigation measures or recovery works, if required.
- 5.9 An additional geophysical survey will be carried out prior to commencement of any dredging works. The geophysical survey will be carried out over the Survey Area which is defined as all areas within the Site where there will be dredging works under the Contract but which have not be covered in the pre-existing AMO survey and any other area within the Site required by AMO. The objectives of the survey are:
- (a) To map the seabed and underlying significant geological horizons;
 - (b) to map features (anomalies) on and buried beneath the seabed.
- 5.10 The geophysical survey work will be carried out in accordance with PS Appendix 1.17 and will include the followings:
- (a) seismic profiling;
 - (b) echo sounding, and
 - (c) side scan sonar.
- 5.11 A monitoring and precautionary guideline will be prepared and submitted to the Engineer and AMO for records at least 4 weeks prior to the commencement of any dredging works.
- 5.12 The dredging works will be carried out in compliance with the submitted monitoring and precautionary guideline.
- 5.13 The dredging works will stop for a diving inspection by the Marine Archaeologist before any anomalies revealed in the AMO's survey or the survey conducted under the Contract are reached. The levels to which dredging will be suspended prior to diving inspection by the Marine Archaeologist will be pre-agreed with the Marine Archaeologist and AMO. Dredging in the affected area will not recommence until any recovery or mitigation works have been carried out by the Contractor in accordance with methodology approved by AMO.
- 5.14 The driving inspections are to determine the likely nature and potential archaeological significance of the anomalies. Any material with potential archaeological value will be reported to the Engineer and AMO. Any archaeological relics recovered during the diving inspection will be recorded and submitted to AMO. Complete records and

reports of the survey and diving inspection will be submitted to AMO for approval in draft and, following resolution of any comments, in final form.

- 5.15 Following the recovery or strategy proposed by the Marine Archaeologist the agreed recovery or mitigation works will be carried out by the Contractor. The affected contract works will not recommence until completion of the recovery or mitigation works.

Methodology and Procedures

- 5.16 The methodology and procedures for the archaeological monitoring and dredging works will be as follows:

- (1) Submit details of proposed additional geophysical survey to the Engineer and AMO for approval;
- (2) carry out additional geophysical survey;
- (3) submit survey report including mapping of any potentially significant archaeological feature at or below the seabed;
- (4) submit survey report to AMO for approval together with recommended monitoring and precautionary measures during dredging including dredging area and dredging level holding point criteria at locations of any potentially significant archaeological features;
- (5) get approval by the AMO of additional geophysical and proposed monitoring and precautionary measures;
- (6) dredge to relevant holding point levels in areas of archaeological features and seabed anomalies;
- (7) conduct dive inspection by Marine Archaeologist including preparation and submission of records on all potential archaeological features identified by existing AMO surveys and current surveys together with proposals by Marine Archaeologist for mitigation or recovery of any significant archaeological deposits;
- (8) get AMO's approval of dive inspection report and proposals for mitigation or recovery of any significant archaeological deposits;
- (9) carry out approved recovery/mitigation measures for any prehistoric or historic artifacts;
- (10) confirm with AMO that recovery/mitigation works are complete; and
- (11) proceed with dredging in the relevant area.

- 5.17 The Contractor will prepare and submit to the Engineer for approval 3 copies of the Draft Report on Geophysical Surveys and Diving Inspections carried out by the Specialist Surveyor and the Marine Archaeologist. No longer than 1 month following the receipt of comments from the Engineer, 8 copies of the Final Report will be prepared taking into account the Engineer's comments and submitted to the Engineer's for approval. Five copies of the Final Report will be submitted through the Engineer to AMO.

6 WASTE MANAGEMENT

Waste Management Plan (WMP)

- 6.1 A Waste Management Plan (WMP) will be prepared by the Contractor under required by the Particular Specification of the Contract No. CV/2002/09.
- 6.2 The WMP, which will be approved by the Engineer, will includes, but not limited to the following items:
- a chart setting out the roles and responsibilities of the Contractor's personnel responsible for waste management and appropriate mitigation measures;
 - an analysis and schedule of when, what quantities and type of construction and demolition (C&D) materials are anticipated to be generated in the course of the execution of the Works;
 - proposals for avoidance / minimization of the generation of C&D materials;
 - a figure showing a specific area on site to facilitate sorting of C&D material;
 - a proposal for handling, recycling, re-use and return of the suitable C&D material;
 - identification of the chemical waste to be generated and proposed means of handling of chemical waste;
 - a proposal for minimizing, storage and disposal of general refuse;
 - a daily checklist to facilitate the Engineer to check how the Contractor will maintain the site in a clean and tidy condition;
 - a monitoring and auditing proposal to ensure that the requirements of the WMP are properly implemented;
- 6.3 The Contractor will review the WMP at monthly intervals and submit a revised and updated WMP if necessary.

7 SITE ENVIRONMENTAL AUDIT

Site Inspections / Audits

- 7.1 Site Inspections / Audits provide a direct means to trigger and enforce the specified environmental protection and pollution control measures. They will be undertaken routinely to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. With well defined pollution control and mitigation specifications and a well established site inspection, deficiency and action reporting system, the site inspection is one of the most effective tools to enforce the environmental protection requirements on the construction site.
- 7.2 The ET Leader is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspection works. He will submit a proposal on the site inspection, deficiency and action reporting procedures within 21 days of the contract commencement to the Contractor for agreement and to the ER and the IEC for approval.
- 7.3 Regular site inspections / audits will be carried out at least once per week. The areas of inspection will not be limited to the environmental situation, pollution control and mitigation measures within the site; the ET Leader will 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 will make reference to the following information in conducting the inspection:-
- (a) the EIA recommendations on environmental protection and pollution control mitigation measures;
 - (b) works progress and programme;
 - (c) individual works methodology proposals (which will include proposal on associated pollution control measures);
 - (d) the contract specifications on environmental protection;
 - (e) the relevant environmental protection and pollution control laws; and
 - (f) previous site inspection results.
- 7.4 The Contractor will update the ET Leader with all relevant information of the construction contract for the ET Leader to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works will be submitted to the ER and the Contractor within 24 hours, for reference and for taking immediate action. The Contractor will follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the ET Leader to report on any remedial measures subsequent to the site inspection.
- 7.5 Ad hoc site inspections will also be carried out if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

Compliance with Legal and Contractual Requirements

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

Environmental Complaints

- 7.11 Complaints will be referred to the ET Leader for carrying out complaint investigation procedures. The ET Leader will undertake the following procedures upon receipt of the complaints:
- (a) log complaint and date of receipt onto the complaint database;
 - (b) investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
 - (c) if a complaint is valid and due to works, identify mitigation measures;
 - (d) if mitigation measures are required, advise the Contractor accordingly;
 - (e) review the Contractor's response on the identified mitigation measures, and the updated situation;
 - (f) if the complaint is transferred from EPD, submit interim report to EPD on status of the complaint investigation and follow-up action within the time frame assigned by EPD;
 - (g) undertake additional monitoring and audit to verify the situation if necessary, and

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- review that any valid reason for complaint does not recur;
- (h) report the investigation results and the subsequent actions to the source of complaint for responding to complainant (If the source of complaint is EPD, the results will be reported within the time frame assigned by EPD); and
 - (i) record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.
- 7.12 During the complaint investigation work, the Contractor and ER will cooperate with the ET Leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor will promptly carry out the mitigation. The ER will ensure that the measures have been carried out by the Contractor.
- 7.13 A flow chart of the complaint response procedures is shown in **Figure 6.1**.
- 7.14 A sample of complaint log sheet is provided in **Appendix G**.

8 REPORTING

General

- 8.1 The following reporting requirements based upon a paper documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the ER and EPD. All monitoring data (baseline and impact) will also be submitted in diskettes in a format agreed by ER and EPD.

Baseline Monitoring Report

- 8.2 The ET Leader will prepare and submit a Baseline Environmental Monitoring Report to EPD at least two weeks before the commencement of construction of the Project. Copies of the Baseline Environmental Monitoring Report will be submitted to each of the four parties: the Contractor, the IEC, the ER and the EPD. The ET Leader will liaise with the relevant parties on the exact number of copies they want. The format and content of the report, and the representation of the baseline monitoring data will be in a format to the satisfaction of EPD and include, but not be limited to the following:
- (a) Up to half a page executive summary;
 - (b) Brief project background information;
 - (c) drawings showing locations of the baseline monitoring stations;
 - (d) monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth); and
 - monitoring date, time, frequency and duration;
 - (e) details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period; and
 - other factors which might affect the results.
 - (f) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data, the analysis will conclude if there is any significant different between control and impact stations for the parameters monitored;
 - (g) revisions for inclusion in the EM&A Manual, and
 - (h) comments and conclusions.

EM&A Reports

- 8.3 The results and findings of all EM&A work required in the Manual will be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report will be prepared and submitted within two weeks after the end of each reporting month, with the first report due in the month after construction commences. A maximum of 4 copies of each monthly EM&A report will be submitted to each of the four parties: the Contractor, the ER, the IEC and EPD. Before submission of the first EM&A report, the ET Leader will liaise with the parties on the exact number of copies and format of the

monthly reports in both hard copy and electronic medium requirement.

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

First Monthly EM&A Report

- 8.5 The first monthly EM&A report will include at least the following:

- (a) executive summary 1-2 pages;
 - breaches of Action/Limit levels;
 - Complaint Log;
 - Notifications of any summons and successful prosecutions;
 - Reporting Changes;
 - Future key issues.

- (b) Basic project information;
 - Project organization including key personnel contact names and telephone numbers;
 - Construction Programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month;
 - Management structure; and
 - Works undertaken during the month;

- (c) Environmental Status
 - Works undertaken during the month with illustrations (such as location of works)
 - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.

- (d) a brief summary of EM&A requirements including:
 - all monitoring parameters;
 - environmental quality performance limits (Action and Limit levels);
 - Event-Action Plans;
 - environmental mitigation measures, as recommended in the project EIA study final report and
 - environmental requirements in contract documents;

- (e) Implementation Status
 - advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarized in the updated implementation schedule; and
 - advice on the status of submissions required under the EP and the status of compliance with EP's conditions.

- (f) Monitoring results (in both hard and diskette copies)
- monitoring methodology
 - name of laboratory and types of equipment used and calibration details
 - parameters monitored
 - monitoring locations (and depth)
 - monitoring date, time, frequency, and duration; - weather conditions during the period;
 - any other factors which might affect the monitoring results;
 - QA/QC results and detection limits and
 - all monitoring results will be tabulated with exceedances highlighted for ease of referencing.
- (g) Report on non-compliance, complaints, notifications of summons and successful 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) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
 - record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up action taken, results and summary;
 - review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; 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
- (h) Others
- an account of the future key issues as reviewed from the works programme and work method statements;
 - advice on the solid and liquid waste management status; and
 - submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule and complaint log summarizing the EM&A of the period.

Subsequent Monthly EM&A Reports

8.6 The subsequent monthly EM&A reports will include the following:

- (a) Executive Summary (1-2 pages)
- Breaches of AL levels
 - Complaint Log
 - Notifications of any summons and successful prosecution
 - Reporting Changes
 - Future key issues

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- (b) Environmental Status
- Construction Programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month
 - Works undertaken during the month with illustration including key personnel contact names and telephone numbers; and
 - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations
- (c) Implementation Status
- advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarized in the updated implementation schedule.
 - advice on the status of submissions required under the EP and the status of compliance with EP's conditions.
- (d) Monitoring Results (in both hard and diskette copies)
- Monitoring methodology
 - Name of laboratory and types of equipment used and calibration details
 - Parameters monitored
 - Monitoring locations (and depth)
 - Monitoring date, time, frequency, and duration;
 - Weather conditions during the period;
 - Any other factors which might affect the monitoring results;
 - QA/QC results and detection limits
 - all monitoring results will be tabulated with exceedances highlighted for ease of referencing.
- (e) Report on non-compliance, complaints, notifications of summons and successful 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) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary of complaints;
 - Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up action taken, results and summary;
 - Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
 - A description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance
- (f) Others
- An account of the future key issues as reviewed from the works programme and work method statements;
 - Advice on the solid and liquid waste management status.

- (g) Appendix
- Action and Limit levels
 - Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
 - i) major activities being carried out on site during the period;
 - ii) weather conditions during the period; and
 - iii) any other factors which might affect the monitoring results
 - Monitoring schedule for the present and next reporting period
 - Cumulative statistics on complaints, notifications of summons and successful prosecutions; and
 - outstanding issues and deficiencies

Quarterly EM&A Summary Reports

- 8.7 The quarterly EM&A summary report which will generally be around 5 pages (including about 3 of text and tables and 2 of figures) will contain at least the step listed below. In addition, the first quarterly summary report will also confirm that the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works:
- (a) up to half a page executive summary;
 - (b) basic project information including a synopsis of the project organization, programme, contacts of key management, and a synopsis of work undertaken during the quarter;
 - (c) a brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (Action and Limit levels); and
 - environmental mitigation measures, as recommended in the EIA report and the ERR;
 - (d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the EIA report and the ERR, summarised in the updated implementation schedule;
 - (e) advice on the status of submissions required under the EP and the status of compliance with EP's conditions;
 - (f) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
 - (g) graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
 - the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
 - (h) advice on the solid and liquid waste management status;
 - (i) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
 - (j) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;

- (k) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

- (l) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (m) a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;
- (n) comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
- (o) the Employer's contacts and any hotline telephone number the public to make enquiries.

Final EM&A Summary Report

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

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

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

- (a) an executive summary;
- (b) basic project information including a synopsis of the project organization, programme, contacts of key management, and a synopsis of work undertaken during the entire construction period;
- (c) a brief summary of EM&A requirements including:
- (d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study reports and ERR, summarized in the updated implementation status proformas;
- (e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (f) graphical plots and the statistical analysis of the trends of monitored parameters over the construction project for representative monitoring stations annotated against;
- (g) compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies;
- (h) provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;
- (i) advice on the solid and liquid waste management status;
- (j) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (k) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- (l) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- (m) a summary record of all complaints received (written or verbal) for each media,

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

Data Keeping

- 8.10 The site document such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the monthly EM&A reports for submission. However, the document will be well kept by the ET Leader and be ready for inspection upon request. All relevant information will be clearly and systematically recorded in the document. The monitoring data will also be recorded in magnetic media form, and the software copy can be available upon request. All the documents and data will be kept for at least one year after completion of the Contract.
- 8.11 A software copy of the monitoring data (including baseline data) will be submitted to EPD along with the EM&A reports.

Interim Notifications of Environmental Quality Limit Exceedances

- 8.12 With reference to Event/Action Plans in Tables 2.3 and 3.5, when the environmental quality limits are exceeded, the ET will immediately notify the ER, the IEC, and EPD, as appropriate. The notification will be followed up with advice to IEC and EPD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. An interim notifications form is shown in **Appendix F** for reference.