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1 INTRODUCTION

Background

- 1.1 Based upon on-going developments along the Castle Peak Road in Yau Kom Tau, Sham Tseng and Tsing Lung Tau, it is anticipated that the road network in the area will become increasingly overloaded by the year 2011. Castle Peak Road is at present a two-lane single carriageway, with narrow footways at discrete locations and is generally characterised by sub-standard geometry and frequent entry / egress points offering insufficient visibility. The exception to this is through the centre of Sham Tseng, where the road is already built to a dual two-lane carriageway standard.
- 1.2 As a result of this, the Government has decided that, in order to enhance the level of service for the increasing number of users, the road needs to be improved to cope with traffic growth predicted by the year 2011. The Mouchel Halcrow Joint Venture has been commissioned by Highways Department under Agreement CE 1/96 to, in broad terms, review the findings, conclusions and recommendations of the Feasibility Study, complete the detailed design of the project taking into account any modifications noted during the review, prepare the pre-qualification and tender documents and implement the project.
- 1.3 China State Construction Engineering (Hong Kong) Ltd. was appointed as the Contractor under Contract No. HY/99/19 – Middle Section to carry out the construction for Castle Peak Road Improvement between Ting Kau and Sham Tseng, Tsuen Wan.

Purpose of the Manual

- 1.4 An Environmental Impact Assessment (EIA) on the Feasibility Study for the Castle Peak Road Improvements between Ka Loon Tsuen and Yau Kom Tau, hereafter referred to as the Feasibility Study EIA, was completed in December 1996. The Feasibility Study EIA has been approved by all relevant parties, including EPD, and was endorsed by the Advisory Council on the Environment (ACE) in April 1997. However, based upon the ‘Rural Road A’ classification of the road, the project as a whole is not classified as a designated project under the Environmental Impact Assessment Ordinance and as such does not require an Environmental Permit (EP) for its implementation.
- 1.5 Notwithstanding, three elements of the project, reclamations at Tsing Lung Tau and Sham Tseng West (west contract) and a reclamation at Sham Tseng East (middle contract) are designated works and each will require an EP under the EIAO. A small reclamation is also proposed for the east contract at Area 2, Tsuen Wan but this reclamation is not designated under the EIAO by virtue of its small size and distance from any specified area of importance.
- 1.6 The EP for construction of reclamation and associated seawall at Sham Tseng East (Middle Contract), EP No. EP-095/2001, was obtained from EPD in April 2001. As specified in the EP, a Marine Water Quality Monitoring and Audit Manual should be prepared and submitted for EPD’s approval prior to the marine water quality monitoring and audit programme.

Scope of Works

1.7 The main scope of the Contract as a whole are as follows:

- Improvement to Castle Peak Road between Ting Kau and Sham Tseng, Tsuen Wan to a dual two-lane carriageway;
- Provision of pedestrian facilities in form of footpaths, subways, footbridges and crossings;
- Road junction and signal design and reprovisioning of access roads and connections to existing road networks;
- Connection of associated drainage and landscaping works;
- Environmental mitigation measure;
- Design and construction of water mains; and
- Construction of entrusted sewerage works.

Objectives of the Marine Water Quality Monitoring and Audit Manual

1.8 The objective of this Manual is to define the procedures of the programme for monitoring the environmental performance of the works associated with the middle contract improvements to Castle Peak Road between Sham Tseng and Ting Kau during construction and implementation with inspection marine water quality. The Manual provides details of the water quality monitoring requirements arising from the EIA and subsequent reviews, as well as audit recommendations for the water quality section in the EM&A Manual.

1.9 The Environmental Permit requires that a Marine Water Quality Monitoring and Audit Manual to be issued to EPD no later than one month before the commencement of construction and it will be the Contractor's responsibility to prepare this document.

1.10 The purposes of the water quality monitoring and audit programme are as follows:

- To ensure the specified mitigation recommendations of the EIA and Environmental Permit are included in the design of the project.
- To clarify and identify sources of water pollution, impact and nuisance arising from the works;
- To confirm compliance with legal, contract specifications and EIA study recommendations;
- To provide an early warning system for impact prevention;
- To provide a database of water quality parameters against which to determine any short term or long term environmental impacts;
- To propose timely, cost-effective and viable solutions to actual or potential environmental issues;
- To monitor performance of the mitigation measures and to assess their effectiveness and, whenever necessary, identify any further need for additional measures;
- To verify the EIA predicted impacts;
- To collate information and evidence for use in public, District Council and Government consultation; and
- To audit environmental performance.

- 1.11 Marine Water Quality Monitoring and Audit procedures are required for the construction activities (seawall construction and reclamation works) of the Contract. This Manual provides specific details of the monitoring and audit requirements that have been recommended to ensure compliance with the mitigation measures specified in the EIA Report.

Sensitive Receivers

- 1.12 Sensitive Receivers along the existing Castle Peak Road alignment for water quality impacts have been identified in accordance with the definitions given in the HKPSG. The receivers relevant to the middle contract are summarized in Table 1.1.

Table 1.1 Environmentally Sensitive Receivers to Water

| SR ID | Sensitive Receiver Identification | Description |
|-------|-----------------------------------|-------------------------------|
| 22 | Gemini Beach | Gazetted beach |
| | Hoi Mei Beach | Gazetted beach |
| 28 | Ting Kau Beach | Gazetted beach and playground |
| | Casam and Lido Beaches | Gazetted beach and playground |
| | Ma Wan Fish Culture Zone | Fish Culture Zone |

The Scope of the Marine Water Quality Monitoring and Audit Programme

- 1.13 The scope of the Marine Water Quality Monitoring and Audit programme is to undertake the following:
- (i) Implement monitoring and audit activities for:
 - Marine Water Quality:
 - a) Establish baseline water quality levels at specified locations and review these levels on a regular basis.
 - b) Implement construction water quality impact monitoring programme.
 - (ii) Liaison and provision of advice to construction site staff on the purposes and implementation of the programme.
 - (iii) Identify and resolve marine water quality issues that may arise from the construction activities.
 - (iv) Check and quantify the Contractor's overall performance, implement Event/Action Plans and recommend and implement remedial actions to mitigate adverse marine water quality effects as identified by the Marine Water Quality Monitoring and Audit programme and EIA.
 - (v) Conduct monthly reviews of monitored impact data and bi-monthly reviews during the operational phase (for a period of one year during the Contractor's maintenance period) as the basis for assessing compliance with defined criteria and ensuring that necessary mitigation measures are identified, designed and implemented and to undertake additional ad hoc monitoring and audit as required by particular circumstances.

- (vi) Evaluate and interpret all marine water quality monitoring data to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards and to verify the environmental impacts predicted in the EIA.
- (vii) Manage and liaise with other individuals or parties concerning any relevant environmental issues.
- (viii) Audit the effectiveness of the Environmental Management System (EMS) practices and procedures and implement any changes as appropriate.
- (ix) Conduct regular site audits of formal or informal nature to assess:
 - the level of the Contractor's general environmental awareness;
 - the Contractor's implementation of the recommendations and conditions specified in the EIA,
 - the Environmental Permit marine baseline survey;
 - the Contractor's performance as measured by the EM&A;
 - the need for specific mitigation measures to be implemented or the continued usage of those previously agreed; and
 - to advise the site staff of any identified potential environmental issues.
- (x) Submit EM&A reports which summarise project monitoring and auditing data, with full interpretation, illustrating the acceptability or otherwise of any environmental impacts and identification or assessment of the implementation status of agreed mitigation measures.

1.14 Thus, this Manual provides the following information:

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

- (viii) Interim notification of exceedances, reporting, procedures, report formats and reporting frequency including periodical quarterly summary reports and annual reviews to cover all construction, post-Project and operational phases of the development.
- (ix) Implementation schedules, summarising all recommended mitigation measures marine water quality.
- (x) Environmental Permit for construction of the reclamation at Sham Tseng East.

1.15 This Manual is considered to be a working document and should be reviewed periodically and revised once substantial changes have been made.

Structure of the Manual

1.16 Following this introductory Section, the remainder of the Manual is set out as follows:

- Section 2 outlines the various parties involved in the EM&A process, and presents the proposed organizational structure of the organizations responsible implementing the EM&A programme and their key responsibilities;
- Section 3 details the requirements for baseline and impact monitoring for marine water quality, and lists relevant monitoring equipment, locations, compliance and EAPs;
- Section 4 sets out the site environmental audit requirement;
- Section 5 details the EM&A reporting requirements;
- Annex A contains Environmental Mitigation Implementation Schedule of Marine Water Quality;
- Annex B contains Proforma for Environmental Monitoring and Audit Programme

2 ORGANISATION AND STRUCTURE OF THE EM&A

Introduction

- 2.1 In this Section, the various parties involved in the EM&A process are outlined and the organizations responsible for implementing the EM&A programme and their key responsibilities are presented.

Project Organization

- 2.2 The Highways Department of the Hong Kong SAR Government is referred to as the "Employer" and the Project "Engineer" defined as the Engineer's Representative (ER), who will be responsible for the supervision of the construction of Contract.
- 2.3 During the Contract, an Environmental Team Leader (ET Leader) is employed by the Contractor. He shall ensure the Contractor's compliance with the project's environmental performance requirements during construction and undertake the post construction EM&A works and his responsibilities will include field measurements, sampling, analysis of monitoring results, reporting and auditing. The ET Leader shall be approved by the ER and the Environmental Protection Department (EPD) and shall be competent and shall have at least 7 years relevant environmental monitoring and audit experience on projects of a similar scale and nature.
- 2.4 The ET Leader will require suitably qualified support staff (the Environmental Team, (ET)), also be employed by the Contractor, to carrying out the EM&A programme. Both the ET Leader and members of the ET shall be independent and shall not be in any way connected to the Contractor's company. Due to the specialist nature of some of the EM&A works required, the ET should comprise professionals proficient to undertake the tasks involved. Thus, the ET should include personnel experienced in marine water quality monitoring.
- 2.5 The overall duties of ET Leader and the team are as follows:
- Sampling, analysis and statistical evaluation of monitoring parameters with reference to the EIA study recommendations and requirements in respect of water quality.
 - Environmental site surveillance.
 - Audit of compliance with environmental protection and pollution prevention and control regulations.
 - Monitor the implementation of environmental mitigation measures.
 - Monitor compliance with the environmental protection clauses/specifications in the Contract.
 - Review construction programme and comment as necessary.
 - Review construction methodology and comment as necessary.
 - Complaint investigation, evaluation and identification of corrective measures.

- Audit of the EMS and recommend and implement any changes as appropriate.
- Liaison with the Independent Checker (Environment) (IC(E)) on all environmental performance matters.
- Advice to the Contractor on environmental improvement, awareness, enhancement matter, etc., on site.
- Timely submission of the designated EM&A reports to the ER, the IC(E) and the EPD as appropriate.

2.6 In addition to the ET Leader, an Independent Checker (Environment) (IC(E)) shall advise the ER on environmental issues related to the project. The role of the Checker shall be independent from the management of construction works, but the Checker shall be empowered to audit the environmental performance of the construction activities and operational mitigation. The IC(E) shall have project management experience in addition to the requirements of the ET Leader specified in Section 2.2.3 and the appointment of the IC(E) will be subject to the approval of the ER. The IC(E) may require specialist support staff in order to properly carry out his duties which shall include the following:

- Review and audit all aspects of the EM&A programme.
- Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers.
- Carry out random sample check and audit on monitoring data and sampling procedures, etc.
- Conduct random site inspection.
- Audit the EIA and Environmental Permit recommendations and requirements against the status of implementation of environmental protection measures on site.
- Review the effectiveness of environmental mitigation measures and project environmental performance.
- Audit the Contractor's construction methodology and agree the least impact alternative in consultation with the ET Leader and the Contractor.
- Check complaint cases and the effectiveness of corrective measures.
- Review EM&A report submitted by the ET Leader.
- Feedback audit results to ET Leader by signing off relevant EM&A proformas.

- 2.7 Both the ET Leader and IC(E) shall be retained for the duration of the EM&A works which will span both the construction phase and one year into the operational phase of the project. The operational EM&A works will be the responsibility of the Contractor and will be undertaken in parallel to the maintenance period after the completion of construction.

3 MARINE WATER QUALITY MONITORING

Introduction

- 3.1 In this section, the requirements, methodology, equipment, monitoring locations and mitigation measures for the monitoring and audit of marine water quality impacts for the Contract are presented.

Methodology and Criteria

- 3.2 Marine water quality monitoring shall be carried out by the ET to ensure that any deteriorating water quality is readily detected and that timely action is taken to rectify the situation. The appropriate water quality mitigation measures are outlined in the Environmental Mitigation Implementation Schedule (in Annex A of this Manual).

Water Quality Monitoring

- 3.3 The objectives of the water quality monitoring programme are as follows:
- to determine the effectiveness of the operational controls and mitigation measures employed, and the need for supplementary mitigation measures; and
 - to check compliance with relevant WQOs;

Water Quality Parameter

- 3.4 Monitoring of turbidity in NTU, dissolved oxygen (DO) in mg/l and suspended solids (SS) in mg/l shall be carried out by the ET to ensure that any deteriorating water quality could be readily detected and timely action be taken to rectify the situation. The former two parameters are measured in-situ while the latter one is determined in laboratory. If there are other water quality parameters recommended in the EIA report, they shall also be included in the environmental monitoring work.
- 3.5 In association with the water quality parameters, some relevant data shall also be measured, such as monitoring location/position, time, water depth, water temperature, salinity, DO saturation, weather conditions, sea conditions, tidal stage, and any special phenomena and work underway at the construction site etc.
- 3.6 A sample monitoring record sheet is shown in Figure 3.3 for reference.

Monitoring Equipment

Dissolved oxygen and temperature measuring equipment

- 3.7 The equipment should comply with the following:
- (a) The instrument shall be a portable, weatherproof dissolved oxygen measuring instrument complete with cable and use a DC power source. It shall be capable of measuring:
 - A dissolved oxygen level in the range of 0-20 mg/l and 0-200% saturation; and
 - A temperature of 0-45 degree Celsius.
 - (b) It shall have a membrane electrode with automatic temperature compensation complete with a cable. Sufficient stocks of spare electrodes and cables shall be available for replacement where necessary (e.g. YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).
 - (c) Should salinity compensation not be integrated in the DO equipment, in-situ salinity shall be measured to calibrate the DO equipment prior to each DO measurement.

Turbidity Measurement Instrument

- 3.8 The instrument shall be a portable, weatherproof turbidity-measuring instrument complete with comprehensive operation manual. The equipment shall use a DC power source. It shall have a photoelectric sensor capable of measuring turbidity between 0-1000 NTU and be complete with a cable (e.g. Hach model 2100P or an approved similar instrument).

Suspended Solids

- 3.9 The following equipment is required:
- (a) A water sampler comprising a transparent PVC cylinder, with a capacity of not less than 2 liters and which can be effectively sealed with latex cups at both ends. The sampler shall have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth (e.g. Kahlsico Water Sampler or an approved similar instrument).
 - (b) Water samples for suspended solids measurement of both the marine and freshwater environment shall be collected in high density polythene bottles, packed in ice (cooled to 4°C without being frozen) and delivered to the laboratory as soon as possible after collection.

Water Depth Detector

- 3.10 A portable, battery-operated echo sounder shall be used for the determination of water depth at each designated monitoring. This unit can either be handheld or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

Salinity

- 3.11 A portable salinometer capable of measuring salinity in the range of 0-40 ppm shall be provided for measuring salinity of the water at each monitoring location and setting salinity compensation on the Dissolved Oxygen Meter.

Location of the Monitoring Site

- 3.12 A hand-held or boat-fixed type differential Global Positioning System (dGPS) or other equivalent instrument of similar accuracy shall be provided and used during monitoring to ensure the monitoring vessel is at the correct location before taking measurements. For the location of the monitoring locations in the water courses a hand-held dGPS, together with a suitably scaled map shall be used.

Calibration and Accuracy of Instrumentation

- 3.13 All in-situ monitoring instrument shall be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes shall 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 location.
- 3.14 For the on site calibration of field equipment, the BS 1427:1993, "Guide to Field and on-site test methods for the analysis of waters" shall be observed.
- 3.15 The limits of detection for the in-situ and laboratory measurements that shall be obtained are summarized in Table 3.1.

Table 3.1 Limits of detection for the in-situ and laboratory measurements

| Determinant | Limit of Detection | Precision |
|--------------------|---------------------------|------------------|
| Dissolved Oxygen | 0.1 mg/L | 1% |
| Salinity | 0.01 ppm | 1% |
| pH | 0.01 units | 1% |
| Temperature | 0.1 degree Celsius | 1 % |
| Turbidity (NTU) | 0.1 NTU | 1% |
| Suspended Solids | 1 mg/L | 2% |

Laboratory Measurement / Analysis

- 3.16 Analysis of suspended solids shall be carried out in a HOKLAS or other international accredited laboratory. Water samples of about 500 ml shall be collected at the monitoring stations for carrying out the laboratory SS determination. The SS determination work shall start within 24 hours after collection of the water samples. The SS determination shall follow APHA 17ed 2540D or equivalent methods subject to approval of EPD.

- 3.17 If a site laboratory is set up or non-HQKLAS and non-international accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment, analytical procedures, and quality control shall be approved by the EPD. All the analysis shall be witnessed by the ER and IC(E). The ET Leader shall provide the ER with one copy of the relevant chapters of the "Standard Methods for the Examination of Water and Wastewater" updated edition and any other relevant document for his reference.
- 3.18 For the testing methods of other parameters as recommended by EIA or required by EPD, detailed method procedures should be submitted to EPD for approval prior to the commencement of monitoring programme. If in-house or non-standard methods are proposed, details of the method verification may also be required to submit to EPD. In any circumstance, the sample testing would have comprehensive quality assurance and quality control programmes. The laboratory should prepare to demonstrate the programmes to EPD or his representatives when requested.

Monitoring Location and Requirements

- 3.19 The ET Leader shall agree with the ER, in consultation with the IC(E), the position of the sampling locations. When alternative monitoring locations shall be proposed, they shall be chosen based on the following criteria:
- (a) at location close to and preferably at the boundary of the mixing zone of the major site activities, which are likely to have water quality impacts;
 - (b) close to the sensitive receptors which are directly or likely to be affected;
 - (c) for monitoring locations located in the vicinity of the sensitive receptors, care should be taken to cause minimal disturbance during monitoring; and
 - (d) control stations which are at locations representative of the project site in its undisturbed condition.
- 3.20 Control stations are necessary to compare the water quality from potential impacted sites with the ambient water quality. Control stations shall be located within the same body of water as the impact monitoring stations but should be outside the area of influence of the works and, as far as practicable, not affected by any other works.
- 3.21 Measurements shall be taken at 3 water depths, namely, 1m below water surface, mid-depth and 1m above seabed. However, if the water depth is less than 6m, the mid depth station may be omitted and if the water depth is less than 3m, only the mid depth station shall be monitored. In all case, duplicate samples shall be collected for analysis at the accredited laboratory. For the in-situ parameters turbidity and DO, measurements shall be made during the descending and ascending of the sensor. The monitoring probes shall be retrieved out of water after the first measurement and then redeployed for the second measurement. If the difference between the measured values at any one depth is greater than 25%, the measurements shall be repeated until an acceptable match is made. If no match is achieved then the equipment shall be checked for accurate calibration or malfunction.

Baseline Monitoring

3.22 Baseline conditions for water quality shall be established and agreed with EPD, AFCD and the IC(E) prior to the commencement of works. The purposes of the baseline monitoring are to establish ambient conditions prior to the commencement of the works and to demonstrate the suitability of the proposed impact, control and reference monitoring stations. The baseline condition shall normally be established by measuring the water quality parameters specified in Section 3.4. The measurements shall be taken at all designated monitoring and control stations summarised in Table 3.2 below. The designated water quality monitoring stations have been located at all the gazetted beaches within the middle contract boundary. In addition, in accordance with the Environmental Permit for the EIAO designated reclamation at Sham Tseng East, monitoring stations have also been located close to the reclamation, with an additional reference station at the Ma Wan Fish Culture Zone. Two control stations are also set up for flood- and ebb-tide references respectively of the surrounding ambient.

Table 3.2 Original Water Quality Monitoring Stations specified in EM&A Manual

| Station I.D. | Description | Northing | Easting | Status |
|--------------|-----------------------------|----------|----------|--|
| MW1 | Gemini Beach | 824974.0 | 825190.0 | Gazetted bathing beach – Impact |
| MR1 | | 824952.0 | 825208.0 | Gazetted bathing beach – Reference |
| MW2 | Hoi Mei Beach | 825084.0 | 825380.0 | Gazetted bathing beach – Impact |
| MR2 | | 825066.0 | 825402.0 | Gazetted bathing beach – Reference |
| MW3 | Casam Beach | 825360.0 | 825747.0 | Gazetted bathing beach – Impact |
| MR3 | | 825328.0 | 825755.0 | Gazetted bathing beach – Reference |
| MW4 | Lido Beach | 825376.0 | 825922.0 | Gazetted bathing beach – Impact |
| MR4 | | 825334.0 | 825916.0 | Gazetted bathing beach – Reference |
| MW5 | Sham Tseng East Reclamation | 824935.0 | 824834.0 | EIAO Designated Reclamation – Impact (EP requirement) |
| MR5 | | 824910.0 | 824815.0 | EIAO Designated Reclamation – Reference (EP requirement) |
| MW6 | | 824906.0 | 824887.0 | EIAO Designated Reclamation – Impact (EP requirement) |
| MR6 | | 824881.0 | 824873.0 | EIAO Designated Reclamation – Reference (EP requirement) |
| WFCZF1 | Ma Wan Fish Culture Zone | 823870.0 | 823500.0 | Impact – EP requirement |

- 3.23 LCSD had advised that motorized vessel for the sampling and in-situ measurement for the monitoring would not permitted at the original monitoring locations in gazetted beaches. In view of the above monitoring constraints at the original locations, alternative water quality monitoring stations (MW1 - MW4) are proposed and summarized in Table 3.3 and shown in Figure 3.1 & 3.2.
- 3.24 In order to ensure any deterioration in marine water quality to be readily detected and timely action to be taken so as to rectify the situation during the course of marine works, one ebb-tide and one flood-tide control station shall be set up for the four gazetted beach monitoring stations (MW1 – MW4) replacing the four original reference stations (MR1 – MR4). The ebb-tide and flood-tide control stations shall be MC1 and MC2 respectively, the locations are shown in Figure 3.1.

Table 3.3 Proposed Alternative Water Quality Monitoring Stations

| Station I.D. | Description | HK 1980 Grid | | Status | Monitoring Parameter |
|--------------|-----------------------------|--------------|----------|-----------|--|
| | | Northing | Easting | | |
| MW1 | Gemini Beach | 824933.2 | 825214.5 | Impact | 1. Suspended solids 2. Turbidity 3. Dissolved Oxygen |
| MW2 | Hoi Mei Beach | 825056.7 | 825423.2 | Impact | |
| MW3 | Casam Beach | 825293.1 | 825737.9 | Impact | |
| MW4 | Lido Beach | 825281.6 | 825874.8 | Impact | |
| MW5 | Sham Tseng East Reclamation | 824935.0 | 824834.0 | Impact | |
| MR5 | | 824910.0 | 824815.0 | Reference | |
| MW6 | | 824906.0 | 824887.0 | Impact | |
| MR6 | | 824881.0 | 824873.0 | Reference | |
| WFCZF1 | Ma Wan Fish Culture Zone | 823870.0 | 823500.0 | Impact | |
| MC1 | Ebb-tide Control Station | 824888.0 | 824403.4 | Reference | |
| MC2 | Flood-tide Control Station | 824834.5 | 825100.0 | Reference | |

- 3.25 The measurements shall be taken at all designated monitoring stations including control stations, on at least 4 days per week for a period of 4 weeks prior to the commencement of an influencing works, but within 45 days of the commencement of construction. Measurements shall be taken at each station within one hour either side of mid-ebb, high water and mid-flood and the interval between two sets of monitoring shall not be less than 36 hours.
- 3.26 There shall not be any marine construction activities in the vicinity of the stations during the baseline monitoring.
- 3.27 In exceptional case when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall seek approval from EPD and AFCD on an appropriate set of data to be used as baseline reference.

Impact Monitoring

- 3.28 During the course of the marine works, monitoring shall be undertaken three days per week, at mid-flood and mid-ebb tides, with sampling/measurement at the designated monitoring stations. The interval between two sets of monitoring shall not be less than 36 hours except where there are exceedances of Action and/or Limit levels, in which case the monitoring frequency will be increased.
- 3.29 During the course of marine works, if monthly water quality monitoring results show that the marine works is causing water deterioration (i.e. exceedance of action or limit level) at the control station, appropriate follow up action such as relocating the control stations will be required. The alternative control stations shall be approved by EPD, AFCD, ER and IC(E).
- 3.30 Upon completion of all marine activities, a post project monitoring exercise on water quality shall be carried out for four weeks in the same manner as the impact monitoring. If marine works are considered minor or short term, an one-week post project monitoring exercise may be sufficient.

Event and Action Plan for Water Quality

- 3.31 The water quality criteria, namely Action and Limit levels are shown in Table 3.4. Should the monitoring results of the water quality parameters at any designated monitoring stations indicate that the water quality criteria are exceeded, the actions in accordance with the Event and Action Plan in Table 3.5 shall be carried out.

Table 3.4 Action and Limit Levels for Water Quality

| Parameters | Action | Limit |
|--|--|---|
| DO in mg/l (Surface, Middle & Bottom) | <u>Surface & Middle</u> 5%-ile of baseline data for surface and middle layer <u>Bottom</u> 5%-ile of baseline data for bottom layer | <u>Surface & Middle</u> 4 mg/l except 5 mg/l for FCZ or 1%-ile of baseline data for surface and middle layer <u>Bottom</u> 2 mg/l or 1%-ile baseline data for bottom layer |
| SS in mg/l (depth-averaged) | 95%-ile of baseline data or 120% of upstream control station's SS at the same tide of the same day | 99%-ile of baseline or 130% of upstream control station's SS at the same tide of the same day and specific sensitive receiver water quality requirements (e.g. required suspended solids level for concerned sea water intakes) |
| Turbidity (Tby) in NTU (depth-averaged) | 95%-ile of baseline data or 120% of upstream control station's Tby at the same tide of the same day | 99%-ile of baseline or 130% of upstream control station's Tby at the same tide of the same day |

Notes:

- "depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
- For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.

Water Quality Audit

- 3.32 In addition, to the water quality monitoring specified above, construction phase audit will be undertaken to ensure that the mitigation measures are being implemented and are effective. Operational EM&A is not required.
- 3.33 Prior to construction, surveys shall be undertaken of the watercourses which are within the influence of construction works at least once per week for a period of two weeks. The surveys should include a description of the stream course, influencing factors, photographs of the watercourse and a map showing areas of construction works.
- 3.34 During the construction phase, surveys shall be undertaken in areas of active construction works and other areas with stock piled materials on exposed ground surfaces at least once per week.
- 3.35 Any noticeable change to water quality should be recorded in the watercourse survey reports and should be investigated and remedial actions shall be undertaken to reduce impacts. The ET Leader shall pay particular attention to the Contractor's incorporation of mitigation measures.
- 3.36 If the above mitigation measures are not sufficient to restore the water quality to an acceptable levels upon the advice of the ET Leader, the Contractor shall liaise with the ET Leader on some other mitigation measures, propose to the IC(E) and ER for approval and carry out the mitigation measures.

Water Quality Mitigation Measures

- 3.37 The EIA report has recommended water quality control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures. The recommended water quality mitigation measures are summarised in the Water Quality Environmental Mitigation Implementation Schedule provided in Annex A and detailed below.
- All active working areas should be bunded to retain storm water with sufficient retention time to ensure that suspended solids are not discharged from the site in concentrations above those specified in the Technical Memorandum for the relevant WCZ. All fuel storage areas should be bunded to 110% of capacity and drainage directed to an oil interceptor. Separate treatment facilities may be required for effluent from site offices, toilets (unless chemical toilets are used, which is the current preference of EPD) and canteens. Consent from EPD will be required for any proposed discharge, which shall not be within 100 metres of any bathing beach. The recommendations of EPD's ProPECC Paper PN 1/94 (Construction Site Drainage) should be adopted.

- Any reclamation work required in the coastal zone will need to be gazetted under the Foreshore and Sea-bed (Reclamations) Ordinance. Any such works must be assessed for their effect on, amongst other things, drainage and sedimentation, coastal water currents and water quality. Works close to gazetted bathing beaches shall be carried out outside the designated bathing season. Otherwise dredgers shall employ a sealed grab operating within a four-sided silt curtain or use alternative methods to ensure that elevation of suspended sediment and turbidity above acceptable levels does not occur within bathing areas. Sealed grab dredgers would be required if the mud is found to be contaminated.

3.38 If the above measures are not sufficient to restore the water quality to an acceptable levels upon the advice of the ET Leader, the Contractor shall liaise with the ET Leader on some other mitigation measures consult with the IC(E) for their effectiveness and then propose these to the ER for approval, prior to implementation.

4 SITE ENVIRONMENTAL AUDIT

Site Inspections

- 4.1 Site inspections provide a direct means to assess and ensure the Contractor's environmental protection and pollution control measures are in compliance with the contract specifications. Site inspections shall be undertaken routinely by the ET Leader to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented in accordance with the EIA.
- 4.2 The ET Leader is responsible for the formulation of an environmental site inspection, deficiency and remedial action reporting system and for carrying out the site inspection works. In consultation with the IC(E), the ET Leader shall prepare a procedure for the site inspection, deficiency and remedial action reporting requirements and submit this to the Contractor for agreement and to the ER for approval within 21 days of commencement to the construction contract.
- 4.3 Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the site area and should also include the environmental conditions outside the site which are likely to be affected, directly or indirectly, by the site activities.
- 4.4 The ET Leader shall make reference to the following information while conducting the inspections:
- (i) the EIA recommendations on environmental protection and pollution control mitigation measures as stated in the EIA report;
 - (ii) work progress and programme;
 - (iii) individual works methodology proposals;
 - (iv) the contract specifications on environmental protection;
 - (v) the relevant environmental protection and pollution control laws;
 - (vi) previous site inspection results; and
 - (vii) environmental monitoring data.
- 4.5 The Contractor shall update the ET Leader with all relevant information on the construction works prior to carrying out the site inspections. The site inspection results and associated recommendations on improvements to the environmental protection and pollution control works shall be submitted, in the site proforma (see Annex B) by the ET Leader to the IC(E), the ER and the Contractor within 24 hours for reference and for taking immediate action. The Contractor shall follow the procedures and time-frame, as stipulated in the environmental site inspection, deficiency and remedial action reporting system to report on any remedial measures subsequent to site inspections. Upon any noticeable change of water quality at the bathing beaches and the Ma Wan Fish Culture Zone, the EPD, AFCD, ER & IC(E) should be informed immediately.

- 4.6 Ad hoc site inspections shall also be carried out by the ET Leader and IC(E) if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint (an example of the complaint log is provided in Annex B) or as part of the investigation work as specified in the Action Plan for environmental monitoring and audit.

Compliance with Legal and Contractual Requirements

- 4.7 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong with which the construction activities shall comply.
- 4.8 In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the ER for approval shall be sent to the ET Leader for vetting to see whether sufficient environmental protection and pollution control measures have been included.
- 4.9 The ET Leader shall also review the progress and programme of the works to check that relevant environmental laws have not been violated and that any foreseeable potential for violating the laws can be prevented.
- 4.10 The Contractor shall regularly copy relevant documents to the ET Leader so that the checking work can be carried out. The documents shall include at minimum the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws and all valid licence/permit. The site diaries shall also be available for the ET Leader's inspection upon request.
- 4.11 After reviewing the document, the ET Leader shall advise the IC(E), the ER and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. The ET Leader shall also advise the IC(E), the Contractor and the ER on the current status on, licence/permit applications and any environmental protection and pollution control preparation works that may not be suitable for the works programme or may result in potential violation of environmental protection and pollution control requirements.
- 4.12 Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ET Leader, IC(E) and the ER shall follow up to ensure that appropriate action has been taken by the Contractor in order that the environmental protection and pollution control requirements are fulfilled.

Environmental Complaints

- 4.13 Complaints shall be referred to the ET Leader for carrying out complaint investigation procedures. The ET Leader shall prepare a flow chart of the complaint response procedures that addresses, complaint receiving channels, responsible parties/contacts for information, the investigation process, procedures for the implementation of mitigation/remedial action, guidelines for communication and public relation with the complainant etc. The flow chart should be agreed by all parties and issued to the Contractor, ER and IC(E) for reference.

- 4.14 The ET Leader shall undertake the following procedures upon receipt of a complaint:
- (i) log complaint and date of receipt into the complaint database and inform the IC(E) immediately;
 - (ii) investigate the complaint and discuss with the Contractor to determine its validity and to assess whether the source of the problem is due to works activities;
 - (iii) if a complaint is considered valid by the ER or the EPD and due to the works, the ET Leader shall identify mitigation measures in consultation with the IC(E);
 - (iv) if mitigation measures are required, the ET Leader shall advise the Contractor accordingly;
 - (v) review the Contractor's response on the identified mitigation measures and the updated situation;
 - (vi) if the complaint is transferred from the EPD, an interim report shall be submitted to the EPD on the status of the complaint investigation and follow-up action within the time frame assigned by EPD;
 - (vii) undertake additional monitoring and audit to verify the situation if necessary and ensure that any valid reason for complaint does not recur;
 - (viii) report the investigation results and the subsequent actions on the source of the complaint for responding to complainant. If the source of complaint is the EPD, the results should be reported within the time frame assigned by the EPD; and
 - (ix) record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.
- 4.15 During the complaint investigation work, the Contractor and ER shall cooperate with the ET Leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation by the ET Leader, in consultation with the IC(E), the Contractor shall promptly carry out the mitigation measures. The ET Leader and ER shall approve the proposed mitigation measures and check that the measures have been carried out by the Contractor.

Choice of Construction Method

- 4.16 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 ET Leader, 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 Leader shall provide a copy of the Proactive Environmental Protection Proforma as shown in Annex B to the IC(E) for approval. The IC(E) should audit the review of the construction method and endorse the proposal on the basis of no adverse environmental impacts.

5. REPORTING

General

- 5.1 The following reporting requirements are based upon a paper documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the ER. The reports are required to be prepared by the ET Leader and verified by the IC(E).

Documentation

- 5.2 All documentation is required to be filed in a traceable and systematically manner. Site documentation, including monitoring field records, laboratory analysis records, meeting minutes, correspondences, etc. shall be cross-referenced by the ET Leader and be ready for inspection upon request. All EM&A results and findings shall be documented in the respective construction and operational phase EM&A reports prepared by the ET Leader and endorsed by the IC(E) prior to dissemination to the Contractor, the ER and the EPD.
- 5.3 All documentation shall be in paper form and/or electronic (in an agreed format) upon request. All documents and data shall be kept for at least one year after the completion of the operational phase EM&A works. All submissions (reports, data and correspondences etc.) shall be liable to free use for the purposes of communicating environmental data and the owner of information shall claim no copyright. Any request to treat all or part of a submission in confidence will be respected, but if no such request is made it will be assumed that the submission is not intended to be confidential.

Baseline Monitoring Report

- 5.4 The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to the following: the Contractor, the IC(E), the ER, the EPD and the AFCD. Two hard copies and one electronic copy in Hyper Text Markup Language (HTML) and Portable Document Format (PDF) should be submitted to EPD. The ET Leader shall liaise with the other relevant parties on the exact number of copies required.
- 5.5 The baseline monitoring reports for both the construction and operational phases shall include at least the following:
- (i) Up to half a page executive summary
 - (ii) Background information.
 - (iii) Drawings showing locations of the baseline monitoring stations.
 - (iv) An updated construction programme with milestones of environmental protection/mitigation activities annotated. An updated construction programme with milestones of environmental protection/mitigation activities annotated. An updated construction programme with milestones of environmental protection/mitigation activities annotated.

- (v) Monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - name of laboratory and equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency and duration; and
 - QA/QC results and detection limits.

- (vi) Details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period; and
 - other factors which might affect the results.

- (vii) Determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data.

- (viii) Revisions for inclusion in the EM&A Manual.

- (ix) Comments and conclusions.

EM&A Reports

- 5.6 The results and findings of all construction phase EM&A work required in this Manual shall be recorded in the EM&A Reports prepared by the ET Leader on a monthly basis and endorsed by the IC(E). The EM&A Reports shall be prepared and submitted within 10 working days of the end of each reporting month, with the first report due one month and 10 days after construction commences.

- 5.7 A maximum of 4 copies of each EM&A Report shall be submitted to each of the following parties: the Contractor, the IC(E), the ER, the EPD and the AFCD. Before submission of the first EM&A Report, the ET Leader shall liaise with the parties on the exact number of copies and format of the reports in both hard copy and electronic medium. Electronic copies to EPD should be submitted in HTML and PDF formats.

- 5.8 The ET Leader shall review the monitoring programme every 6 months or on an as needed basis in order to cater for any changes in the surrounding environment and nature of works in progress and shall document all observations in the monthly/bi-monthly reports.

First EM&A Report

- 5.9 The first EM&A report for both the construction and operational phases shall include at least the following:

-
- (i) 1-2 pages executive summary, comprising:
- breaches of AL levels
 - complaint log;
 - notifications of any summons and successful prosecutions;
 - reporting changes; and
 - future key issues.
- (ii) Basic Project information including a synopsis of the Project organisation (including key personnel, contact names and telephone numbers), a drawing of the Project area showing the environmentally sensitive receivers and the locations of monitoring and control stations, programme, management structure and the work undertaken during the month.
- (iii) Environmental Status, comprising:
- works undertaken during the month with illustrations (such as location of works, daily dredging/filling rates, percentage fines in the fill material used); and
 - drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- (iv) A brief summary of EM&A requirements including:
- all monitoring parameters;
 - environmental quality performance limits (Action and Limit levels);
 - Event-Action Plans;
 - environmental mitigation measures, as recommended in the Project EIA study final report and Environmental Review Report; and
 - environmental requirements in contract documents.
- (v) Advice on the implementation status of environmental protection and pollution control/mitigation measures as recommended in the Project EIA study report and Environmental Review Report and summarised in the updated implementation schedule.
- (vi) Monitoring results (in both hard and diskette copies) together with the following information:
- monitoring methodology;
 - name of laboratory and equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency, and duration; and
 - QA/QC results and detection limits.

- (vii) Graphical plots of trends of monitored parameters at the representative monitoring stations annotated against the following:
 - major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
 - QA/QC results and detection limits.
- (viii) Advice on the solid and liquid waste management status.
- (ix) A summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels).
- (x) A review of the reasons for and the implications of noncompliance including a review of pollution sources and working procedures.
- (xi) A description of the actions taken in the event of noncompliance and deficiency reporting and any follow-up procedures related to earlier noncompliance.
- (xii) A summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints.
- (xiii) A summary of notifications of summons, successful prosecutions for breaches of environmental protection/pollution control legislation and actions to rectify such breaches.
- (xiv) An account of the future key issues as assessed from the works programme and work method statements.
- (xv) Advice on the solid and liquid waste management status.
- (xvi) Comments, recommendations and conclusions for the monitoring period.
- (xvii) Submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule and complaint log summarizing the EM&A of the period.

Subsequent EM&A Reports

5.10 The subsequent EM&A reports prepared by the ET Leader shall include the following:

- (i) Title page.
- (ii) Executive summary (1 -2 pages), including:
 - breaches of all Action and Limit levels;
 - complaint log;
 - notifications of any summons and successful prosecutions;
 - reporting changes; and

- future key issues.
- (iii) Contents page.
- (iv) Environmental status, comprising:
- drawing showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
 - summary of non-compliance with the environmental quality performance limits; and
 - summary of complaints.
- (v) Environmental issues and actions, comprising:
- review issues carried forward and any follow-up procedures related to earlier non-compliance (complaints and deficiencies);
 - description of the actions taken in the event of noncompliance and deficiency reporting;
 - recommendations (should be specific and target the appropriate party for action); and
 - implementation status of the mitigatory measures and the corresponding effectiveness of the measures.
- (vi) Future key issues.
- (vii) Appendices, including:
- action and limit levels;
 - graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following: major activities being carried out on site during the period; weather conditions during the period; and any other factors which might affect the monitoring results; monitoring schedule for the present and next reporting period;
 - cumulative complaints statistics; and
 - details of complaints, outstanding issues and deficiencies.

Quarterly EM&A Summary Reports

5.11 The ET Leader shall submit Quarterly EM&A Summary. These reports should be around 5 pages (including about three pages of text and tables and two pages of figures) and shall contain at minimum the following information:

- (i) Up to half a page executive summary.
- (ii) Basic Project information including a synopsis of the Project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter.

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- (iii) A brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (Action and Limit levels); and
 - environmental mitigation measures, as recommended in the Project EIA study final report and Environmental Review Report.

 - (iv) Advice on the implementation, status of environmental protection and pollution control/mitigation measures as recommended in the Project EIA study report and Environmental Review Report and summarised in the updated implementation schedule.

 - (v) Drawings showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations.

 - (vi) Graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
 - the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results.

 - (vii) Advice on the solid and liquid waste management status.

 - (viii) A summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels).

 - (ix) A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures.

 - (x) An assessment of the construction impacts on suspended solids, including but not limited to, a comparison of the difference between the quarterly mean and the 1.3 times the ambient mean value, the latter being defined as a 30% increase of the baseline data or the EPD data, using appropriate statistical procedures. Suggestions of appropriate mitigation measures shall be made if the quarterly assessment analytical results demonstrate that the quarterly mean is significantly higher than the 1.3 ambient mean value ($p < 0.05$).

 - (xi) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance.

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

 - (xiii) Comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter.

 - (xiv) Proponents' contacts and any hotline telephone number for the public to make enquiries.
-

Annual/Final EM&A Review Reports

5.12 An annual EM&A report should be prepared by the ET Leader at the end of each construction year during the course of the project. A final EM&A report should be prepared by the ET Leader at the end of the construction phases. The annual/final EM&A reports should contain at least the following information:

- (i) Executive Summary (1-2 pages).
- (ii) Drawings showing the project area any environmental sensitive receivers and the locations of the monitoring and control stations.
- (iii) Basic project information including a synopsis of the project organization, contacts for key management staff and a synopsis of work undertaken during the course of the project or past twelve months.
- (iv) A brief summary of EM&A requirements including:
 - environmental mitigation measures as recommended in the project EIA study final report and Environmental Review Report;
 - environmental impact hypotheses tested;
 - environmental quality performance limits (Action and Limit Levels);
 - all monitoring parameters; and
 - Event-Action Plans.
- (v) A summary of the implementation status of environmental protection and pollution control/mitigation measures as recommended in the project EIA study report and Environmental Review Report and summarised in the updated implementation schedule.
- (vi) Graphical plots and the statistical analysis of the trends of monitored parameters over the course of the projects including the post-project monitoring (or the past twelve months for annual reports) for all monitoring stations annotated against the following:
 - the major activities being carried out on site during the period;
 - weather conditions during the period;
 - any other factors which might affect the monitoring results; and
 - the return of ambient environmental conditions in comparison with baseline data.
- (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) media, liaison and consultation undertaken, actions and follow-up procedures taken.

- (xi) A summary record of notifications of summonses and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches investigation, follow-up actions taken and results.
- (xii) A comparison of the EM&A data with the EIA predictions with annotations and explanations for any discrepancies, including a review of the validity of EIA and Environmental Review Report predictions and identification of shortcomings in the EIA recommendations.
- (xiii) A review of the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness, including cost effectiveness;
- (xiv) A review of the success of the EM&A programme, including a review of the effectiveness and efficiency of the mitigation measures, and recommendations for any improvements in the EM&A programme.
- (xv) A clear cut statement on the environmental acceptability of the project with reference to specific impact hypotheses and a conclusion to state the return to ambient and/or the predicted scenario as the EIA and Environmental Review Report findings.

Data Keeping

- 5.13 The site documents such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the EM&A Reports for submission. However, the documents shall be kept by the ES and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the documents. The monitoring data shall also be recorded in magnetic media, and the software copy shall be available upon request. All the documents and data shall be kept for at least one year after the completion of the operational phase EM&A works.

Interim Notifications of Environmental Quality Limit Exceedances

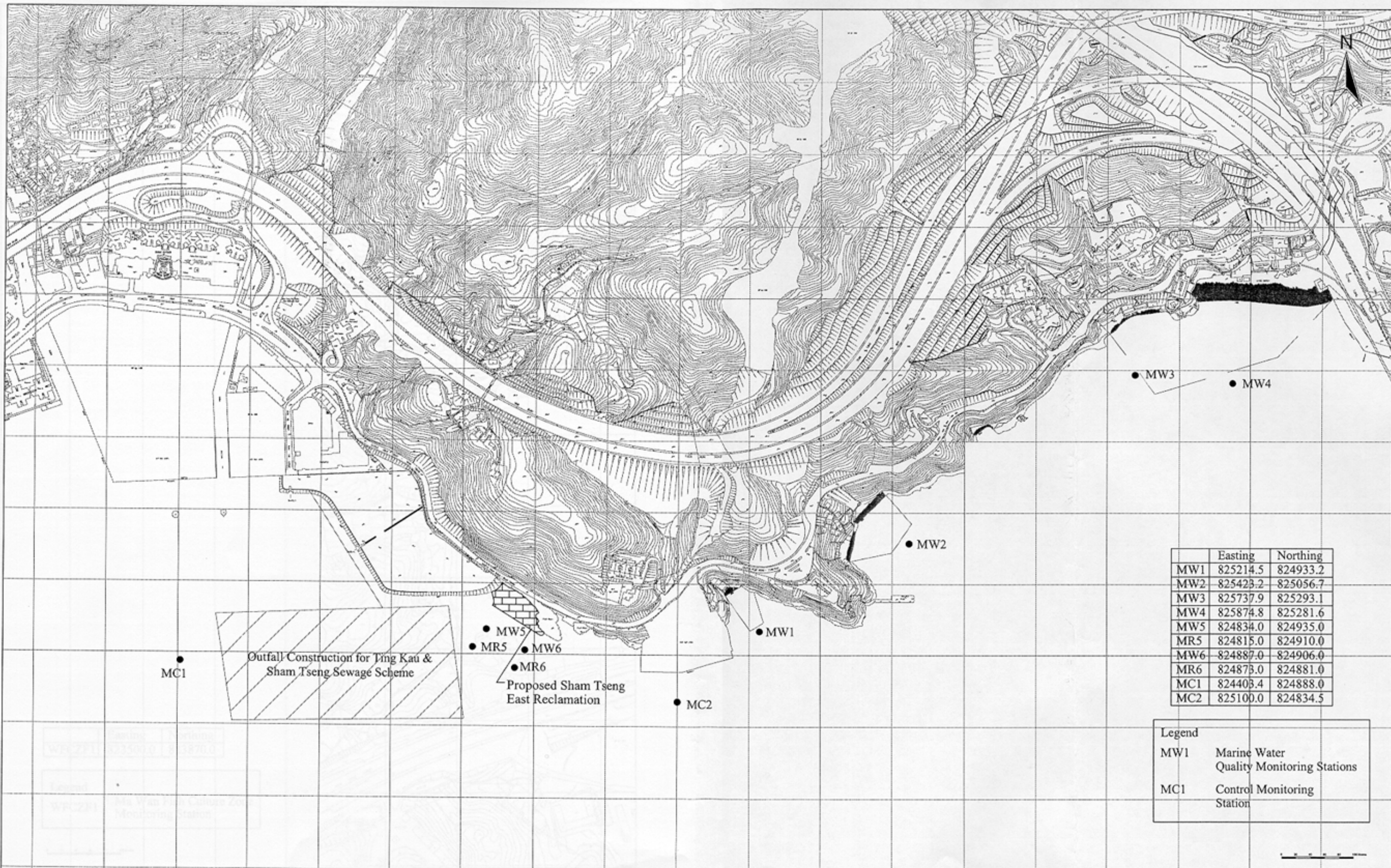
- 5.14 With reference to Event and Action Plans in Tables 3.5, when the environmental quality limits are exceeded, the ET Leader shall immediately notify the IC(E), EPD and AFCD, as appropriate. The notification shall be followed up with advice to IC(E), EPD and AFCD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in Figure 5.1.

Table 3.5 Event and Action Plan for Marine Water Quality

| EVENT | ACTION | | | |
|--|---|--|--|---|
| | ET Leader | IC(E) | ER | Contractor |
| Action Level being exceeded by one sampling day | <ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform the IC(E) and the Contractor; 4. Check monitoring data, all plant, equipment and the Contractor's working methods; 5. Discuss mitigation measures with the IC(E) and the Contractor; 6. Repeat measurement on next day of exceedance. | <ol style="list-style-type: none"> 1. Discuss with the ET Leader and the Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by the Contractor and advise the ER accordingly; 3. Access the effectiveness of the implemented mitigation measures. | <ol style="list-style-type: none"> 1. Discuss with the IC(E) on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented. | <ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with the ET Leader and the IC(E) and propose mitigation measures to the IC(E) and the ER; 6. Implement the agreed mitigation measures. |
| Action Level being exceeded by more than one consecutive sampling days | <ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform the IC(E) and the Contractor; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with the IC(E) and the Contractor; 6. Ensure mitigation measures are implemented; 7. Prepare to increase the monitoring frequency to daily; 8. Repeat measurement on next day of exceedance. | <ol style="list-style-type: none"> 1. Discuss with the ET Leader and the Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by the Contractor and advise the ER accordingly; 3. Access the effectiveness of the implemented mitigation measures. | <ol style="list-style-type: none"> 1. Discuss with IC(E) on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented; 3. Access the effectiveness of the implemented mitigation measures. | <ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with the ET Leader and the IC(E) and propose mitigation measures to the IC(E) and the ER; 6. Implement the agreed mitigation measures. |
| Limit Level being exceeded by one consecutive sampling day | <ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform the IC(E), the Contractor, the EPD and the AFCD; 4. Check monitoring data, all plant, equipment and the Contractor's working methods; | <ol style="list-style-type: none"> 1. Discuss with the ET Leader and the Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by the Contractor and advise the ER accordingly; | <ol style="list-style-type: none"> 1. Discuss with the IC(E) on the proposed mitigation measures; 2. Request the Contractor to critically review the working methods; | <ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with the ET Leader, the IC(E) |

Table 3.5 Event and Action Plan for Marine Water Quality (Continue)

| EVENT | ACTION | | | |
|---|--|---|---|---|
| | ET Leader | IC(E) | ER | Contractor |
| | 5. Discuss mitigation measures with the IC(E), ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit Level. | 3. Access the effectiveness of the implemented mitigation measures. | 3. Make agreement on the mitigation measures to be implemented; 4. Access the effectiveness of the implemented mitigation measures | and the ER and proposed mitigation measures to the IC(E) and the ER within 3 working days; 6. Implement the agreed mitigation measures. |
| Limit Level being exceeded by more than one consecutive sampling days | 1. Repeat in-situ measurement to confirm findings; 2. Identify source(s) of impact, 3. Inform the IC(E) and the Contractor; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with the IC(E) and the Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit Level for two consecutive days. | 1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by the Contractor and advise the ER accordingly; 3. Access the effectiveness of the implemented mitigation measures. | 1. Discuss with IC(E) on the ET Leader and the Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Access the effectiveness of the implemented mitigation measures; 5. Consider and instruct, if slow down or to stop all or part of the marine work until no exceedance of Limit Level. | 1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with the ET Leader, the IC(E) and the ER and propose mitigation measures to the IC(E) and the ER within 3 working days; 6. Implement the agreed mitigation measures; 7. As directed by the ER, slow down or stop all or part of the construction activities. |



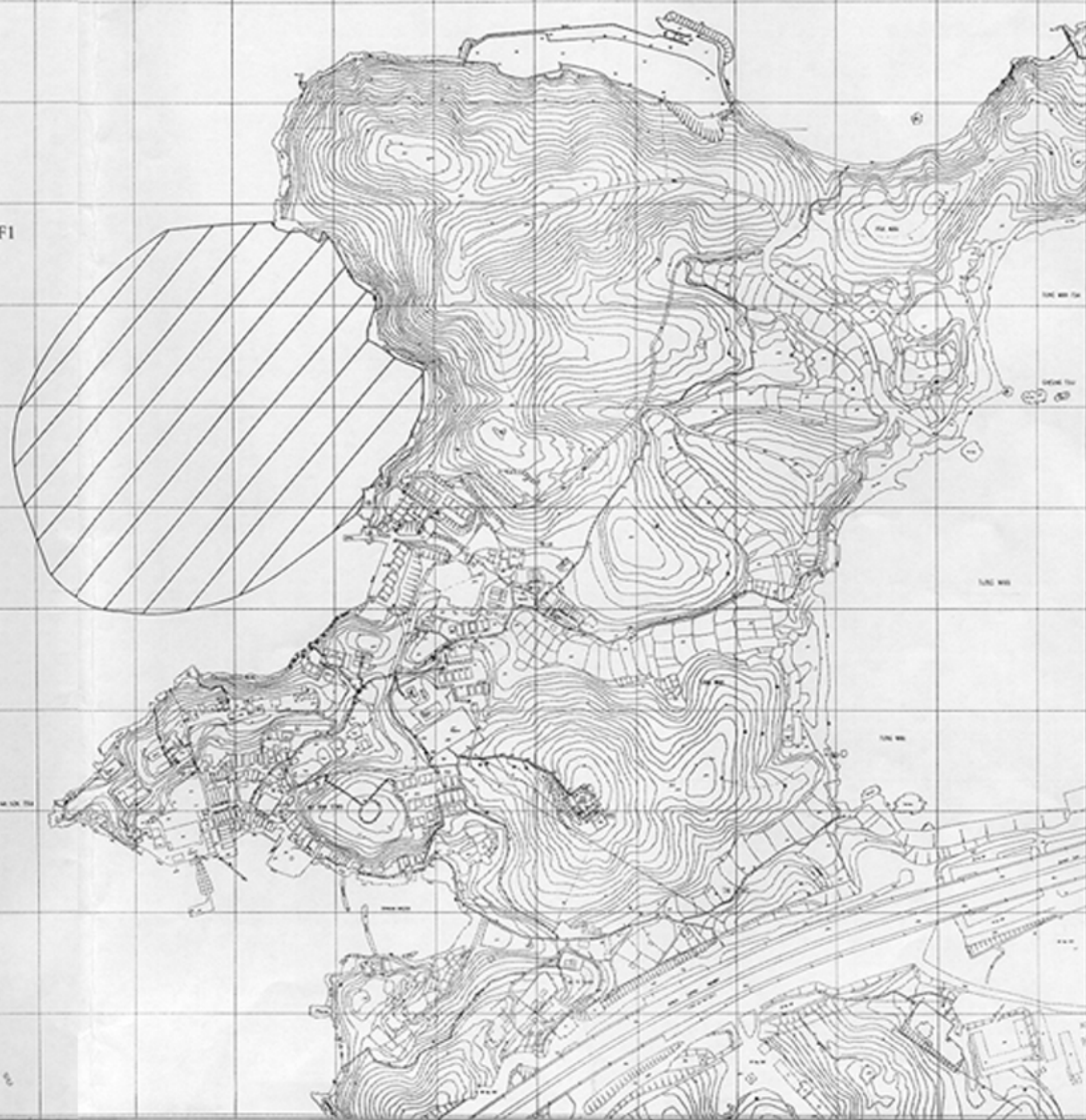
| | | | |
|-------|---|----------|------------|
| Title | Contract No. HY/99/19 - Middle Section | Scale | Project |
| | Castle Peak Road Improvement Between Ting Kau and Sham Tseng, Tsuen Wan | 1 : 5000 | No. S04002 |
| | Water Quality Monitoring Stations | Date | Figure |
| | | 2002 | No. 3.1 |




K:\S04002\figure\jul02\wqm-iks2.dwg



● WFCZF1



| | Easting | Northing |
|--------|----------|----------|
| WFCZF1 | 823500.0 | 823870.0 |

| Legend | |
|---|---|
| ● WFCZF1 | Ma Wan Fish Culture Zone Monitoring Station |
|  | Ma Wan Fish Culture Zone |

Title

Contract No. HY/99/19 - Middle Section
Castle Peak Road Improvement Between Ting Kau and Sham Tseng, Tsuen Wan
Water Quality Monitoring Stations

Scale
1 : 5000

Project
No. S04002

Date
2002

Figure
No. 3.2

Maunsell
MAUNSELL ENVIRONMENTAL
MANAGEMENT CONSULTANTS LTD

Figure 3.3 Water Quality Monitoring Data Record Sheet

| | | | | |
|----------------------------|---------------------|---------|--------|--------|
| Location | | | | |
| Date | | | | |
| Start Time (hh:mm) | | | | |
| Weather | | | | |
| Sea Conditions | | | | |
| Tidal Mode | | | | |
| Water Depth (m) | | Surface | Middle | Bottom |
| Monitoring Depth | | | | |
| Salinity | | | | |
| Temperature (°C) | | | | |
| DO Saturation (%) | | | | |
| DO (mg/l) | | | | |
| Turbidity (NTU) | | | | |
| SS Sample Identification | | | | |
| SS (mg/l) | | | | |
| Observed | <100m from location | | | |
| Construction Activities | >100m from location | | | |
| Other Observations | | | | |

Note: The SS results are to be filled up once they are available from the laboratory.

Name & Designation

Signature

Date

Recorded By: _____

Checked By: _____

**Figure 5.1 Sample Template for Interim Notification of Environmental Quality
Limits Exceedances**

Incident Report on Action Level or Limit Level Non-compliance

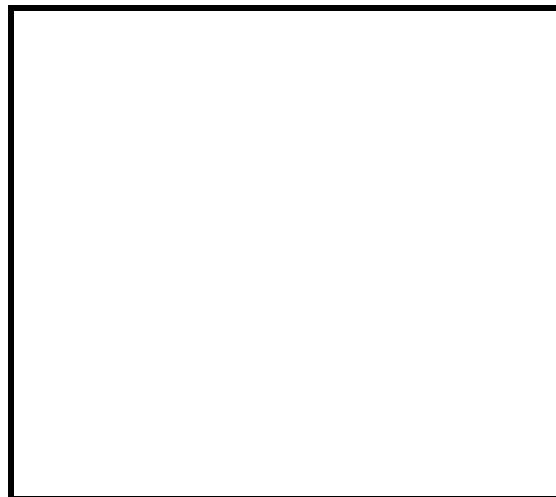
| | |
|---|--|
| Project | |
| Date | |
| Time | |
| Monitoring Location | |
| Parameter | |
| Action & Limit Levels | |
| Measured Level | |
| Possible reason for Action or Limit Level Non-compliance | |
| Actions taken / to be taken | |
| Remarks | |

Location
Plan
Prepared by: _____

Designation: _____

Signature: _____

Date: _____



ANNEX A - ENVIRONMENTAL MITIGATION IMPLEMENTATION SCHEDULE OF MARINE WATER QUALITY

| Ref.# | Feasibility Study EM&A Manual Log Ref. | Environmental Protection Measures / Mitigation Measures | Location / Timing | Implementation Agent | Relevant Standard or Requirement | Implementation Stages* | | | |
|------------------|--|---|-----------------------------|----------------------|--|------------------------|--------------|-----------|--------------|
| | | | | | | Design | Construction | Operation | Decommission |
| 12.3.1 | 4.8 | Bund all active work areas to 110% capacity | All areas | Contractor | TMEIA | | ✓ | | |
| 12.3.1 | 4.8 | Obtain discharge consent | Site offices | Contractor | TMEIA | | ✓ | | |
| 12.3.1 | 4.8 | Direct drainage as far away as possible from sensitive areas | All areas | Contractor | TMEIA | | ✓ | | |
| 12.3.1 | 4.8 | Provide proper sewage treatment and disposal facilities in the form of chemical toilets for site workers. | All areas | Contractor | TMEIA | | ✓ | | |
| 12.3.2 | 4.8 | Undertake works close to beaches outside the designated bathing season | All areas | Contractor | TMEIA | | ✓ | | |
| Annex C (C6-C12) | | Include contract specifications for environmental protection | All areas | Contractor | TMEIA | | ✓ | | |
| 12.3.1 | | Provide proper sewage treatment and disposal facilities in the form of chemical toilets for site workers | All areas | Contractor | TMEIA | | ✓ | | |
| | | All design and construction measures described in the submission approved or deposited under conditions 2.1, 2.2, 2.3 and 2.4 of the Environmental Permit AEP- 095/2001 shall be fully implemented. | All areas | Contractor | Environmental Permit AEP-095/2001, Condition 3.1 | | ✓ | | |
| | | Dredging of marine sediment shall be limited to the scour apron | Sham Tseng East Reclamation | Contractor | Environmental Permit AEP-095/2001, Condition 3.2 | | ✓ | | |
| | | No more than 1 derrick lighter shall be used for marine dredging works. The total maximum dredging rate shall not be more than 200m ³ per day | Sham Tseng East Reclamation | Contractor | Environmental Permit AEP-095/2001, Condition 3.3 | | ✓ | | |

| Ref.# | Feasibility Study EM&A Manual Log Ref. | Environmental Protection Measures / Mitigation Measures | Location / Timing | Implementation Agent | Relevant Standard or Requirement | Implementation Stages* | | | |
|--------|--|--|-----------------------------|----------------------|--|------------------------|--------------|-----------|--------------|
| | | | | | | Design | Construction | Operation | Decommission |
| | | All filling activities shall be carried out behind rockfill and rock armour | Sham Tseng East Reclamation | Contractor | Environmental Permit AEP-095/2001, Condition 3.4 | | ✓ | | |
| | | Tightly closed grabs shall be used to restrict the loss of fine sediment to suspension | Sham Tseng East Reclamation | Contractor | Environmental Permit AEP-095/2001, Condition 3.5 | | ✓ | | |
| | | Silt curtains shall be used along the reclamation area during construction to control sediment suspension within the work area. | Sham Tseng East Reclamation | Contractor | Environmental Permit AEP-095/2001, Condition 3.6 | | ✓ | | |
| | | The construction method specified in Section 2.1 of the Project Profile submitted on 16 February 2001 shall be followed during the construction | Sham Tseng East Reclamation | Contractor | Environmental Permit AEP-095/2001, Condition 3.7 | | ✓ | | |
| 12.3.1 | 4.8 | Surface run-off from the Castle Peak Road Improvement Project sites shall be directed into adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins before discharge into storm drains. Channels, earth bunds or sand bag barriers shall be provided on site to properly direct stormwater to such silt removal facilities. | All areas | Contractor | Environmental Permit AEP-095/2001, Condition 3.8 | | ✓ | | |
| | | Catchpits and perimeter channels shall be constructed in advance of site formation works and earthworks of Castle Peak Road Improvement Project. | All areas | Contractor | Environmental Permit AEP-095/2001, Condition 3.9 | | ✓ | | |

| Ref.# | Feasibility Study EM&A Manual Log Ref. | Environmental Protection Measures / Mitigation Measures | Location / Timing | Implementation Agent | Relevant Standard or Requirement | Implementation Stages* | | | |
|-------|--|--|-------------------|----------------------|---|------------------------|--------------|-----------|--------------|
| | | | | | | Design | Construction | Operation | Decommission |
| | | Silt removal facilities, channels and manholes of the Castle Peak Road Improvement Project shall be suitably maintained. The deposited silt and grit shall be removed at least once per week, and at the onset of the after each rainstorm to ensure that these facilities of the Castle Peak Road Improvement Project are functioning at all times. | All areas | Contractor | Environmental Permit AEP-095/2001, Condition 3.10 | | ✓ | | |
| | | Open stockpiles of construction materials (e.g. Aggregates and sand) on the work sites for the Castle Peak Road Improvement project shall be covered with tarpaulin or similar fabric during rainstorms, such measures as providing sand barriers shall be taken to prevent the washing away of construction material, soil silt and debris into any drainage channel. | All areas | Contractor | Environmental Permit AEP-095/2001, Condition 3.11 | | ✓ | | |
| | | All manholes (including any newly constructed ones) of the Castle Peak Road Improvement project shall be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into drainage system. | All areas | Contractor | Environmental Permit AEP-095/2001, Condition 3.12 | | ✓ | | |

| Ref.# | Feasibility Study EM&A Manual Log Ref. | Environmental Protection Measures / Mitigation Measures | Location / Timing | Implementation Agent | Relevant Standard or Requirement | Implementation Stages* | | | |
|-------|--|---|-------------------|----------------------|--|------------------------|--------------|-----------|--------------|
| | | | | | | Design | Construction | Operation | Decommission |
| | | A marine water quality and audit programme shall be carried out during the construction stage. One monitoring station shall be located at the Ma Wan Fish Culture Zone. A marine water quality monitoring and audit manual shall be issues to EPD for approval no later than 1 month prior to commencement of construction of the project | All areas | Contractor | Environmental Permit AEP-095/2001, Condition 2.1 | | ✓ | | |

ANNEX B - Proforma for Environmental Monitoring and Audit Programme

COMPLAINT LOG

Ref: _____

| Log Ref. | Date / Location | Complainant/ Date of Contract | Details of Complaint | Investigation / Mitigation Action | File Closed |
|-----------------|------------------------|--|-----------------------------|--|------------------------|
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Filed by Environmental Team Leader : _____

Date : _____

**ANNEX A - Environmental mitigation implementation schedule OF MARINE WATER QUALITY
DATA RECOVERY SCHEDULE**

Ref: _____

| Date | Air Quality Monitoring Monitoring Station* | | | | | | | | | Noise Monitoring Monitoring Station* | | | | | | |
|--------|---|-----|-----|-----|-----|-----|-----|-----|-----|---|----|----|-----|-----|-----|-----|
| | A02 | A06 | A07 | A21 | A24 | A34 | A36 | A40 | A42 | R2 | R5 | R7 | R14 | R16 | R21 | R24 |
| 1 | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | | | | |
| % of R | | | | | | | | | | | | | | | | |

*Research type of parameters

% of R The percentage of Data Recovery id=s the natural monitoring over the scheduled monitoring

Signed by Environmental Team Leader: _____

Date: _____

ANNEX A - Environmental mitigation implementation schedule OF MARINE WATER QUALITY

Copy to Independent Checker (Environment)

IMPLEMENTATION SCHEDULE

Ref: _____

| EIA Ref* | EM&A Log Ref | Environmental Protection Measures* | Location/ Timing | Implementation Agent | Implementation Stages** | | | |
|----------|--------------|------------------------------------|------------------|----------------------|-------------------------|---|---|-----|
| | | | | | Des | C | O | Dec |
| | | | | | | | | |
| | | | | | | | | |
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*All recommendations and requirements resulted during the Course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project

**Des-Design, C-Construction, O-Operation, Dec-Decommissioning

Signed by Project Proponent: _____

Date : _____

IMPLEMENTATION STATUS PROFORMA

Ref: _____

| Ref* | Environmental Protection Measures* | Implementation Status |
|------|------------------------------------|-----------------------|
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| | | |

**All recommendations and requirements resulted during the Course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project*

***EIA Ref / EM&A Log Ref / Design Document Ref*

Signed by Environmental Team Leader: _____

Date : _____

Audited by Independent Checker (Environment): _____

Date : _____

PROACTIVE ENVIRONMENTAL PROTECTION PROFORMA

| Ref* | Proposed Construction Method* | Location / Working Period | Anticipated Impacts | Recommended Mitigation Measures |
|------|-------------------------------|---------------------------|---------------------|---------------------------------|
| | | | | |
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**EIA Ref / EM&A Log Ref / Design Ref*

***Details of equipment, vehicles, plants, processes, technologies for the option of construction method*

Reviewed by Environmental Team Leader: _____

Date : _____

Approved by Independent Checker (Environment): _____

Date : _____

REGULATORY COMPLIANCE PROFORMA

| Ref* | Environmental License / Permit* | Control Area / Facility / Location | Effective Date |
|-------------|--|---|-----------------------|
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*Name of Applicant, Business Corporation, relevant regulation and remark of license / permit conditions

**File reference of the licensee / permittee

Filed by Environmental Team Leader: _____

Date: _____

Signed by Independent Checker (Environment): _____

Date: _____

SITE INSPECTION PROFORMA

| Date | Location | Req't Ref.* | Observation / Deficiency | Mitigation Action** (Responsible Agency) | Date***of Confirmation |
|------|----------|-------------|--------------------------|---|------------------------|
| | | | | | |
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| | | | | | |

**EIA Ref / EM&A Log Ref / Design Document Ref / Environmental Protection Contract Clause*

***Specific Environmental Mitigation Measures should be stated, such as, equipment, processes, systems, practices or technologies*

****The required completion date to confirm the specified Environmental Protection Action*

This Proforma is an Environmental Protection Instruction for: _____ on _____

Signed by Environmental Team Leader: _____ Date: _____

Copy to Independent Checker (Environment)