

Civil Engineering and Development
Department

**Pier Improvement at Tung Ping
Chau**

Environmental Monitoring and Audit
Manual

This report takes into account the particular
instructions and requirements of our client.

It is not intended for and should not be relied
upon by any third party and no responsibility
is undertaken to any third party.

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1 Introduction

1.1 Project Background

- 1.1.1.1 There are currently 117 public piers in Hong Kong are built, maintained and managed by the Government. Whilst the Government has carried out regular inspections and maintenance for public piers to ensure their structural integrity, some public piers at remote areas are in service for many years suffering from aging problem, or cannot cope with the current needs/ usages, such as:
- unsatisfactory boarding condition of small or primitive piers leading to potential safety concerns to passengers especially for kids and elderly;
 - inadequate water depth for larger vessels to berth especially during low tide;
 - limited berthing space or narrow accesses which cannot cope with the fluctuating utilization rate during festive times or weekends; and
 - aged pier structures with a need for improvement works.
- 1.1.1.2 In 2017 Policy Address, the Government committed to improve a number of remote public piers to facilitate public access to outing destinations and natural heritage such as Hong Kong UNESCO Global Geopark. To take forward the policy initiative, the Government has launched the Pier Improvement Programme (PIP) for the implementation of improvement works for piers at remote areas.
- 1.1.1.3 A Committee on Piers spearheaded by the Development Bureau, comprising members of relevant bureaux and departments was set up to examine the requests received by different departments concerning improvement suggestions for public piers in the New Territories and outlying islands and set priority for pier improvement items under the PIP taking into account a host of factors including structural and public safety concerns. The Committee has recommended implementing a list of 10 proposed pier improvement items under the first implementation phase of the PIP. Tung Ping Chau Public Pier is one of the recommended proposed pier items.
- 1.1.1.4 Tung Ping Chua Public Pier is located along the north-eastern coast of Tung Ping Chau facing towards Ping Chau Hoi. It falls within the Tung Ping Chau Marine Park and the Hong Kong UNESCO Global Geopark (Geopark). It is also adjacent to the Ping Chau Site of Special Scientific Interest (SSSI) and the Plover Cove (Extension) Country Park.
- 1.1.1.5 The pier was constructed more than 50 years ago. It is composed of a causeway, catwalk and a pier head. The pier is about 97m long and 5.5m wide. One landing steps of 1.1m wide are located at each side of pier head. The catwalk in the middle section was re-constructed in 2008. The pier level is about +4.4 mPD at the causeway rising to about +4.9 mPD at the pier head.
- 1.1.1.6 The pier is the only access for public to Tung Ping Chau. Currently, there are public ferry services operated between Ma Liu Shui Ferry Pier and Tung Ping Chau Public Pier on weekends and public holidays. Vessels of private operators also bring tourists to the island during weekdays. As the width of the landing steps is less than the standard width of 2m, there are safety concerns for passengers embarking on/disembarking off vessels.

- 1.1.1.7 Though being only a small primitive pier with a length of 97m and a width of 5.5m, the existing Tung Ping Chau Public Pier serves as the main transportation to villagers at Tung Ping Chau for access, delivery of daily necessities and dealing with emergency situations and also provides access for some locals and tourists to scenic spots and natural heritage within or near Tung Ping Chau. The Tung Ping Chau Public Pier consists of narrow staircases and is inadequate to meet the current operational needs. In addition, there have been repeated requests from Sai Kung North Rural Committee members, Tai Po District Council members and Village Representative (VRs) to improve the safety of the passengers using the pier. Therefore, Pier Improvement at Tung Ping Chau (the Project) is being proposed and taken forward.
- 1.1.1.8 The overall objective of this Project is to conduct environmental impact assessment (EIA) study and preliminary engineering studies before proceeding with the detailed design and construction of the Project.
- 1.1.1.9 Upon completion, the Project would have a width of 5.5m to 6m increased to 15m at the head and a length of 123m with the following facilities/features.
- Covered sitting / waiting area; and
 - Floating pontoon together with downstand wave walls at pier head for facilitating barrier-free access to/from vessels.
- 1.1.1.10 In June 2018, Civil Engineering and Development Department (CEDD) commissioned Ove Arup and Partners Hong Kong Limited (Arup) to provide consultancy services for Agreement No. CE2/2018 (CE) “Study for Pier Improvement at Lai Chi Wo and Tung Ping Chau – Investigation” (the Study). This consultancy includes, among others, compilation and submission of an EIA Report to fulfil the relevant legislative requirements. The Study is separated into two parts – one is Pier Improvement at Lai Chi Wo and the other is Pier Improvement at Tung Ping Chau. This EIA report is responsible for the environmental impact assessment of the Pier Improvement at Tung Ping Chau under the EIA Ordinance (EIAO) (Cap. 499). The EIA Report for Lai Chi Wo Pier will be separately submitted under the EIAO.

1.2 Purpose of the Manual

- 1.2.1.1 The purposes of this Environmental Monitoring and Audit (EM&A) Manual are to:
- Guide the setup of an EM&A programme to ensure compliance with the EIA recommendations;
 - Specify the requirements for monitoring equipment;
 - Propose environmental monitoring points, monitoring frequency, etc.;
 - Propose Action and Limit levels; and
 - Propose Event and Action Plans.
- 1.2.1.2 This Manual outlines the monitoring and auditing programme for the construction and operation of the proposed Project and provides systematic procedures for monitoring, auditing and minimising environmental impacts.
- 1.2.1.3 Hong Kong environmental regulations and the Hong Kong Planning Standards and Guidelines (HKPSG) have served as environmental standards and guidelines in the preparation of this Manual. In addition, this EM&A Manual has been prepared in

accordance with the requirements stipulated in Annex 21 of the Technical Memorandum on the EIA Process (EIAO-TM).

1.2.1.4 This Manual contains the following information:

- Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), Environmental Team (ET), and the Independent Environmental Checker (IEC) under the context of EM&A;
- Project organisation for the EM&A works;
- The basis for, and description of the broad approach underlying the EM&A programme;
- Details of the methodologies to be adopted, including all laboratories and analytical procedures, and details on quality assurance and quality control programme;
- The rationale on which the environmental monitoring data will be evaluated and interpreted;
- Definitions of Action and Limit levels;
- Establishment of Event and Action Plans;
- Requirements for reviewing pollution sources and working procedures required in the event of non-compliance with the environmental criteria and complaints; and
- Requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures.

1.2.1.5 For the purpose of this Manual, the ER shall refer to the Engineer as defined in the Construction Contract, in cases where the Engineer's powers have been delegated to the ER, in accordance with the Construction Contract. The ET leader, who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the environmental monitoring and audit requirements.

2 Project Description

2.1 General Description of the Project

2.1.1.1 Section 2 of the EIA Report has described the approaches adopted to avoid and minimise various environmental impacts throughout the design process. The design has therefore been taken forward as the basis for this EIA to demonstrate that all statutory requirements under EIA Study Brief (ESB-306/2017) and the Environmental Impact Assessment Ordinance (EIAO) are complied with. To implement the Project, the following works will be carried out at different stages:

- Carrying out site investigation works for detailed design;
- Provision of plants, equipment and materials on working barge(s) for implementation of the Project;
- Provision of temporary berthing and mooring facilities (temporary pier) using working barge and/or steel structures supported by piles to maintain access to Tung Ping Chau until a new berth of the pier is available for use;
- Removal of temporary pier;
- Modification of the existing pier and construction of new pier structure elements; and
- Construction of associated facilities on the pier.

2.1.1.2 The location and tentative implementation programme for the construction of the Project are shown in **Figure 2.1** and **Appendix 2.1** respectively.

2.2 Designated Project

2.2.1.1 The Project comprises demolition, construction and operation works within Tung Ping Chau Marine Park. The Project is a Designated Project (DP) by virtue of Item Q.1, Part 1 of Schedule 2 of the EIAO which specifies “*All projects including new access roads, railways, sewers, sewage treatment facilities, earthworks, dredging works and other building works partly or wholly in an existing or gazetted proposed country park or special area, a conservation area, and existing or gazetted proposed marine park or marine reserve, a site of cultural heritage, and a site of special scientific interest, ...*”.

2.3 Tentative Implementation Programme

2.3.1.1 A tentative programme for the construction of the project is shown in **Appendix 2.1**. Site Investigation works for detailed design will be carried out from Q4 2021 to Q1 2022. Prefabrication method will be adopted as far as practicable for the construction works. Construction is scheduled to commence in Year 2023 and completed by Year 2026. Construction works are planned to be carried out during non-restricted hours (i.e. 0700-1900 hours from Monday to Saturday other than public holidays). The exact schedule of construction depends upon factors such as the granting of necessary permit for its construction and the awarding of the contract to the contractor.

3 Project Organisation

- 3.1.1.1 The proposed project organisation and lines of communication with respect to environmental protection works are shown in **Appendix 3.1**.
- 3.1.1.2 Only one ET with ET Leader shall be engaged for the entire Project at any time. The ET shall conduct the EM&A programme and ensure the Contractor's compliance with the Project's environmental performance requirements. The ET shall be directly employed by the Project Proponent, or shall be part of the Resident Site Staff of the Engineer and directly supervised by the Engineer or Engineer's Representative, and shall be an independent party from the Contractor or the IEC for the Project. The ET shall be led and managed by an ET leader. The ET leader shall possess at least 7 years of experience in EM&A and/or environmental management. The minimum on-site time for the ET leader and ET shall be proposed with justifications having regard to potential environmental impacts arising from activities on site at various stages of the Project as detailed in the Contractor's construction programme, and the qualifications and experience of the specialists in the ET shall also be proposed, for the approval of the EPD.
- 3.1.1.3 Only one IEC with a supporting team shall be directly employed by the Project Proponent for the entire Project at any time. The IEC shall audit the overall EM&A programme, including the implementation of all environmental mitigation measures, submissions required in this Manual, as well as any other relevant submissions required under the Environmental Permit. The IEC shall be an independent party from the Engineer or Engineer's Representative, Contractor and the ET for the Project. The IEC shall possess at least 7 years of experience in EM&A and/or environmental management. The IEC shall report directly to the EPD on matters relating to the EM&A programme and environmental impacts from the Project. The minimum on-site time for the IEC and his/her supporting team shall be proposed with justifications, having regard to potential environmental impacts arising from activities on site at various stages of the Project as detailed in the Contractor's construction programme, for the approval of the EPD.
- 3.1.1.4 The responsibilities of respective parties are:

The Contractor

- Implement the EIA recommendations and requirements;
- Provide assistance to ET in carrying out relevant monitoring and auditing;
- 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 agreed procedures for carrying out environmental compliant investigation.

Engineer or Engineer's Representative (ER)

- Supervise the Contractor's activities and ensure that the requirements in the EM&A Manual are fully complied with;

- Inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans;
- Assist the Project Proponent in employing an ET to undertake monitoring, laboratory analysis and reporting of environmental monitoring and audit;
- Assist the Project Proponent in employing an IEC to audit the results of the EM&A works carried out by the ET;
- Comply with the agreed Event and Action Plans in the event of any exceedance;
- Participate in joint site inspections and audits undertaken by the ET; and
- Adhere to the procedures for carrying out complaint investigations.

Environmental Team (ET)

- Set up all the required environmental monitoring stations;
- Monitor various environmental parameters as required in the EM&A Manual;
- Analyse the environmental monitoring and audit data, review the success of EM&A programme, confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions, and to identify any adverse environmental impacts arising;
- Carry out site inspection to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and environmental mitigation measures, and take proactive actions to pre-empt problems;
- Audit and prepare audit reports on the environmental monitoring data and site environmental conditions;
- Report on the environmental monitoring and audit results to the IEC, Contractor, and the ER or its delegated representative;
- Recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans;
- Undertake regular on-site audits / inspections and report to the Contractor and the ER of any potential non-compliance;
- Follow up and close out non-compliance actions;
- Advise the Contractor on environmental improvement, awareness, enhancement matters, etc., on site; and
- Adhere to the procedures for carrying out environmental complaint investigation.

Independent Environmental Checker (IEC)

- Review the EM&A works performed by the ET (at not less than monthly intervals) in an independent, objective and professional manner;

- Audit the monitoring activities and results (at not less than monthly intervals);
- Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers;
- Report the audit results to the ER and EPD in parallel;
- Review the EM&A reports (monthly and quarterly summary reports) submitted by the ET;
- Review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;
- Check the mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;
- Check the mitigation measures that have been recommended in the EIA and this Manual, and ensure they are properly implemented in a timely manner, when necessary; and
- Report the findings of site inspections and other environmental performance reviews to ER and EPD.

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

4 Environmental Submission

4.1 Introduction

- 4.1.1.1 The Contractor shall prepare an Environmental Management Plan (EMP) (including a Waste Management Plan, WMP), a Construction Method Statement prior to the commencement of construction works and obtain approval from ER and IEC and other relevant authorities to encompass the recommended environmental protection / mitigation measures with respect to their latest construction methodology and programme.

4.2 Environmental Management Plan

- 4.2.1.1 A systematic EMP shall be set up by the Contractor to ensure effective implementation of the mitigation measures, monitoring and remedial requirements presented in the EIA, EM&A and Environmental Mitigation Implementation Schedule (EMIS) (See **Appendix 4.1**). The ER and the IEC will audit the implementation status against the EMP and advise the necessary remedial actions required. These remedial actions shall be enforced by the ER through contractual means.
- 4.2.1.2 The EMP will require the Contractor (together with its sub-contractors) to define in detail how to implement the recommended mitigation measures in order to achieve the environmental performance defined in the Hong Kong environmental legislation and the EIA documentation.
- 4.2.1.3 The review of on-site environmental performance shall be undertaken by ER and IEC through a systematic checklist and audit once the construction works commences. The environmental performance review programme comprises a regular assessment on the effectiveness of the EMP. Reference should be made to ETWB TC 19 / 2005 “Environmental Management on Construction Sites” or its latest versions, and any other relevant Technical Circulars.

4.3 Waste Management Plan

- 4.3.1.1 As part of the EMP, the Contractor shall include WMP for the construction of the Project and prior to the commencement of construction works submit it to the ER and IEC for approval. Where waste generation is unavoidable, the opportunities for recycling or reusing should be maximised. If wastes cannot be recycled, recommendations for appropriate disposal routes should be provided in the WMP. A method statement for stockpiling and transportation of the excavated materials and other construction wastes should also be included in the WMP and be approved before the commencement of construction works. All mitigation measures arising from the approved WMP shall be fully implemented.
- 4.3.1.2 For the purpose of enhancing the management of Construction and Demolition (C&D) materials including rock, and minimising its generation at source, construction works would be undertaken in accordance with the Section 4.1.3 of Chapter 4 in the Project Administration Handbook for Civil Engineering Works (PAH).

4.4 Construction Method Statement

- 4.4.1.1 In case the Contractor would like to adopt alternative construction methods or implementation schedules, it is required to submit details of methodology and equipment to the ER for approval before the work commences. Any changes in construction method shall be reflected in a revised EMP or the Contractor will be required to demonstrate the manner in which the existing EMP should accommodate the proposed changes. The Contractor may need to apply for a Variation of Environmental Permit (VEP) from EPD before commencement of any construction activities.

5 Air Quality

5.1 Introduction

- 5.1.1.1 The EIA has considered the potential air quality impacts associated with the Project. As adverse fugitive dust emission or air quality impacts during construction and operational phases are not anticipated, mitigation measures and monitoring are not required. Nevertheless, dust monitoring and regular site environmental audit are recommended to check the implementation of good site practices.

5.2 Mitigation Measures

5.2.1 Construction Phase

- 5.2.1.1 During construction phase, mitigation measures are not required. However, good site management practices as stipulated in Air Pollution (Construction Dust) Regulation (e.g. regular watering) shall be implemented to minimise potential construction dust impacts. The following dust suppression measures/practices should be incorporated by the Contractor to control the dust nuisance throughout the construction phase:
- Spray water regularly as required at the surrounding pier area, access and working barges;
 - Cover or shelter any stockpile of dusty materials on working barges; and
 - Cover any dusty load by impervious sheeting during delivery and before they leave the site.
- 5.2.1.2 To minimise air quality impact from fuel combustion, PME used in the construction site should be registered under Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation with the NRMM label displayed at a conspicuous position of the registered item. In addition, routing of barges used for delivery of goods should be as far away from the identified ASRs as practicable.
- 5.2.1.3 The Contractor is also advised to minimise the number of boat trips as far as practicable by appropriate planning to maximise the utilisation of each trip traveling to and from the nearest pier in other district and the Project site.
- 5.2.1.4 All the recommended good practices are summarised in the Environmental Mitigation Implementation Schedule (EMIS) given in **Appendix 4.1**.

5.2.2 Operational Phase

- 5.2.2.1 Adverse air quality impacts are not anticipated during operational phase, and thus mitigation measures are not required.

5.3 Environmental Monitoring and Site Audit Requirements

5.3.1 Construction Phase

- 5.3.1.1 Good practices have been recommended in the EIA Report. The Contractor shall be responsible for the design and implementation of these good practices. Regular

audits and site inspection at least once per week should be carried out during the construction phase by the Contractor and ET to ensure that the recommended good practices have been properly implemented by the Contractor.

5.3.2 Operational Phase

- 5.3.2.1 Adverse air quality impacts during operational phase are not anticipated. Hence, monitoring and audit is not required.

6 Noise

6.1 Introduction

- 6.1.1.1 The EIA Report has considered the potential noise impacts associated with the Project. Noise from the use of powered mechanical equipment (PME) would be the major potential noise impacts during the construction phase. Other than the existing Plover Cove (Extension) Country Park, the nearest Noise Sensitive Receiver (NSR), Tai Tong, is located about 210m away from the Project site. As adverse construction noise impact is not anticipated, construction noise monitoring is not necessary. Nevertheless, it is also recommended that regular site inspections should be undertaken to inspect the construction activities and works area in order to ensure the recommended mitigation measures are properly implemented to avoid the noise disturbance to the existing Country Park environment.

6.2 Mitigation Measures

6.2.1 Construction Phase

- 6.2.1.1 Adverse construction noise impacts are not anticipated during the construction phase and hence mitigation measures are not required. Nevertheless, the Contractor shall implement good site management practices to avoid the potential construction noise impact. The following enhancement measures should be incorporated by the Contractor to minimise the noise disturbance to the Country Park environment during the construction phase:

- Good site practices to limit noise emission at the source;
- Use of Quality Powered Mechanical Equipment (QPME);
- Use of temporary noise barriers to screen noise from relatively static PME; and
- Alternative use of plant items within one worksite, wherever practicable.

- 6.2.1.2 The above recommended practices would need to be implemented in work sites as good practices where appropriate. “Recommended Pollution Control Clauses for Construction Contracts” promulgated by EPD will be added to the Contract for future contractors to follow. Detailed description of these enhancement measures is given in the following sections.

Good Site Management Practices

- 6.2.1.3 Good site practice and noise management techniques could considerably reduce the noise impacts from construction site activities. The following measures should be practised during each phase of construction:
- only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme;
 - machines and plant (such as crane and generator) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;

- plant known to emit noise strongly in one direction, where possible, be orientated so that the noise is directed away from nearby NSRs;
- silencers or mufflers on construction equipment should be properly fitted and maintained during construction works;
- mobile plant should be sited as far away from NSRs as possible and practicable; and
- material stockpiles, site office and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.

6.2.1.4 The environmental noise climate would certainly be improved with these good site management practices.

Use of Quality Powered Mechanical Equipment (QPME)

6.2.1.5 The use of quiet plant associated with the construction works should make reference to the PME listed in the TM or the QPME/ other commonly used PME listed in EPD web pages as far as possible which includes the SWLs for specific quiet PME. It is generally known (supported by field measurement) that particular models of construction equipment are quieter than standard types given in the TM-GW. Whilst it is generally considered too restrictive to specify that the Contractor has to use specific models or items of plant, it is reasonable and practicable to set plant noise performance specifications for specific PME so that some flexibility in selection of plant is allowed. A pragmatic approach would be to request that the Contractor independently verifies the noise level of the plant proposed to be used and demonstrates through furnishing of these results, that the plant proposed to be used on the site meets the requirements.

Use of Temporary Noise Barriers to Screen Noise from Relatively Static PME

6.2.1.6 Movable temporary noise barriers will be used for some PME (e.g. breaker, mobile crane) where practicable. It is anticipated that suitably designed barriers could achieve at least 5dB(A) reduction for movable plant. Acoustic mat would be used for other plant items such as piling rig and a 5 dB(A) noise reduction is anticipated.

Alternative Use of Plant Items within One Worksite

6.2.1.7 In practice, some plant items will operate sequentially within the same work site, and certain reduction of the predicted noise impacts could be achieved. However, any additional control on the sequence of plant will impose a restrictive constraint to the Contractor on the operation and planning of plant items, and the implementation of the requirement would be difficult to monitor.

6.2.1.8 All the recommended good practices are summarised in the Environmental Mitigation Implementation Schedule (EMIS) given in **Appendix 4.1**.

6.2.2 Operational Phase

6.2.2.1 Adverse noise impacts are not anticipated during operational phase, and thus mitigation measures are not required.

6.3 Environmental Monitoring and Site Audit Requirements

6.3.1 Construction Phase

- 6.3.1.1 Good site management practices have been recommended in the EIA Report. The Contractor shall be responsible for the design and implementation of these good site management practices. Regular audits and site inspection at least once per week should be carried out during the construction phase by the Contractor and ET to ensure that the recommended mitigation measures have been properly implemented by the Contractor.

6.3.2 Operational Phase

- 6.3.2.1 Adverse noise impacts during operational phase are not anticipated. Hence, monitoring and audit is not required.

7 Water Quality

7.1 Introduction

- 7.1.1.1 The EIA Report has assessed the potential water quality impacts associated with the Project. According to the EIA Report, the water quality impact could be minimised with the implementation of mitigation measures. The water quality monitoring programme as discussed below could ensure the implementation of the recommended mitigation measures and provide continue improvements to the environmental conditions.

7.2 Mitigation Measures

7.2.1 Construction Phase

- 7.2.1.1 The EIA Report has recommended mitigation measures such as the use of double casing system, Y-shape funnel and closed grab to be implemented during marine-based site investigation and construction works. All the recommended good practices are summarised in the EMIS in **Appendix 4.1**.

7.2.2 Operational Phase

- 7.2.2.1 Adverse water quality impacts are not anticipated during operational phase. Mitigation measures are therefore not required.

7.3 Water Quality Monitoring Parameters

- 7.3.1.1 The monitoring shall be established by measuring the dissolved oxygen (DO), dissolved oxygen saturation (DO%), temperature, turbidity, salinity, pH and suspended solids (SS) in the water body at all designated locations as specified in **Section 7.6**.
- 7.3.1.2 The measurements shall be taken at all designated monitoring stations 3 days per week during construction phase. The interval between two sampling surveys shall not be less than 36 hours.
- 7.3.1.3 Replicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database. DO, pH value, salinity, temperature and turbidity should be measured in-situ whereas other parameters should be determined by an accredited laboratory.
- 7.3.1.4 Other relevant data shall be recorded, including monitoring location / position, time, water depth, tidal stages, weather conditions and any special phenomena or work underway at the Project Site.

7.4 In-situ Monitoring Equipment

7.4.1 Dissolved Oxygen Equipment

- 7.4.1.1 The dissolved oxygen (DO) measuring instruments should be portable and weatherproof. The equipment should complete with cable and sensor, and DC power source. It should be capable of measuring:

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

7.4.1.2 The equipment should have a membrane electrode with automatic temperature compensation complete with a cable.

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

7.4.2 Turbidity Measuring Equipment

7.4.2.1 The turbidity measuring instruments should be portable and weatherproof with DC power source. It should have a photoelectric sensor capable of measuring turbidity level between 0 – 1000 NTU (for example, Hach model 2100P or an approved similar instrument).

7.4.3 Salinity Measuring Equipment

7.4.3.1 A portable salinometer capable of measuring salinity in the range of 0 – 40 parts per thousand (ppt) should be provided for measuring salinity of the water at each monitoring location.

7.4.4 pH Measuring Equipment

7.4.4.1 A portable pH meter of measuring a pH range between 0.0 and 14.0 shall be provided under the specified conditions (for example Orion Model 250A or an approved similar equipment).

7.4.5 Positioning Equipment

7.4.5.1 A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication and Radio Technical Commission for Maritime (RTCM) Type 16 error message “screen pop-up” facilities (for real-time auto-display of error messages and DGPS corrections from the Hong Kong Hydrographic Office), or other equipment instrument of similar accuracy, should be provided and used during marine water monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

7.4.6 Water Depth Detector

7.4.6.1 A portable, battery-operated echo sounder should be used for water depths determination at each designated monitoring station. The detector can either be hand-held or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

7.4.7 Water Sampling Equipment

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

7.4.8 Sample Containers and Storage

- 7.4.8.1 Water samples for SS should be stored in high density polythene bottles with no preservative added, while those for fungicides and insecticides should be stored in amber glass bottles with no preservative added, packed in ice (cooled to 4°C without being frozen) and shipment to the testing laboratory. The samples shall be delivered to the laboratory of collection and be analysed as soon as possible after collection.

7.4.9 Calibration of In-Situ Instruments

- 7.4.9.1 The pH meter, DO meter and turbidimeter shall be checked and calibrated before use. DO meter and turbidimeter shall be certified by a laboratory accredited under HOKLAS or any other international accreditation scheme, and subsequently re-calibrated on quarterly basis throughout all stages of the water quality monitoring. Responses of sensors and electrodes should be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter shall be carried out before measurement at each monitoring station.

7.4.10 Back-up Equipment and Vessels

- 7.4.10.1 Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when some equipment is under maintenance, calibration, malfunction, etc.
- 7.4.10.2 The water quality monitoring will involve four monitoring stations during the construction phase, and measurements should be conducted within the prescribed tidal conditions in order to ensure the measurement / samples are representative. A multi-probe monitoring equipment set integrated with water sampler(s) is highly recommended to improve the monitoring efficiency. Depending on the actual operation, more than one field survey vessels might be required simultaneously to ensure the monitoring are conducted within the acceptable monitoring period. The ET shall also consider the use of unattended automatic sampling / monitoring devices at fixed stations where monitoring is required throughout the construction period. The use of such unattended automatic devices, however, shall be subject to the approval of the ER, IEC and EPD.

7.5 Laboratory Measurement/Analysis

- 7.5.1.1 At least 3 replicate samples from each independent sampling event are required for the SS measurement which shall be carried out in a HOKLAS or international accredited laboratory. Where water depth is allowed, sampling should be conducted at three water depths which are 1m below water surface, mid-depth, and 1m above the sea bed. If the sampling water depth is less than 6m, the mid-depth may be omitted. If the water depth is less than 3m, only the mid-depth may be monitored. Sufficient water samples shall be collected at the monitoring stations for carrying out the laboratory measurement and analysis. The laboratory determination work shall start within 24 hours after the collection of water samples. The analysis for suspended solids is presented in **Table 7.1**.

Table 7.1 Laboratory analysis for construction phase water quality monitoring

Parameters	Analytical Method	Reporting Limit
Suspended Solids (SS)	APHA 2540-D	0.5 mg/L

7.6 Monitoring Locations

- 7.6.1.1 Water quality monitoring will be carried out at two sides of the pier in the proximity of the coral communities.
- 7.6.1.2 The proposed water quality monitoring locations during the construction phase are shown in **Figure 7.1** and listed in **Table 7.2**. The ET shall seek approval from IEC and EPD for any alternative monitoring locations.

Table 7.2 Proposed water quality monitoring location during construction phase

Monitoring Station ID	Description	Easting	Northing
WM1	Coral Community (To the West of the Pier)	862616	845073
WM2	Coral Community (To the East of the Pier)	862682	845026
WM3	Coral Community (at Wong Ye Kok)	862685	844965
C1	Control Station 1	862983	844905
C2	Control Station 2	862536	845235

7.7 Baseline Monitoring

- 7.7.1.1 Baseline conditions for water quality shall be established and agreed with EPD prior to the commencement of construction works. The baseline conditions shall include the water quality parameters specified in **Section 7.3**. The proposed water quality monitoring schedule shall be submitted to EPD by the ET at least 2 weeks before the first day of the monitoring month. The baseline monitoring shall be conducted for at least 4 weeks prior to the commencement of construction works with a frequency of 3 days in a week, at mid-flood and mid-ebb tides. The interval between two sets of monitoring shall not be less than 36 hours. EPD shall also be notified immediately for any changes in schedule.
- 7.7.1.2 In general, where the difference in value between the first and second in-situ measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading shall be discarded and further readings should be taken.
- 7.7.1.3 There should be no construction work in the vicinity of the stations during the baseline monitoring. The baseline data will be used to establish the Action and Limit levels. The determination of Action and Limit levels will be discussed in **Section 7.9**.
- 7.7.1.4 **Table 7.3** summarises the proposed water quality monitoring programme for baseline monitoring.

Table 7.3 Proposed water quality monitoring programme for baseline monitoring

Item	Baseline Monitoring
Monitoring Period	At least 4 weeks prior to the commencement of construction works
Monitoring Frequency	3 days in a week
Monitoring Locations	All stations in Table 7.2
Monitoring Parameters	Dissolved oxygen (DO), dissolved oxygen saturation (DO%), temperature, turbidity, salinity, pH and suspended solids (SS)
Intervals between 2 Sets of Monitoring	Not less than 36 hours

7.8 Impact Monitoring

- 7.8.1.1 Impact monitoring shall be conducted during construction phase when there are marine works. The purpose of impact monitoring is to ensure the implementation of the recommended mitigation measures, provide effective control of any malpractices, and provide continuous improvements to the environmental conditions. The proposed water quality monitoring schedule shall be submitted to EPD by the ET at least 2 weeks before the first day of the monitoring month. The interval between two sets of monitoring shall not be less than 36 hours with a frequency of 3 days in a week, at mid-flood and mid-ebb tides. EPD shall also be notified immediately of any changes in schedule.
- 7.8.1.2 In general, where the difference in value between the first and second in-situ measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading shall be discarded and further readings should be taken.
- 7.8.1.3 In case of project-related exceedances of Action and/or Limit Levels, the impact monitoring frequency shall be increased according to the requirement of Event and Action Plan. The details of Event and Action Plan will be discussed in **Section 7.10**.
- 7.8.1.4 **Table 7.4** below summarises the proposed water quality monitoring programme for impact monitoring during construction phase.

Table 7.4 Proposed water quality monitoring programme for impact monitoring during construction phase

Item	Impact Monitoring during Construction Phase
Monitoring Period	During the construction phase when there are marine works
Monitoring Frequency	3 Days in a Week
Monitoring Locations	All stations in Table 7.2
Monitoring Parameters	Dissolved oxygen (DO), dissolved oxygen saturation (DO%), temperature, turbidity, salinity, pH and suspended solids (SS)
Intervals between 2 Sets of Monitoring	Not less than 36 hours

7.9 Action and Limit Levels

7.9.1.1 The Action and Limit levels for water quality of all water monitoring stations during the construction phase are defined in **Table 7.5** below.

Table 7.5 Action and limit levels for water quality monitoring during the construction phase

Parameters	Action Level	Limit Level
DO in mg/L (Surface, Middle & Bottom)	<u>Surface and Middle</u> 5 percentile of baseline data. ^[1] <u>Bottom</u> 5 percentile of baseline data. ^[1]	<u>Surface and Middle</u> 4 mg/L except 5 mg/L for fish culture zone; or 1 percentile of baseline data. ^[1] <u>Bottom</u> 2 mg/L or 1 percentile of baseline data. ^[1]
SS in mg/L (depth-averaged) ^[3]	95 percentile of baseline data / 120% of upstream control stations' results ^[2]	99 percentile of baseline data / 130% of upstream control stations' results ^[2]
Turbidity in NTU (depth-averaged) ^[3]	95 percentile of baseline data / 120% of upstream control stations' results ^[2]	99 percentile of baseline data / 130% of upstream control stations' results ^[2]

Notes:

[1] For DO, non-compliance occurs when monitoring results is lower than the limits.

[2] For SS and turbidity, non-compliance occurs when monitoring results is larger than the limits.

[3] "Depth-averaged" is calculated by taking the arithmetic means of readings of all three depths.

7.10 Event and Action Plan

7.10.1.1 Should non-compliance of the criteria occur, action in accordance with the Event and Action Plan in the **Table 7.6** below shall be carried out.

Table 7.6 Event and Action Plan for water quality

Event	Action			
	ET	IEC	ER	Contractor
Action level exceedance for one sampling day	<ol style="list-style-type: none"> 1. Inform IEC, Contractor and ER; 2. Check monitoring data, all plant, equipment and Contractor's working methods; and 3. Discuss remedial measures with IEC and Contractor and ER. 	<ol style="list-style-type: none"> 1. Discuss with ET, ER and Contractor on the implemented mitigation measures; 2. Review proposals on remedial measures submitted by Contractor and advise the ER accordingly; and 3. Review and advise the ET and ER on the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IEC, ET and Contractor on the implemented mitigation measures; 2. Make agreement on the remedial measures to be implemented; 3. Supervise the implementation of agreed remedial measures. 	<ol style="list-style-type: none"> 1. Identify source(s) of impact; 2. Inform the ER and confirm notification of the non-compliance in writing; 3. Rectify unacceptable practice; 4. Check all plant and equipment; 5. Consider changes of working methods; 6. Discuss with ER, ET and IEC and propose remedial measures to IEC and ER; and 7. Implement the agreed mitigation measures.
Action level exceedance for more than one consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat in-situ measurement on next day of exceedance to confirm findings; 2. Inform IEC, contractor and ER; 3. Check monitoring data, all plant, equipment and Contractor's working methods; 4. Discuss remedial measures with IEC, contractor and ER 5. Ensure remedial measures are implemented 	<ol style="list-style-type: none"> 1. Discuss with ET, Contractor and ER on the implemented mitigation measures; 2. Review the proposed remedial measures submitted by Contractor and advise the ER accordingly; and 3. Review and advise the ET and ER on the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with ET, IEC and Contractor on the proposed mitigation measures; 2. Make agreement on the remedial measures to be implemented; and 3. Discuss with ET, IEC and Contractor on the effectiveness of the implemented remedial measures. 	<ol style="list-style-type: none"> 1. Identify source(s) of impact; 2. Inform the ER and confirm notification of the non-compliance in writing; 3. Rectify unacceptable practice; 4. Check all plant and equipment and consider changes of working methods; 5. Discuss with ET, IEC and ER and submit proposal of remedial measures to ER and IEC within 3 working days of notification; and 6. Implement the agreed mitigation measures.

Event	Action			
	ET	IEC	ER	Contractor
Limit level exceedance for one sampling day	<ol style="list-style-type: none"> 1. Repeat measurement on next day of exceedance to confirm findings; 2. Inform IEC, contractor and ER; 3. Rectify unacceptable practice; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Consider changes of working methods; 6. Discuss mitigation measures with IEC, ER and Contractor; and 7. Ensure the agreed remedial measures are implemented 	<ol style="list-style-type: none"> 1. Discuss with ET, Contractor and ER on the implemented mitigation measures; 2. Review the proposed remedial measures submitted by Contractor and advise the ER accordingly; and 3. Review and advise the ET and ER on the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with ET, IEC and Contractor on the implemented remedial measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the remedial measures to be implemented; and 4. Discuss with ET, IEC and Contractor on the effectiveness of the implemented remedial measures. 	<ol style="list-style-type: none"> 1. Identify source(s) of impact; 2. Inform the ER and confirm notification of the non-compliance in writing; 3. Rectify unacceptable practice; 4. Check all plant and equipment and consider changes of working methods; 5. Discuss with ET, IEC and ER and submit proposal of additional mitigation measures to ER and IEC within 3 working days of notification; and 6. Implement the agreed remedial measures.
Limit level exceedance for more than one consecutive sampling days	<ol style="list-style-type: none"> 1. Inform IEC, contractor and ER; 2. Check monitoring data, all plant, equipment and Contractor's working methods; 3. Discuss mitigation measures with IEC, ER and Contractor; and 4. Ensure mitigation measures are implemented; and 5. Increase the monitoring frequency to daily until no exceedance of Limit Level for two consecutive days 	<ol style="list-style-type: none"> 1. Discuss with ET, Contractor and ER on the implemented mitigation measures; 2. Review the proposed remedial measures submitted by Contractor and advise the ER accordingly; and 3. Review and advise the ET and ER on the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with ET, IEC and Contractor on the implemented remedial measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the remedial measures to be implemented; 4. Discuss with ET and IEC on the effectiveness of the implemented mitigation measures; and 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the relevant 	<ol style="list-style-type: none"> 1. Identify source(s) of impact; 2. Inform the ER and confirm notification of the non-compliance in writing; 3. Rectify unacceptable practice; 4. Check all plant and equipment and consider changes of working methods; 5. Discuss with ET, IEC and ER and submit proposal of additional mitigation measures to ER and IEC within 3 working days of notification; and 6. Implement the agreed remedial measures. 7. As directed by the ER, to slow down or stop all or part of the relevant

Event	Action			
	ET	IEC	ER	Contractor
			construction activities until no exceedance of Limit level.	construction activities until no exceedance of Limit level.

Notes:

ET – Environmental Team

IEC – Independent Environmental Checker

ER – Engineer's Representative

Each step of actions required shall be implemented within 1 working days unless otherwise specified or agreed with EPD.

8 Waste Management

8.1 Introduction

- 8.1.1.1 The quantity of waste generated during the construction phase have been estimated in the EIA Report. Measures including the opportunity for on-site sorting, reusing excavated materials etc., are devised in the construction methodology to minimise the surplus materials to be disposed of off-site. Chemical waste should be collected by licensed chemical waste collectors for proper disposal.

8.2 Mitigation Measures

8.2.1 Construction Phase

- 8.2.1.1 Waste will be handled in accordance with the relevant legislation and guidelines and with the implementation of the proposed mitigation measures, no adverse environmental impacts from waste management are anticipated. EM&A is required for waste management during the construction phase only and the effective management of waste arising during the construction phase will be monitored through the site audit programme. The aims of the waste audit are:

- to ensure the waste arising from the works are handled, stored, collected, transferred and disposed of in an environmentally acceptable manner; and
- to encourage the reuse and recycling of material.

- 8.2.1.2 A trip-ticket system in accordance with DEVB TC(W) No. 6/2010 Trip Ticket System for Disposal of Construction and Demolition Materials should be operated to monitor all movements of inert C&D materials for disposal at public fill bank and chemical wastes which will be collected by licensed chemical waste collectors to licensed facilities for final treatment and disposal. Recommendations have been made in the EIA Report to ensure proper treatment and proper disposal of these wastes and summarised in the Environmental Mitigation Implementation Schedule (EMIS) **Appendix 4.1**.

8.2.2 Operational Phase

- 8.2.2.1 As discussed in the EIA report, general refuse is anticipated to be the major waste type generated from the visitors of the pier. Sufficient number of trash bins and recycling bins have already been provided for the collection of general refuse generated by visitors and pier users along the existing hiking trail of Tung Ping Chau. No bin will be required to be provided in the Tung Ping Chau Public Pier as no general refuse is anticipated by the Project during the operational phase. Adverse waste management implications are not anticipated.

8.3 Environmental Monitoring and Site Audit Requirements

8.3.1 Construction Phase

- 8.3.1.1 The Contractor shall be required to pay attention to the environmental standard and guidelines and carry out appropriate waste management and obtain the relevant licenses/ permits for waste disposal. The ET shall ensure that the Contractor has

obtained from the appropriate authorities the necessary waste disposal permits or licenses including:

- Chemical Waste Producer Registration under the Waste Disposal Ordinance (Cap 354);
- Dumping License under the Land (Miscellaneous Provisions) Ordinance (Cap 28); and
- Water Pollution Control Ordinance License under the Water Pollution Control Ordinance (Cap 358).

8.3.1.2 The Contractor shall refer to EPD's Guidance Notes for License Application when applying for the license/permit under Waste Disposal Ordinance and Water Pollution Control Ordinance. The ET shall refer to these Guidance Notes for auditing purposes.

8.3.1.3 Regular audits and site inspections should be carried out during construction phase by the ET to ensure that the recommended good site practices and other mitigation measures recommended in the EIA Report and in **Appendix 4.1** are properly implemented by the Contractor. The audits should concern all aspects of on-site waste management practices including waste generation, storage, recycling, transport and disposal. Apart from site inspection, documents including licenses, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation and contract requirements.

8.3.1.4 The requirements of the environmental audit programme are set out in **Section 14** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

8.3.2 Operational Phase

8.3.2.1 As it is anticipated that there would not be any insurmountable impacts during the operational phase, monitoring and audit requirements are not required.

9 Land Contamination

9.1 Introduction

- 9.1.1.1 The EIA Report has stated the land contamination issues associated with the Project. As outlined in Section 7 of the EIA Report, based on the desktop review findings of selected aerial photos, the information collected during site survey as well as EPD and Fire Services Department (FSD), no potential land contamination issue is identified in the Project Site. In addition, potentially land contaminating activities or land use under the Project are not anticipated.

9.2 Mitigation Measures

- 9.2.1.1 Potentially contaminating land uses or activities within the Project Site were not identified and hence mitigation measures are not required.

9.3 Environmental Monitoring and Site Audit Requirements

9.3.1 Construction Phase

- 9.3.1.1 Environmental monitoring and site audit are not required for construction phase.

9.3.2 Operational Phase

- 9.3.2.1 Environmental monitoring and site audit are not required for operational phase.

10 Ecology

10.1 Introduction

- 10.1.1.1 The EIA has evaluated the ecological consequences of the Project and recommended design/measures to avoid and minimize the impacts arising from the Project, and proposed ecological mitigation measures. As the Project is marine-based, only mitigation measures for marine ecology are required.

10.2 Mitigation Measures

10.2.1 Avoidance

- 10.2.1.1 Based on the selection of option to extend the existing pier instead of building a new pier, the need of having new access road or conducting works in backshore has been avoided. The proposed works area only covers marine habitats, and no terrestrial habitats or recognized sites of conservation importance such as Plover Cove (Extension) Country Park, Geo Park and the Ping Chau SSSI will be encroached. Besides, core areas of Tung Ping Chau Marine Park are also avoided.
- 10.2.1.2 The pier improvement will be carried out by extension of the existing pier. The existing causeway will be utilized and no need to construct structures over the intertidal zone connecting the land area and the berth area. This will avoid the encroachment of any natural coastline should the new pier be constructed at a new location, and also reduce the scale of construction works involved.

10.2.2 Minimisation

- 10.2.2.1 By making reference to information from REA survey results, Hong Kong Reef Check and the survey on distribution of coral colonies near the existing pier conducted in 2004, the proposed works area has already avoided the areas with relatively high coral coverage near the existing pier. The proposed works for pier improvement at Tung Ping Chau will be limited to the close proximity of the existing pier. The detailed design should make reference to the present survey results to avoid encroaching the coral as far as possible.
- 10.2.2.2 Construction impacts to marine ecological resources have largely been avoided by adopting piling method instead of reclamation method for pier improvement. By adopting the piling method, the seabed loss can greatly be reduced and water quality will not be affected significantly as there will be no reclamation and dredging of the seabed.
- 10.2.2.3 Hard corals are known to be at particular risk of deleterious impacts on respiration and feeding from sedimentation through smothering and clogging. Similarly, more turbid water may reduce the amount of light reaching beneath the water surface, which may also detrimental to hard corals. In order to minimise the increased suspended solids (SS) from the site investigation works and piling works, outer casing to confine the works shall be provided around the bored locations to prevent the accidental release of muddy water to the surrounding marine waters during site investigation works and piling construction.
- 10.2.2.4 Water contaminated with slurry rock fragment should be stored in a barge and recycled for use again in the piling works. Wastewater coming from the grouting of

piles shall be treated in sedimentation tank placed in a barge before discharging offsite with a valid discharge license under the Water Pollution Control Ordinance.

- 10.2.2.5 Besides, prefabrication approach will first be considered when designing concrete superstructures. This can directly avoid on-site casting activities that could have potential impact on water quality. Moreover, this approach can minimize the extent and duration of on-site construction activities. As a result, the water quality impacts associated with these construction activities including site run-off, accidental spillage of chemical and sewage from workforce could thus be avoided or minimized.
- 10.2.2.6 Emergency Spillage Plan should be established during the construction phase as a precautionary measure so that appropriate actions to prevent or reduce risks to sensitive receivers in the vicinity can be undertaken in the event of an accidental spillage.
- 10.2.2.7 A no-dumping policy is simply a policy prohibiting dumping of wastes, chemicals, oil, trash, plastics, or any other substance that would potentially be harmful to marine habitats. It is mandatory that an educational program of the no-dumping policy be made available to all construction-site personnel for all project-related works. The policy needs to be strictly enforced and there need to be stiff fines for infractions. Unscheduled, on-site audits will also generally be required.
- 10.2.2.8 Four marker buoys shall be set up to demarcate the works area before the commencement of marine-based works and will be retrieved upon completion of the construction of the Project (refer to Figure 1.3 of the EIA report). All construction vessels shall be restricted to the marked areas. Besides, no overloading of the working barges during operation should be allowed, and movement of the construction vessels close to the shallow waters particular during low tide should be avoided.

10.2.3 Other Mitigation

Coral Translocation

- 10.2.3.1 The coral colonies within the plan view area of the proposed pier extension will potentially be impacted by direct encroachment (if they are located on the artificial vertical walls at the outmost part of the existing pier head to be demolished), or by permanent reduction of sunlight due to the pier extension structures. A coral translocation plan is recommended as ecological mitigation and it should be prepared during the detailed design stage and prior to commencement of the construction works.
- 10.2.3.2 According to the coral mapping result from present study, a total of 90 hard coral colonies were recorded within the plan view area of the proposed pier extension (73 colonies on seabed beneath the proposed pier extension, 12 colonies on the existing pier head) to be demolished and 5 colonies on seabed beneath the proposed temporary pier. The coral translocation plan should consider all coral colonies within these two areas, including those directly encroached (those on the pier head) and to be indirectly affected by reduction of light permanently or for an extended duration (for those on the seabed beneath the pier extension and the temporary pier).
- 10.2.3.3 Among the 73 corals recorded on the seabed within the proposed pier extension, 39 colonies have been identified during the mapping survey as readily movable (colonies together with the substrates able to be moved by divers manually). Within the temporary pier plan view area, there were 5 hard coral colonies recorded on the seabed, with 2 of them readily movable. For the remaining colonies not

found readily movable, it was observed from the coral surveys that most of these colonies were attached on boulders which may require equipment to move or isolate. Alternatively, feasibility of removing coral colonies from the original substrates and then attaching to new substrates in the recipient site could be considered. Translocation of encrusting/fragile coral colonies or species tolerant to low light environment should be carefully considered. The detailed approach and method of translocating these colonies should be recommended in the coral translocation plan. The objective is to translocate coral colonies within the plan view area of pier extension and temporary pier as far as practicable. The only exception is the two colonies of *Oulastrea crispata* (see **Appendix 8.12** of EIA report) which is a very common species and highly tolerant for low light conditions and adverse environment, and thus normally would not require translocation as mitigation, in particular when without direct impacts. Translocation of these two *Oulastrea crispata* colonies will be subject to the recommendation in the detailed translocation plan.

- 10.2.3.4 Regarding the 12 coral colonies on the existing pier head and to be directly encroached, it is unlikely to have them translocated with the substrates, and the coral translocation plan should consider the feasibility to remove them from the original substrates and then attaching to new substrates in the recipient site.
- 10.2.3.5 The whole stretch of eastern coast of Tung Ping Chau is generally suitable as recipient site for coral translocation. For example, the Reef Check locations in Tung Ping Chau (i.e. A Ma Wan, A Ye Wan and Wong Ye Kok) could all be considered as potential recipient sites for coral translocation. It is anticipated that one recipient site is enough for the translocation exercise of about 90 coral colonies in the present study. Both direct and indirect impacts to the coral communities at the three Reef Check locations are not expected. The final recommendation of recipient site however will be determined in the detailed coral translocation plan, but it should be located at a reasonable distance away from the proposed works area.
- 10.2.3.6 Coral translocation should be carried out during the period (November – April) in order to avoid the spawning period (i.e. May to October). A coral translocation plan with brief description on pre-translocation coral survey / baseline survey, translocation methodology, including the stabilization of the translocated corals, identification of coral recipient site and post-translocation monitoring methodology should be prepared during the detailed design stage of the Project. Competition between the corals from the donor site and the recipient site and conditions of the recipient site (such as hydrographic condition and bathymetry, and vulnerability to storm/typhoon damage) should be considered when formulating the coral translocation plan. Pre-translocation survey of coral within the proposed pier would be focused on identifying and mapping the coral colonies that would be directly impacted by the proposed marine works, and investigating the translocation feasibility of these coral colonies (e.g. health status of coral colony and nature of the attaching substrata).
- 10.2.3.7 The coral translocation plan should be submitted to AFCD for approval before the coral translocation. All translocation activities should be carried out by experienced marine ecologists agreed by AFCD.

Inspection of Seabed

- 10.2.3.8 Before marine-based site investigation works, the jack-up barge will be fixed in a position by extending its 4 legs into seabed, and concrete mooring sinkers will be deployed by the derrick barge for piling works, the legs and boring location as well

as the concrete mooring sinkers should be inspected by divers with knowledge about corals, to ascertain no coral colonies will be affected.

Good Site Practices for Water Quality Control

- 10.2.3.9 The mitigation measures for water quality impacts have been stated in the EMIS in **Appendix 4.1** for water quality. Besides the adoption of double casing system to confine the suspended solids during the marine-based foundation works, good site practices should be strictly followed when working in marine parks and avoidance of surface runoff and accidental spillage of chemicals.

10.2.4 Precautionary Measures

- 10.2.4.1 **Planning of Piling Works Locations:** Indirect impacts on corals are considered minor. After completion of each work cycle for site investigation or piling, the barges will move to another location for the next work cycle. The seabed underneath the barges will be re-exposed to direct sunlight. Similar piling works were previously conducted in 2008 at TPC Public Pier and no adverse impacts on corals were reported by monitoring survey. It is suggested that as a precautionary measure the programme of the site investigation and piling works could be planned in a way that where practicable there would be no overlapping of the positions for construction vessels between two sequential work cycles, to limit the duration with reduced sunlight reaching seabed. The site investigation works will take longer time at each location than the piling works, the jack-up barge should be lifted up as much above water surface as practicable to allow more light reaching the seabed.
- 10.2.4.2 **Scheduling Temporary Pier Piling Works:** Scheduling the pile construction works for the temporary pier (if it is confirmed that floating pontoon option is not feasible) to avoid the spawning seasons of hard corals (i.e. May to October (Lam 2000; Storlazzi *et al.*, 2004; and Chui *et al.*, 2004)) could be adopted as a precautionary measure, in view of its closer distances among piling locations with the southern end of the proposed works area (where the relatively higher coral density area within the proposed works area is located, see Figure 8.6 of EIA report)

10.2.5 Enhancement Measures

- 10.2.5.1 Mitigation measures to ameliorate against specific impacts and precautionary measures to further protect the marine ecology have been detailed above. However, notwithstanding these, further measures to enhance the marine environment are also recommended.
- 10.2.5.2 There will be a vertical above-seabed downstand wall and piles to support the new pier extension. The subtidal portion of many man-made structures could provide hard substrates for colonization of corals or other epibenthos. The armour ‘Dolosse’ on the east main cofferdam of the High Island Reservoir is known for the diverse coral communities and is now one of the locations for Reef Check in Hong Kong, with a considerable coral coverage. On the old pillars beneath the existing catwalk of Tung Ping Chau Public Pier, over 80 colonies of hard corals were recorded during the dive survey of the present EIA study. The submerged structures in the future new pier extension could also provide hard surface for colonization of marine sessile epibenthos including corals. It is also known that by suitable design, the colonization of epibenthos would be promoted and/or faster, and the ecological functions of epibenthic communities on the subtidal portions of these structures could be further enhanced.

- 10.2.5.3 It is proposed that the future design of the downstand wall and piles should take into account the enhancement of ecological functions. One of the approaches is to provide uneven surface or selected patterns on the future downstand wall and piles (either incorporating on the structures or installing additional panels/ tiles with such features). The enhanced surface could provide microhabitats for various marine organisms to colonise and grow, and develop into communities to provide feeding and hiding habitats for juveniles of marine fauna, and thereby effectively enhance biodiversity and ecological functions of the new man-made structures.
- 10.2.5.4 It is therefore recommended that during the detailed design of the pier improvement, a study should be conducted to explore and confirm the feasible enhancement designs to be adopted, to investigate the proper form of enhanced surface of the hard structures to be adopted for the above-seabed downstand wall and piles. The study report covering the recommendations of the proper form of design to be adopted, the detailed design and the implementation programme will be submitted to the authority for approval before commencement of the construction works.

10.3 Environmental Monitoring and Site Audit Requirements

- 10.3.1.1 The EIA has predicted the project would lead to some ecological impacts and has recommended a series of measures to avoid, minimise, and mitigate the impacts to an acceptable level. An ecological monitoring and audit programme would be needed to ensure the recommended measures are properly implemented.

Site Inspection on Terrestrial Habitat

- 10.3.1.2 The proposed TPC Public Pier extension is a marine-based project, and thus ecological impacts to terrestrial ecology and the Plover Cove (Extension) Country Park are not likely. However, due to the conservation importance of country park, general site inspection within the country park in particular the woodland is recommended to ensure no ecological disturbance within the country park.

Monitoring on Coral Community

Monitoring of water quality

- 10.3.1.3 Given the close proximity to coral communities, water quality monitoring is recommended to be undertaken at the nearby waters prior to the commencement of the construction as well as during the construction phase. Baseline data should be obtained prior to the start of the construction. Regular monitoring should be carried out throughout the whole construction phase to ensure that the water quality complies with the established environmental standards as stated in water quality chapter. Detailed monitoring locations and parameters as well as frequency are shown in the water quality chapter of the EM&A manual.

Monitoring of translocated coral colony

- 10.3.1.4 A pre-translocation baseline survey prior to the commencement of any construction works, would be conducted at 1) the confirmed area of the proposed pier extension, 2) the confirmed area of the temporary pier, and 3) the confirmed extent of the existing pier head to be demolished. All coral colonies within these three confirmed areas will be tagged by marine ecologist(s) to be approved by AFCD. Tagging methodology shall adopt non-destructive method that would not cause any damages to corals, and the tags should be removed afterwards, either after the translocation exercise or at the end of the monitoring period. Each of the tagged coral colony will be identified to species level and photographed. Information on location, size,

health condition (e.g. sedimentation, bleaching (by CoralWatch), mortality), movability and general condition of the surrounding environment will be recorded. All the coral colonies that can be translocated within the three confirmed areas will be translocated to the recipient site.

- 10.3.1.5 A representative number of the translocated corals (e.g. 40 colonies) should be selected for post-translocation monitoring, which should include observations on the presence, survival, health condition (e.g. sedimentation, bleaching (by CoralWatch), mortality) and size of the translocated coral colonies. Priority shall be given to the larger colonies as those colonies are likely to be more prone to sedimentation. These parameters should then be compared with the baseline results collected from the pre-translocation survey, in order to evaluate the effectiveness of the translocation task. Should the translocation recipient site recommended in the detailed translocation plan be located in the vicinity of the control site with 20 control corals below, the control site may also serve as the control for the translocated corals. Otherwise, a separated group of 20 control corals should be proposed for the translocated corals. Tags on the colonies selected for monitoring will be removed at the end of the monitoring period, while the tags on the remaining coral colonies will be removed at the time of the first post-translocation monitoring.
- 10.3.1.6 For the translocated coral colonies at the recipient site, monitoring on the translocated corals and the control corals will be conducted monthly for the first three months of the construction phase. After the first three months, quarterly monitoring will be conducted during the whole construction period, and will continue after the completion of construction works for one year.

Monitoring of coral colony in the works area and control site

- 10.3.1.7 *Baseline survey* – A baseline survey prior to the commencement of any construction works will be conducted to identify and tag at least 20 coral colonies for monitoring within the proposed works area, in particular near the piling locations and the southern part of the proposed works area (**Figure 8.6** of EIA report, i.e. with relatively higher density of coral colony), but outside the confirmed areas of the proposed pier extension and the temporary pier. The monitoring aims to assess if there are impacts to coral colonies from the construction or any impacts from light reduction due to the working vessels.
- 10.3.1.8 In order to determine if the coral colonies being monitored within the proposed works area would also be affected by factors other than the construction works, a baseline survey prior to the commencement of any construction works will be conducted at a control site to select and tag at least 20 coral colonies for monitoring, for the purposes of providing reference information on whether any natural fluctuations in environment or ecology that will also affect the health of corals. According to the pier improvement works in 2006-2007, a control site was selected at a location more than 100m from the TPC public pier. In the present project, the nearest reef check location (i.e. Wong Ye Kok) could thus be chosen as the control site for monitoring, and the locations of the selected coral colonies should be at least 100m away from TPC Public Pier. The monitoring results of the coral colonies in the control site will be compared with those of the coral colonies in the proposed works area.
- 10.3.1.9 Priority of selecting the corals to be monitored within the proposed works area as well as the control site shall be given to the largest and undamaged colonies as those colonies are likely to be more prone to sedimentation. Tagging methodology shall adopt non-destructive method that would not cause any damages to corals, and the tags should be removed at the end of the monitoring period. During the baseline

survey, each of the selected and tagged coral colonies (i.e. at least 20 from the proposed works area and at least 20 from the control site) will be identified to species level and photographed. Information on location, size, health condition (e.g. sedimentation, bleaching (by CoralWatch), mortality) and general condition of the surrounding environment will be recorded.

- 10.3.1.10 *Construction and operational phases monitoring* - Impact monitoring frequencies would be changed at different construction stages. The monitoring of the tagged colonies within the proposed works area and the control site will be conducted weekly during construction of piles and downstand wall. For the rest of the construction phase when no works of piles and downstand wall is conducted, the monitoring frequency will be monthly, provided that no Project exceedance of water quality due to construction works is recorded. However, once any exceedance of water quality is reported, the monitoring frequency should be increased to weekly, until no exceedance in water quality is reported again for two sequential water quality monitoring. The presence, survival, and health conditions of the tagged coral colonies will be recorded.
- 10.3.1.11 Post-construction monitoring of the 20 colonies within the proposed works area, the translocated colonies (e.g. 40 colonies) and 20 colonies at the control site of colonies within proposed works area (i.e. the nearest reef check location - Wong Ye Kok) will be conducted quarterly for a year.
- 10.3.1.12 The ecological monitoring and auditing will be conducted by a qualified ecologist(s) who has suitable background in marine ecology, and to be approved by AFCD.
- 10.3.1.13 The action and limit level and event action plan for coral monitoring in the works area is shown in **Table 10.1**. Action of exceedance of action and limit levels is shown in **Table 10.2**. If the Limit Level is exceeded, the ET Leader should inform all parties (Contractor, Project Proponent, EPD, AFCD and IEC) immediately. Should the Limit Level be exceeded, the contractor should stop the underwater works immediately and work out the solution according to the requirements of EPD and AFCD. The ET Leader should inform the Contractor to suspend all underwater works until an effective solution or remediation such as coral restoration is identified. The solution or remediation will be agreed by EPD and AFCD. Once the solution has been identified and agreed with all parties, underwater works may commence.

Table 10.1 Action and Limit Level of Coral Monitoring in the Works Area

Parameters	Action Level	Limit Level
Sedimentation	a 15% increase in the percentage of sedimentation on the hard corals occurs at more than 20% of the tagged coral colonies	a 25% increase in the percentage of sedimentation on the hard corals occurs at more than 20% of the tagged coral colonies
Bleaching	a 15% increase in the percentage of bleaching of hard corals occurs at more than 20% of the tagged coral colonies	a 25% increase in the percentage of bleaching of hard corals occurs at more than 20% of the tagged coral colonies

Parameters	Action Level	Limit Level
Mortality	a 15% increase in the percentage of partial mortality of corals occurs at more than 20% of the tagged coral colonies	a 25% increase in the percentage of partial mortality of corals occurs at more than 20% of the tagged coral colonies

Table 10.2 Action for Exceedance of Action Level and Limit Level

Period	Exceedance of Action Level	Exceedance of Limit Level
Construction Phase	<p>If the Action Level is exceeded, the ET Leader should inform all parties (Contractor, Project Proponent, EPD, AFCD and IEC). The data from the water quality monitoring should also be reviewed. If the water quality monitoring shows no attributable effects of the works, then the Action is not triggered. If the water quality data indicate exceedances (for SS and/or turbidity) the ET Leader should discuss with the Contractor the most appropriate method of reducing suspended solids, and/or control sedimentation.</p> <p>This mitigated method should then be enacted on the next working day.</p>	<p>If the Limit Level is exceeded, the ET Leader should inform all parties (Contractor, Project Proponent, EPD, AFCD and IEC) immediately. Should the Limit Level be exceeded, the contractor should stop the underwater works immediately and work out the solution according to the requirements of EPD and AFCD. The ET Leader should inform the Contractor to suspend all underwater works until an effective solution or remediation such as coral restoration is identified. Once the solution has been identified and agreed with all parties, underwater works may commence.</p>
Operational Phase	<p>If the Action Level is exceeded, the ET Leader should inform the Project Proponent, EPD, and AFCD. The data from the water quality monitoring should also be reviewed. If the water quality monitoring shows no attributable effects, then the Action is not triggered. If the water quality data indicate exceedances, the ET Leader should discuss with the Project Proponent the most appropriate method of reducing the water quality impact.</p> <p>This mitigated method should then be enacted on the next working day.</p>	<p>If the Limit Level is exceeded, the ET Leader should inform all parties Project Proponent, EPD, and AFCD immediately. Should the Limit Level be exceeded, the Project Proponent should stop the operation of the pier according to the requirements of EPD and AFCD. The operation of the pier would be suspended until an effective solution is identified.</p>

11 Fisheries

11.1 Introduction

- 11.1.1.1 Residual fisheries impacts would be the permanent loss of about 0.056 ha of low production fishing grounds in Tung Ping Chau. Given the small proportion in fishing grounds in Hong Kong waters and the small contribution on Hong Kong fisheries production, as well as the implementation of the mitigation measures for water quality, the residual impact is considered acceptable.
- 11.1.1.2 The EIA has considered avoidance and minimisation for the impacts arising from the Project.

11.2 Mitigation Measures

11.2.1 Consideration of Impact Avoidance

- 11.2.1.1 The proposed TPC Pier involves extension of new pier head and a floating structure in the main waters. Piles will be constructed under the proposed new pier head and the floating structure, thus direct encroachment of fishing ground is expected. Nevertheless, there is no mariculture site within the proposed pier at Tung Ping Chau. The proposed pier is not located in waters of high fisheries production or fish fry collection. The proposed pier at Tung Ping Chau is not within the spawning ground and nursery area for commercial fisheries resources.

11.2.2 Consideration of Impact Minimisation

- 11.2.2.1 During the construction phase, the mitigation measures as detailed in water quality chapter should be implemented / adopted. The mitigation measures cover the potential water quality impacts from marine-based site investigation works, marine-based foundation works, above-water construction works, site run-off from general site operation, accidental spillage of chemicals and sewage from workforce. With the implementation of the mitigation measures for water quality, no adverse fisheries impact is anticipated and no additional mitigation measure for fisheries is required. Secondary impacts from the proposed mitigation measures for water quality are not expected.
- 11.2.2.2 No specific mitigation measures would be required for the operational phase of the Project.

11.3 Environmental Monitoring and Site Audit Requirements

- 11.3.1.1 Site inspections follow water quality chapter during construction phase should be carried out to monitor any malpractice leading to deterioration of water quality of the surrounding which may in turn affect the fisheries resources (i.e. a monitoring and audit programme aims to ensure that the released suspended solids (SS) concentrations from the piling activities). As there are no anticipated adverse impacts during operational phase, monitoring and audit requirements are not required.

12 Landscape and Visual

12.1 Introduction

- 12.1.1.1 The EIA has recommended that EM&A for landscape and visual resources is undertaken during the design, construction and operational phases of the project. The design, implementation and maintenance of landscape mitigation measures should be checked to ensure that any potential conflicts between the proposed landscape measures and any other works of the Project would be resolved at early as practical without affecting the implementation of the mitigation measures.
- 12.1.1.2 The proposed mitigation measures of landscape and visual impacts are summarised in **Appendix 4.1**. The construction phase mitigation measures will be adopted and audited from the commencement of construction throughout the entire construction period. Mitigation measures for the operational phase will be adopted during the detailed design and be built as part of the construction works so that they are in place on commissioning of the Project.

12.2 Mitigation Measures

12.2.1 Construction Phase

- 12.2.1.1 The landscape and visual mitigation measures to be incorporated in the design and construction phase, and relevant agencies for the measures are summarised in **Table 12.1** and shown in **Figure 12.1**.

Table 12.1 Recommended Mitigation Measures in Construction Phase

ID	Mitigation Measures	Responsible Agent for Implementation of Mitigation Measures
CM1	<u>Minimisation of Construction Area</u> The footprint of the improved pier structure should be minimised as far as practicable to minimise the potential landscape and visual disturbance.	Project Proponent - CEDD (Via the Engineer)
CM2	<u>Site Hoarding</u> To reduce negative visual impact, where practicable, construction site hoarding should be erected around any active works area to screen pedestrian level views into the construction area from visually sensitive receivers.	Project Proponent - CEDD (Via the Engineer/ Contractor)
CM3	<u>Construction Programme</u> Employ practicable construction techniques to streamline construction programme, minimise the duration of plant operations. Consider prefabrication of building elements offsite to minimise on site works and construction period.	Project Proponent - CEDD (Via the Engineer/ Contractor)
CM4	<u>Water Quality Control</u> Precautionary measures should be adopted to avoid untreated runoff from directly discharging into the sea, particularly during rainy condition, and any pollutants / wastes / debris from entering the sea.	Project Proponent - CEDD (Via the Engineer/ Contractor)

ID	Mitigation Measures	Responsible Agent for Implementation of Mitigation Measures
CM5	<u>Appearance of Construction Plants / Machinery</u> A suitable colour scheme of construction machines and plants should be adopted where possible.	Project Proponent - CEDD (Via the Engineer/ Contractor)
CM6	<u>Lighting Control</u> Construction day and night-time lighting should be controlled to minimise glare impact to adjacent VSRs during the construction stage.	Project Proponent - CEDD (Via the Engineer/ Contractor)

12.2.2 Operational Phase

12.2.2.1 The landscape and visual mitigation measures to be incorporated in the operational phase, and relevant agencies for the measures are summarised in **Table 12.2** and shown in **Figure 12.2**.

Table 12.2 Recommended Mitigation Measures in Operational Phase

ID	Mitigation Measures	Responsible Agent for Implementation of Mitigation Measures (Design and Construction Stage)	Responsible Agent for Implementation of Mitigation Measures (Operation and Maintenance)
OM1	<u>Sensitive Design and Disposition of the Pier Structures</u> The proposed hard structures of the pier should be sensitively designed to become compatible with the existing landscape context. The footprint of the pier should also be minimised while optimising the berthing depth and length of the pier to reduce the landscape impact. The materials used for decoration such as external paint, metal cladding, tile, stone cladding should be compatible to the neighbouring natural environment. The orientation of the proposed hard structures of the pier should aim at minimising visual intrusion to visually sensitive receivers as far as practicable. Additional lights in the new pier will be kept to as minimal for safety purpose. Night-time lighting of the pier shall also be controlled to minimise glare impact to adjacent VSRs during the operation phase. If solar panels are to be installed as renewable energy source, non-reflective solar panels should be installed to avoid glare from direct or reflected sunlight.	Project Proponent – CEDD (Via Architect/ Designer)	Operator – CEDD (Via Contractor)

12.3 Environmental Monitoring and Site Audit Requirements

- 12.3.1.1 Audits will be carried out during construction phase to ensure all the recommended landscape and visual mitigation measures in the EIA are properly and effectively implemented and to ensure compliance with the intended aims of the measures. The EM&A comprises monitoring and auditing of proper mitigation measures and site practices to reduce landscape and visual impacts as discussed in **Section 12.2**. Site inspections should be undertaken by the ET at least twice a month during the construction period.

12.4 Event and Action Plan

12.4.1.1 In the event of non-compliance, the responsibilities of the relevant parties are detailed in the Event/Action plan provided in **Table 12.3**.

Table 12.3 Event/Action Plan for Landscape and Visual

Event	Action			
	ET	IEC	ER	Contractor
Design Check	1. Check final design conforms to the requirements of EP and prepare report.	1. Check report. 2. Recommend remedial design if necessary.	1. Undertake remedial design if necessary.	N/A
Non-conformity on one occasion	1. Inform the IEC, ER and the Contractor 2. Discuss remedial actions with IEC, ER and Contractor 3. Monitor remedial actions until rectification has been completed	1. Check report. 2. Check Contractor's working method 3. Discuss with ET, ER and Contractor on possible remedial measures. 4. Advise ER on effective of proposed remedial measures. 5. Check implementation of remedial measures	1. Confirm receipt of notification of non-conformity in writing 2. Review and agree on the remedial measures proposed by the Contractor 3. Ensure remedial measures are properly implemented	1. Identify source and investigate the non-conformity 2. Amend working methods agreed with ER as appropriate 3. Rectify damage and undertake any necessary replacement
Repeated Non-conformity	1. Identify sources 2. Inform the Contractor, IEC and ER 3. Discuss inspection frequency 4. Discuss remedial actions with IEC, ER and Contractor 5. Monitor remedial actions until rectification has been completed 6. If non-conformity stops, cease additional monitoring	1. Check inspection report 2. Check Contractor's working method 3. Discuss with ET, ER and Contractor on possible remedial measures 4. Advise ER on effectiveness of proposed remedial measures	1. Notify the Contractor 2. In consultation with the ET and IEC, agree with the Contractor on the remedial measures to be implemented 3. Supervise implementation of remedial measures	1. Identify source and investigate the non-conformity 2. Amend working methods agreed with ER as appropriate 3. Rectify damage and undertake any necessary replacement. Stop relevant portion of works as determined by ER until the non-conformity is abated.

Notes:

ET – Environmental Team

IEC – Independent Environmental Checker

13 Cultural Heritage

13.1 Introduction

- 13.1.1.1 The EIA has assessed the potential cultural heritage impacts associated with the Project. A Marine Archaeological Investigation (MAI) with a geophysical survey has been conducted. Potential terrestrial archaeological impact is also assessed.

13.2 Mitigation Measures

13.2.1 Construction Phase

- 13.2.1.1 As neither marine nor terrestrial archaeological impact is expected from the construction of the Project, mitigation measures are not necessary. As a precautionary measure, Antiquities and Monuments Office (AMO) should be informed in case of discovery of antiquities or supposed antiquities in the course of marine works.

13.2.2 Operational Phase

- 13.2.2.1 As the Project would not generate or induce any additional cultural heritage impact during the operational phase, mitigation measures are considered not necessary.

13.3 Environmental Monitoring and Site Audit Requirements

13.3.1 Construction Phase

- 13.3.1.1 As neither marine nor terrestrial archaeological impact is expected from the construction of the Project, monitoring and audit are considered not necessary.

13.3.2 Operational Phase

- 13.3.2.1 As the Project would not generate or induce any additional cultural heritage impact during the operational phase, mitigation measures are considered not necessary.

14 Site Environmental Audit

14.1 Site Inspection

- 14.1.1.1 Site inspection provides a direct means to initiate and enforce specified environmental protection and pollution control measures. These shall be undertaken routinely to inspect construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. Site inspection is one of the most effective tools to enforce the environmental protection requirements at the works area.
- 14.1.1.2 The ET shall be responsible for formulating the environmental site inspection programme as well as the deficiency and action reporting system, and for carrying out the site inspections. The proposal for rectification, if any, should be prepared and submitted to the ET Leader and IEC by the Contractor.
- 14.1.1.3 Regular site inspections shall be carried out and led by the ER and attended by the Contractor and ET at least once per week during the construction phase. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site. It should also review the environmental conditions of locations outside the works area which is likely to be affected, directly or indirectly, by the construction site activities of the Project. The ET shall make reference to the following information in conducting the inspection. During the inspection, the following information should be referred to:
- (i) EIA Report and EM&A Manual recommendations on environmental protection and pollution control mitigation measures;
 - (ii) ongoing results of the EM&A programme;
 - (iii) works progress and programme;
 - (iv) individual works methodology proposals (which shall include the proposal on associated pollution control measures);
 - (v) contract specifications on environmental protection;
 - (vi) relevant environmental protection and pollution control legislations; and
 - (vii) previous site inspection results undertaken by the ET and others.
- 14.1.1.4 The Contractor shall keep the ER and ET Leader updated with all the relevant environmental related information on the construction contract necessary for him to carry out the site inspections. Site inspection results and associated recommendations for improvements to the environmental protection and pollution control efforts should be recorded and followed up by the Contractor in an agreed time-frame. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, and the deficiency and action reporting system formulated by the ET, to report on any remedial measures subsequent to the site inspections.
- 14.1.1.5 The ER, ET and the Contractor should also carry out ad-hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of a valid environmental complaint, or as part of the investigation work, as specified in the Event and Action Plans for the EM&A programme.

14.2 Environmental Compliance

- 14.2.1.1 There are statutory requirements on environmental protection and pollution control requirements with which construction activities must comply.
- 14.2.1.2 In order to ensure the works comply with statutory requirements, all method statements of works should be submitted by the Contractor to the ER for approval and to the ET Leader for vetting to ensure sufficient environmental protection and pollution control measures have been included. EMIS is summarised in **Appendix 4.1**. Any proposed changes to the mitigation measures shall be certified by the ET Leader and verified by the IEC as conforming to the relevant information and recommendations contained in the EIA Report.
- 14.2.1.3 The ER and ET shall also review the progress and programme of the works to check that relevant environmental legislation has not been violated, and that any foreseeable potential for violating laws can be prevented.
- 14.2.1.4 The Contractor should provide the update of the relevant documents to the ET Leader so that checking can be carried out. The document shall at least include the updated Works Progress Reports, updated Works Programme, method statements, any application letters for different licenses / permits under the environmental protection laws, and copies of all valid licenses / permits. The site diary and environmental records shall also be available for inspection by the relevant parties.
- 14.2.1.5 After reviewing the document, the ET shall advise the IEC and the Contractor of any non-compliance with legislative requirements on environmental protection and pollution control so that they can timely take follow-up actions as appropriate. If the follow-up actions still result in potential violation of environmental protection and pollution control requirements, the ER and ET should provide further advice to the Contractor to take remedial action to resolve the problem.
- 14.2.1.6 Upon receipt of the advice, the Contractor shall undertake immediate actions to correct the situation. The ER and ET shall follow up to ensure that appropriate action has been taken in order to satisfy legal requirements.

14.3 Choice of Construction Method

- 14.3.1.1 At times during the construction phase, the Contractor may submit method statements for various aspects of construction. This state of affairs would only apply to those construction methods that the EIA has not imposed conditions while for construction methods that have been assessed in the EIA, the Contractor is bound to follow the requirements and recommendations in the EIA study. The Contractor's options for alternative construction methods may introduce adverse environmental impacts into the Project. It is the responsibility of the Contractor and ET, in accordance with established standards, guidelines and EIA study recommendations and requirements, to review and determine the adequacy of the environmental protection and pollution control measures in the Contractor's proposal in order to ensure no unacceptable impacts would result. To achieve this end, the ET shall provide a copy of the Proactive Environmental Protection Proforma as shown in **Appendix 14.1** to the IEC for approval before commencement of work. The IEC should audit the review of the construction method and endorse the proposal on the basis of no adverse environmental impacts.

14.4 Environment Complaints

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

- The Contractor to log complaint and date of receipt onto the complaint database and inform the ER, ET and IEC immediately;
- The Contractor to investigate, with the ER and ET, the complaint to determine its validity, and assess whether the source of the problem is due to construction works of the Project with the support of additional monitoring frequency and stations, if necessary;
- The Contractor to identify remedial measures in consultation with the IEC, ET and ER if a complaint is valid and due to the construction works of the Project;
- The Contractor to implement the remedial measures as required by the ER and to agree with the ET and IEC any additional monitoring frequency and stations, where necessary, for checking the effectiveness of the remedial measures;
- The ER, ET and IEC to review the effectiveness of the Contractor's remedial measures and the updated situation;
- The ET/Contractor to undertake monitoring and audit to verify the situation if necessary, and oversee that circumstances leading to the complaint do not recur;
- If the complaint is referred by the EPD, the Contractor to prepare interim report on the status of the complaint investigation and follow-up actions stipulated above, including the details of the remedial measures and monitoring identified or already taken, for submission to EPD within the time frame assigned by the EPD; and
- The ET to record the details of the complaint, results of the investigation, subsequent actions taken to address the complaint and updated situation including the effectiveness of the remedial measures, supported by regular and monitoring results in the monthly EM&A reports.

15 Reporting

15.1 General

- 15.1.1.1 Reports can be provided in an electronic medium upon agreeing the format with the ER and EPD. This would enable a transition from a paper / historic and reactive approach to an electronic / real time proactive approach. All the monitoring data shall also be submitted on diskettes or other approved medium. The formats for monitoring data to be submitted shall be separately agreed.
- 15.1.1.2 Types of reports that the ET shall prepare and submit include monthly EM&A report and final EM&A report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly and final EM&A reports shall be made available to the Director of Environmental Protection.

15.2 Baseline Monitoring Report

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

15.3 Monthly Monitoring Reports

- 15.3.1.1 The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET and endorsed by the IEC. The EM&A report shall be prepared and submitted to EPD within 10 working days of the end of each reporting month, with the first report within the month after major construction works commences. Copies of each monthly EM&A report shall be submitted to the following parties: the IEC, the ER and EPD. Before submission of the first EM&A report, the ET shall liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.
- 15.3.1.2 The ET should prepare and submit a Baseline Environmental Monitoring Report at least one month before commencement of construction of the Project. Copies of the Baseline Environmental Monitoring Report should be submitted to the IEC, the ER and EPD. The ET should liaise with the relevant parties on the exact number of copies required.
- 15.3.1.3 The ET shall review the number and location of monitoring stations and parameters every six months, or on as needed basis, in order to cater for any changes in the surrounding environment and the nature of works in progress.

First Monthly EM&A Report

- 15.3.1.4 The first monthly EM&A report shall include at least the following:
- (i) Executive summary (1-2 pages):
 - breaches of Action and Limit levels;
 - compliant log;
 - notifications of any summons and successful prosecutions;
 - reporting changes; and
 - future key issues.
 - (ii) Basic project information:
 - project organisation including key personnel contact names and telephone numbers;
 - programme;
 - management structure; and
 - the work undertaken during the month.
 - (iii) Environmental status:
 - advice on the status of statutory environmental compliance such as the status of compliance with the environmental permit (EP) conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
 - works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and

- drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring stations (with co-ordinates of the monitoring locations).
- (iv) A brief summary of EM&A requirements including:
- all monitoring parameters;
 - environmental quality performance limits (Action and Limit levels);
 - Event and Action Plans;
 - environmental mitigation measures, as recommended in the EIA Report; and
 - environmental requirements in contract documents.
- (v) Implementation status
- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA Report.
- (vi) Monitoring results (in both hard and diskette copies) together with the following information:
- monitoring methodology;
 - name of laboratory and types of equipment used and calibration details;
 - monitoring parameters;
 - monitoring locations;
 - monitoring date, time, frequency, and duration;
 - weather conditions during the period;
 - any other factors which might affect the monitoring results; and
 - QA/QC results and detection limits.
- (vii) Report on non-compliance, complaints, and 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 investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
 - record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
 - review of the reasons for and the implications of non-compliances, complaints, summons and prosecutions including review of pollution sources and working procedures; and

- description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- (viii) Others
- an account of the future key issues as reviewed from the works programme and work method statements;
 - advice on the solid and liquid waste management status;
 - record of any project changes from the originally proposed as described in the EIA Report (e.g. construction methods, mitigation proposals, design changes, etc.); and
 - comments (for example, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

Subsequent Monthly EM&A Reports

15.3.1.5 Subsequent monthly EM&A reports shall include at least the following:

- (i) Executive summary (1-2 pages):
- breaches of Action and Limit levels;
 - compliant log;
 - notifications of any summons and successful prosecutions;
 - reporting changes; and
 - future key issues.
- (ii) Basic project information:
- project organisation including key personnel contact names and telephone numbers;
 - programme;
 - management structure; and
 - the work undertaken during the month; and
 - any updates as needed to the scope of works and construction methodologies.
- (iii) Environmental status:
- advice on the status of statutory environmental compliance such as the status of compliance with the environmental permit (EP) conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
 - works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and

- drawings showing the Project area, any environmental sensitive receivers and the locations of the monitoring stations (with co-ordinates of the monitoring locations).
- (iv) Implementation status
- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA Report.
- (ix) Monitoring results (in both hard and diskette copies) together with the following information:
- monitoring methodology;
 - name of laboratory and types of equipment used and calibration details;
 - monitoring parameters;
 - monitoring locations;
 - monitoring date, time, frequency, and duration;
 - weather conditions during the period;
 - any other factors which might affect the monitoring results; and
 - QA/QC results and detection limits.
- (v) Report on non-compliance, complaints, and 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 investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
 - record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
 - review of the reasons for and the implications of non-compliances, complaints, summons and prosecutions including review of pollution sources and working procedures; and
 - description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- (vi) 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;

- record of any project changes from the originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc.); and
 - comments (for example, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.
- (vii) Appendices
- Action and Limit levels;
 - graphical plots of trends of the monitoring parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
 - a) major activities being carried out on site during the period;
 - b) weather conditions during the period; and
 - c) any other factors that 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.

15.4 Final EM&A Review Report for Construction and Operational Phases

- 15.4.1.1 The construction phase final report shall be submitted within 1 month after completion of the Project. Meanwhile the operational phase final report shall be submitted within 1 month after the termination of post-Project EM&A.
- 15.4.1.2 Prior to the proposed termination, it may be advisable to consult relevant local communities. The proposed termination should only be implemented after the proposal has been endorsed by the IEC, the ER and the Project Proponent followed by approval from the Director of Environmental Protection.
- 15.4.1.3 The final EM&A report should contain at least the following information:
- (i) Executive summary (1-2 pages);
 - (ii) Drawings showing the Project area, any environmental sensitive receivers and locations of monitoring stations and commissioning test;
 - (iii) Basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the course of the Project or past twelve months;
 - (iv) A brief summary of EM&A requirements including:
 - environmental mitigation measure, as recommended in the EIA Report;
 - environmental impact hypotheses tested;
 - environmental quality performance limits (Action and Limit levels);

- all monitoring parameters; and
 - Event and Action Plans.
- (v) A summary of the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report, and summarised in the updated implementation schedule;
- (vi) Graphical plots and the statistical analysis of the trends of monitoring parameters over the course of the Project, including:
- the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
- (vii) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (viii) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- (ix) A description of the actions taken in the event of non-compliance;
- (x) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up actions taken and results;
- (xi) A review of the validity of EIA predictions and identification of shortcomings in EIA recommendations;
- (xii) Comments (for example, a review of the effectiveness and efficiency of the mitigation measures and of the performance of the environmental management system, that is, of the overall EM&A programme); and
- (xiii) Recommendations and conclusions (for example, a review of success of the overall EM&A programme to cost-effectively identify deterioration and to initiate prompt effective mitigatory action when necessary).

15.5 Data Keeping

- 15.5.1.1 No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the monthly EM&A reports. However, any such document shall be well kept by the ET and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. Monitoring data shall also be recorded on diskettes or other approved media, and the software copy must be available upon request. Data format shall be agreed with EPD. All documents and data shall be kept for at least one year following completion of the construction phase monitoring and one year following completion of the operational phase monitoring for construction phase EM&A and operational phase EM&A respectively.

15.6 Interim Notifications of Environmental Quality Limit Exceedances

- 15.6.1.1 With reference to the Event and Action Plans, when the environmental quality performance limits are exceeded and if they are proven to be valid, the ET should immediately notify the IEC and EPD, as appropriate. The notification should be followed up with advice to the IEC and EPD on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals. A sample template for the interim notification is presented in **Appendix 15.1**.