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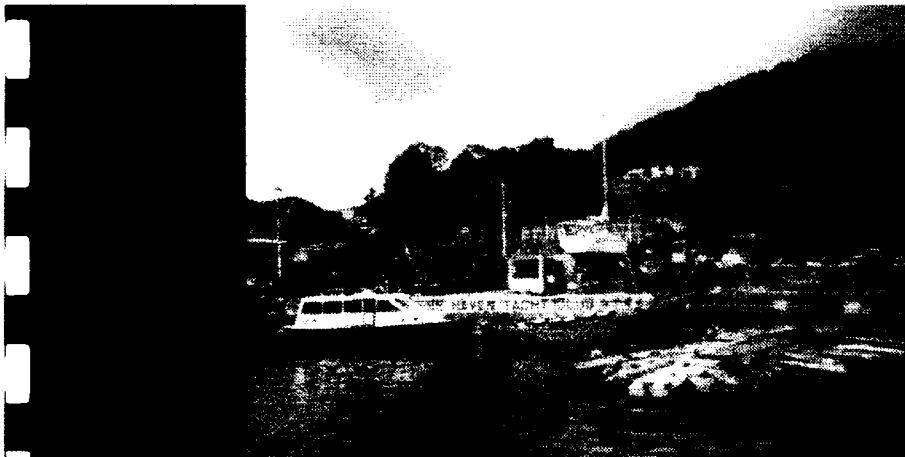
Consulting Engineers

合樂 工程顧問集團

Hebe Haven Yacht Club Development - Phase 2 Environmental Impact Assessment Study

EM&A Manual
Final

October 1999



Hyder
Consulting



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HEBE HAVEN YACHT CLUB DEVELOPMENT - PHASE 2

FINAL EM&A MANUAL

OCTOBER 1999

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Introduction

1. INTRODUCTION

1.1 BACKGROUND

Hebe Haven Yacht Club intends to extend its existing marina to accommodate the projected membership growth and the increasing demand in boat storage space. A Phase 2 development plan has been proposed. Phase 1 was the land-use rearrangement for the club and not part of the development plan itself.

Hyder Consulting Ltd have been commissioned by Halcrow China Ltd, the design engineer, to conduct the corresponding EIA and prepare an EM&A Manual for the proposed development.

1.2 PURPOSE OF THE MANUAL

The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the set-up of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme to be undertaken during the construction of the Phase 2 development. It aims to provide systematic procedures for monitoring, auditing and minimising of the environmental impacts associated with the construction works.

Hong Kong environmental regulations for air and water quality, noise and waste, the Hong Kong Planning Standards and Guidelines, and recommendations in the EIA study final report on the proposed development have served as environmental standards and guidelines in the preparation of this Manual.

This Manual contains the following :

- i. responsibilities of the Contractor, the Engineer or Engineer's representative (ER), Environmental Team and the Independent Checker (Environmental) (IC(E)) with respect to the environmental monitoring and audit requirements during the course of the project;
- ii. information on project organisation and programming of construction activities for the project;
- iii. the hypotheses of potential impacts, the basis for and the description of the broad approach underlying the environmental monitoring and audit programme;
- iv. requirements with respect to the construction schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- v. full details of the methodologies to be adopted, including all field, laboratory and analytical procedures, and details on quality assurance and quality control programme;

- vi. definition of Action and Limit levels;
- vii. establishment of Event and Action Plans;
- viii. requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria and complaints;
- ix. requirements of presentation of environmental monitoring and appropriate reporting procedures; and
- x. requirements for review of EIA predictions and effectiveness of the environmental monitoring and audit programme.

1.3 PROJECT ORGANISATION

The project organisation and lines of communication with respect to environmental protection works is shown in Figure 1.1.

The responsibility of respective parties are given in the following sub-sections.

1.3.1 The Contractor:

- Employ an Environmental Team (ET) to undertake monitoring, laboratory analysis and reporting of environmental monitoring and audit activities
- Provide assistance to ET in carrying out monitoring
- 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
- Adhere to the procedures for carrying out complaint investigation in accordance with Clause 4.3 of this Manual

1.3.2 The Engineer or Engineer's Representative:

- 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
- Employ an Independent Checker (Environmental) (IC(E)) to audit the results of the EM&A works carried out by the ET
- Adhere to the procedures for carrying out complaint investigation in accordance with Clause 4.3 of this Manual

1.3.3 The Environmental Team:

- Should be led by a Team Leader
- Monitor the various environmental parameters as required in the EM&A Manual

- Analyse the environmental monitoring and audit data and review the success of EM&A programme to cost effectively confirm the adequacy of mitigatory 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 Contractor's site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and anticipate environmental issues for proactive action before problems arise
- Audit and prepare audit reports on the environmental monitoring data and the site environmental conditions
- Report on the environmental monitoring and audit results to the IC(E), Contractor, the ER, and the EPD as and when necessary and required
- 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
- Adhere to the procedures for carrying out complaint investigation in accordance with Clause 4.3 of this Manual

1.3.4 Independent Environmental Checker

- Review the EM&A works performed by the ET
- Audit the monitoring activities and results
- Report the audit results to the ER and EPD in parallel
- Review the EM&A reports submitted by the ET
- Review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans
- Adhere to the procedures for carrying out complaint investigation in accordance with Clause 4.3 of this Manual

Suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibility, as required under the EM&A programme for the duration of the project.

1.4 PROJECT DESCRIPTION

Hebe Haven Yacht Club hereafter known as The Club, has occupied its present site at Pak Sha Wan (Hebe Haven) near Sai Kung in the New Territories since 1963. The Club is located on the western shore of Pak Sha Wan and occupies a site area of approximately 8,830 m². It is bounded by a boatyard to the north, a public car park and boatyards to the south, by Hiram's Highway to the west and to the east by the natural harbour of Hebe Haven.

The proposed reclamation is planned so as to increase the number of hard standings for boat maintenance and repair, and also to provide a more efficient overall layout. The existing clubhouse, garden and slipways will remain intact.

The major construction works for Phase 2 development of the Club include the following:

- reclamation of a land area of 2,619 m² for hard standing, boat storage and repair and pontoon moorings providing an overall total area of 4,392m².
- provision of boat removal or transport facility such as boat hoist
- provision of approximately 46 berths in pontoon marina facility
- associated dredging (approximately 23,000 m³) of pontoon area to increase the water depth for boat access

None of the potential environmental impacts identified in the EIA study were found to be significant or insurmountable. With the implementation of the mitigation measures recommended, the proposed works will not cause significant environmental impacts. The EM&A will ensure that these measures are effectively implemented.

1.5 SENSITIVE RECEIVERS

The SRs in this study include the Ma Nam Wat Fish Culture Zone, the Hebe Haven Gazetted Beach and mangrove communities in the study area. Within the study area there is also an existing Site of Special Scientific Interest (SSSI), coastal protection area and conservation area which is indicated in the Hebe Haven Outline Zoning Plan. Part of the Pak Sha Wan peninsula is a designated SSSI, and almost all of the peninsula is within the Ma On Shan Country Park Extension. There is also a Conservation Area at the north of the same peninsula.

There are intertidal mudflats of over 0.5 hectares and established mangal communities in the area.

Hebe Haven is a popular focus for boating and other recreational activities. In the vicinity are Marina Cove, the Pak Sha Wan Scout Sea Activities Centre, Hong Kong Marina and the Royal Hong Kong Yacht Club. The local ferry service runs from the pier at Pak Sha Wan to Trio Beach and Kiu Tsui Chau. In addition, there are numerous other private moorings and slipways and boatyards in the area.

The EIA found that there will be no significant adverse impact on the SRs during the operation of the expanded yacht club. Monitoring programme is only required for the construction period of the proposed development.

1.6 PROPOSED WORK PROGRAMME

- Dredge the seabed at tow of new seawalls, in the proposed pontoon area and the waterway adjacent to the Sea Scout Association north of the site
- Demolish the existing slipway west of the new reclamation
- Construct the new sloping and vertical seawalls as well as the junctions in between
- Start backfill reclamation from the centre of the existing eastern seawall and to work outwards towards the new seawalls

- Pave the top of new reclamation with concrete slabs
- Provide surface drainage and oil interceptors
- Piling works and placement of pontoon moorings

1.7 ENVIRONMENTAL PROTECTION MEASURES

The EIA identified and assessed a number of mitigation measures which were summarised in Appendix A and would ensure that the works would not affect any of the identified sensitive receivers. These measures and appropriate references have been incorporated into an Environmental Mitigation Implementation Schedule (EMIS).

Water Quality Monitoring

2. WATER QUALITY MONITORING

2.1 INTRODUCTION

The study area and location of the yacht club development is shown in Figure 2.1. The key potential impact identified by this EIA has been the increases in suspended solids within the water column resulting from the construction activities. However, this impact will be confined to the very vicinity of the works area, and far from any sensitive waters. Environmental monitoring will therefore focus on collection and analysis of marine water quality around the work's "mixing zone" to verify the model predictions. The mixing zone represents an area where the works may cause the water quality to deteriorate significantly compared to the baseline conditions.

2.2 SAMPLE LOCATION

Monitoring stations will be located at:

- i. The boundary of the mixing zone or area where there is the potential for water quality assessment criteria to be exceeded. The extent of the mixing zones is approximately within 100m of the dredging operations according to the EIA final report. These stations have been termed as the impact monitoring stations and are shown in Figure 2.1. Within the mixing zone there will be six impact monitoring stations; three located for ebb tide monitoring and three for flood tide monitoring.
- ii. Areas unaffected by the works; control stations are necessary to compare the water quality from potentially impacted sites with the ambient water quality. Control stations will therefore be used to determine the level for non compliance and should be at locations representative of the project site in its undisturbed condition. Control stations should also be located, as far as is practicable, both upstream and downstream of the works area. Figure 2.1 shows the location of the three control stations which will be used during the course of the impact monitoring. C1 is located in the offshore side of the potential sediment plume and therefore unlikely to be affected by the works. C2 and C3 lie to the southern and northern limits of the plume excursion and will be used on the flood and ebb tide respectively.

Measurements shall be taken at 3 water depths, namely, 1m below water surface, mid-depth and 1m above sea bed, except where the water depth less than 6m, the mid-depth station may be omitted. Should the water depth be less than 3m, only the mid-depth station will be monitored. Approval of these monitoring stations shall be obtained from EPD prior to commencement of the monitoring programme.

2.3 BASELINE MONITORING PROGRAMME

The aim of the data set is to establish the suitability of the selected control and impact monitoring stations and to also determine a typical background level at the SRs.

2.3.1 Baseline monitoring at Control and Impact Stations

To determine the suitability of the control stations and impact monitoring stations a simple statistical test (to be undertaken by the ET) is required to test the following hypothesis,

“prior to commencement of work the water quality at the control station is not significantly different to that at the impact monitoring stations.”

Data will therefore be collected at the following stations:

- Flood Tide: C1, C2, I4, I5 and I6
- Ebb tide: C1, C3, I1, I2 and I3

Prior to any sampling it will be ensured that there are no marine construction activities in the vicinity of the stations.

Because the data will be used in a statistical test, in order to obtain confidence in the data and have sufficient data on which to perform the test, duplicates of these samples are required. Samples will therefore be collected in duplicate at three depths (surface, middle and bottom), at four tidal states: high water, low water, mean water flood and mean water ebb on 4 alternative tides spreading over 4 days (1st tide on 2 days and 2nd tide on another 2 days) per week for two weeks prior to the commencement of the works .

Parameters to be measured at these stations during the baseline monitoring are:

- Suspended Solids (SS, measured in mg/l)
- Turbidity (Tby, expressed as NTU)
- Dissolved Oxygen (DO, measured in mg/l and % saturation)

The suspended solids data will be used to calibrate the turbidity so that future monitoring at the boundary of the mixing zone can largely focus on collection of field data so that instantaneous assessments of impacts can be made rather than waiting for laboratory analytical data. On each day of the compliance monitoring the calibration will be checked through the collection of 2 samples for suspended solids analysis.

2.4 COMPLIANCE MONITORING

Monitoring should be undertaken three times a week throughout the works period and for two weeks after completion of dredging. However, due to the need for a flexible programme, the monitoring will be subject to a constant review. Table 2.1 shows the parameters and locations to be monitored during the compliance monitoring at the control and impact stations.

Field data and analytical results will be recorded on a field record sheet as shown in Appendix B1. Non compliance will be recorded on a notification form shown in Appendix B2.

Table 2.1 Control Stations and Impact Stations

Parameters:	Location ¹	Frequency
Turbidity	Flood tide (mid flood) C1, C2, I4, I5 & I6 Ebb tide (mid ebb) C1, C3, I1, I2 & I3	Three times a week (or daily at the impact monitoring stations if additional monitoring during non-compliance is required). All samples to be duplicated.
Dissolved Oxygen	Flood tide (mid flood) C1, C2, I4, I5 & I6 Ebb tide (mid ebb) C1, C3, I1, I2 & I3	Three times a week (or daily at the impact monitoring stations if additional monitoring during non-compliance is required). All samples to be duplicated.
Suspended Solids	Flood tide (mid flood) C1, C2, I4, I5 & I6 Ebb tide (mid ebb) C1, C3, I1, I2 & I3	Three times a week. All samples to be duplicated.

1 All samples to be collected from surface, middle and bottom layers of water column

2 See Table 2.3 to determine whether additional monitoring is required. This should be undertaken at the request of the Engineer. If turbidity and not SS is measured during the additional monitoring then it must be correlated using the baseline data for correlation to SS and the values of this additional monitoring converted to SS. Alternatively, SS can be measured rather than DO/Turbidity for this additional monitoring but SS data must be made available from the laboratory within 24 hours.

2.4.1 Statistical Analysis of data

A simple statistical analysis (e.g. Student’s t-test) shall be undertaken by the ET, to check whether there is a significant difference between the mean of three days impact monitoring stations data and the mean of three days control station monitoring data. The same test will be performed to determine whether there is a significant difference between the models predicted increases in SS in the mixing zone and actual increases recorded in SS. Finally, at the end of the works period, the two weeks post project monitoring should seek to determine whether there is a) a significant difference between the control and impact monitoring stations and b) the baseline data set and the two week post-project data set.

2.5 MONITORING EQUIPMENT

2.5.1 Dissolved oxygen and temperature measuring equipment

- i. The instrument should be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and use a DC power source. It should be capable of measuring:-
 - a dissolved oxygen level in the range of 0-20 mg/l and 0-200% saturation
 - a temperature of 0-45 degree Celsius

- ii. It should have a membrane electrode with automatic temperature compensation complete with a cable. Sufficient stocks of spare electrodes and cables should 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).

2.5.2 Turbidity Measurement Instrument

The instrument should be a portable, weatherproof turbidity-measuring instrument complete with comprehensive operation manual. The equipment should use a DC power source. It should 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).

2.5.3 Suspended Solids

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

2.5.4 Locating the monitoring site

A hand-held digital Global Positioning System (GPS) 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.

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 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 location.

For the on site calibration of field equipment by the ET, the BS 127:1993, "Guide to Field and on-site test methods for the analysis of waters" should be observed.

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

2.6 LABORATORY MEASUREMENT / ANALYSIS

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 DEP.

If a site laboratory is set up or a non-HOKLAS and non-international accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment, analytical procedures, and quality control shall be approved by EPD. The ET 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.

2.7 EVENT AND ACTION PLAN FOR WATER QUALITY

2.7.1 Action Levels

The action levels are set out in Table 2.2 below.

Table 2.2 Action Levels for Water Quality

Parameters	Action
Suspended Solids (Depth Averaged) ¹	Depth average of the pooled data for the impact monitoring stations for three days is significantly greater ($p < 0.05$) than 30% above the control.
DO ² in mg/l (Surface Middle & Bottom)	<i>Surface & Middle</i> 1%-ile of baseline data for surface and middle layer, or midway between 5%-ile of baseline data and limit levels. <i>Bottom</i> 1%-ile of baseline data for bottom layer, or midway between 5%-ile of baseline data and limit levels
Turbidity in NTU (Depth-Averaged)	Depth average of the pooled data for the impact monitoring stations for three days is significantly greater ($p < 0.05$) than 30% above the control on three consecutive monitoring occasions.

¹ "depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.

²-For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.

2.7.2 Event Contingency Plans

The Event Contingency Plans are presented in Table 2.3 below.

In the event of a non compliance. i.e. exceedances at the impact monitoring stations outside the predicted impact area (i.e. 100m of the dredging operations) on

three consecutive days, then the ET leader should be notified immediately. The ET leader should, in consultation with EPD, IC(E) and ER, recommend any necessary mitigation measures or alternative monitoring stations. In the absence of alternatives it will be necessary to reduce the number of dredging cycles.

Table 2.3 Event and Action Plan for Water Quality

Action/ Limit Level	ET Leader/ET	IC(E)	ER	CONTRACTOR
Action level being exceeded on two consecutive sampling days.	<ol style="list-style-type: none"> Repeat in-situ measurement on next day of exceedance to confirm findings; Identify source(s) of impact; Inform IC(E), Contractor and ER; Check monitoring data , all plant, equipment and contractor's working methods; 	<ol style="list-style-type: none"> Check monitoring data submitted by ET and Contractor's working methods; 	<ol style="list-style-type: none"> Confirm receipt of notification of failure in writing; Notify Contractor. 	<ol style="list-style-type: none"> Inform the ER and confirm notification of the non-compliance in writing; Rectify any unacceptable practice; Amend working methods if appropriate.
Action Level exceeded on three consecutive days at Impact monitoring stations	<ol style="list-style-type: none"> Repeat measurement on next day of exceedance to confirm findings; Identify source(s) of impact; Inform IC(E), Contractor, ER and EPD; Check monitoring data, all plant, equipment and Contractor's working methods; Discuss mitigation measures with IC(E), ER and Contractor Ensure mitigation measures are implemented; 	<ol style="list-style-type: none"> Check monitoring data submitted by ET and Contractor's working method; Discuss with ET and Contractor possible remedial actions; Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly; Supervise the implementation of mitigation measures. 	<ol style="list-style-type: none"> Discuss with IC(E) on the proposed mitigation measures; Ensure mitigation measures are properly implemented; Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> Inform the Engineer and confirm notification of the non-compliance in writing; Rectify unacceptable practice; Check all plant and equipment and consider changes of working methods; Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IC(E) and ER; Implement the agreed mitigation measures.

1 *Reduction in dredging cycles should be made in the absence of alternative or further additional mitigation measures.*

2 *Engineer may wish to increase measurements of Turbidity and Dissolved Oxygen at the Impact and Monitoring Stations to enable quicker resumption of maximum number of dredging cycles per day.*

Waste and Noise Management



3. WASTE AND NOISE MANAGEMENT

The Contractor is responsible for waste control within the construction site, removal of the waste material produced from the site and to implement any mitigation measures to minimise waste or redress problems arising from the waste from the site. A site waste inventory record should be maintained.

The following good site practice should be implemented during the construction phase in order to minimise uncontrolled construction noise emissions:

- all plants should be used properly and well-maintained during the construction phase
- mobile plants should be placed as far as possible from the NSRs
- plants which emit noise strongly in one direction should be oriented, if possible, so that the noise generated is directed away from the nearby NSRs
- machines or plants that might be intermittent use should be shut down between work period, or should be throttled down to a minimum
- material stockpile and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities

Site Environmental Audit

4. SITE ENVIRONMENTAL AUDIT

4.1 SITE INSPECTIONS

Site Inspections provide a direct means to trigger and enforce the specified environmental protection and pollution control measures listed in the EMIS. They shall be undertaken routinely to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. With well defined pollution control and mitigation specifications and a well established site inspection, deficiency and action reporting system, the site inspection is one of the most effective tools to enforce the environmental protection requirements on the construction site.

The ET Leader is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspection works. He shall submit a proposal on the site inspection, deficiency and action reporting procedures within 21 days of the construction contract commencement to the Contractor for agreement and to the ER for approval. The ET's proposal for rectification would be made known to the IC(E).

Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site; it shall also review the environmental situation outside the site area which is likely to be affected, directly or indirectly, by the site activities. The ET Leader shall make reference to the following information in conducting the inspection:

- i. the EIA recommendations on environmental protection and pollution control mitigation measures;
- ii. works progress and programme;
- iii. individual works methodology proposals (which shall include proposal on associated pollution control measures);
- iv. the contract specifications on environmental protection;
- v. the relevant environmental protection and pollution control laws; and
- vi. previous site inspection results.

The Contractor shall update the ET Leader with all relevant information of the construction contract for him to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the ER, IC(E) and the Contractor within 24 hours, for reference and for taking immediate action. The EMIS will be updated and included in each monthly submission of the EM&A report.

The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated

by the ET Leader to report on any remedial measures subsequent to the site inspections.

Ad hoc site inspections shall also be carried out if significant environmental problems are identified.

Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the Action Plan.

4.2 COMPLIANCE WITH LEGAL AND CONTRACTUAL REQUIREMENTS

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

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 reviewing to see whether sufficient environmental protection and pollution control measures have been included.

The ET Leader shall also review the progress and programme of the works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violating the laws can be prevented.

The Contractor shall regularly copy relevant documents to the ET Leader so that the checking work can be carried out. The document shall at least include the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws, and all the valid licence/permit. The site diary shall also be available for the ET Leader's inspection upon his request.

After reviewing the document, the ET Leader shall advise the IC(E) and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence/permit application and any environmental protection and pollution control preparation works may not cope with the works programme or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise the Contractor and the ER accordingly.

Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. 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.

4.3 ENVIRONMENTAL COMPLAINTS

Complaints shall be referred to the ET Leader for carrying out complaint investigation procedures. The ET Leader shall undertake the following procedures upon receipt of the complaints:

- i. log complaint and date of receipt onto the complaint database and notify the IC(E) immediately;
- ii. investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
- iii. if a complaint is valid and due to works, identify mitigation measures in consultation with the IC(E);
- iv. if mitigation measures are required, 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 EPD, submit interim report to EPD on 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 review that any valid reason for complaint does not recur;
- viii. report the investigation results and the subsequent actions to the source of complaint for responding to complainant (If the source of complaint is EPD, the results shall be reported within the time frame assigned by EPD); and
- ix. record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

During the complaint investigation work undertaken by the ET, the Contractor and ER shall co-operate with the ET Leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures (in consultation with the IC(E)) are identified in the investigation, the Contractor shall promptly carry out the mitigation. The ER shall ensure that the measures have been carried out by the Contractor.

A flow chart of the complaint response procedures is shown in Figure 4.1.



5. REPORTING

5.1 GENERAL

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 and EPD. All the monitoring data (baseline and impact) shall also be submitted in diskettes in the format shown in Appendix C.

5.2 BASELINE MONITORING REPORT

The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to each of the four parties: the Contractor, the IC(E), the ER and the EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies they require.

The form and content of the report, and the representation of baseline monitoring data shall be in a format to the satisfaction of EPD and include at least, but not be limited to 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 (and depth)
 - monitoring date, time, frequency and duration
 - QA/QC results and detection limits
- v. details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period
 - other factors which might affect the results
- vi. determination of the Action and Limit Levels (AL levels) for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored;
- vii. revisions for inclusion in the EM&A Manual; and
- viii. comments and conclusions.

5.3 EM&A REPORTS

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 Leader. The EM&A report shall be prepared and submitted within 10 working days of the end of each reporting month, with the first report due in the month after construction commences. A maximum of 4 copies of each monthly EM&A report shall be submitted to each of the four parties: the Contractor, the IC(E), the ER and the EPD. 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 monthly reports in both hard copy and electronic medium requirement. The ET leader shall review the number and location of monitoring stations and parameters to monitor every month or on an as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

5.3.1 First Monthly EM&A Report

The first monthly EM&A report shall include at least but not be limited to the following :

- i. Executive Summary (1-2 pages):
 - Breaches of AL levels
 - Complaint Log
 - Notifications of any summons and successful prosecutions
 - Reporting Changes
 - Future key issues
- ii. Basic Project Information
 - Project organisation including key personnel contact names and telephone numbers
 - Programme
 - Management structure
 - Works undertaken during the month
- iii. Environmental Status
 - Works undertaken during the month with illustrations (such as location of works, daily dredging/filling rates, percentage fines in the fill material used)
 - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations
- iv. Summary of EM&A requirements
 - All monitoring parameters
 - Environmental quality performance limits (Action and Limit levels)
 - Event-Action Plans

- Environmental mitigation measures, as recommended in the project EIA study final report
- Environmental requirements in contract documents

v. Implementation Status

- Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological and visual impacts, as recommended in the project EIA study report, summarised in the updated EMIS

vi. Monitoring Results

To provide monitoring results (in both hard and diskette copies) together with the following information:

- Monitoring methodology
- Name of laboratory and types of equipment used and calibration details
- Parameters monitored
- Monitoring locations (and depth)
- Monitoring date, time, frequency, and duration
- Weather conditions during the period
- Any other factors which might affect the monitoring results
- QA/QC results and detection limits

vii. Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions

- Record of all non compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
- Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary
- Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control 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-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures
- 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

5.3.2 Subsequent Monthly EM&A Reports

The subsequent monthly EM&A reports shall include the following :

- i. Executive Summary (1-2 pages)
 - Breaches of AL levels
 - Complaint Log
 - Notifications of any summons and successful prosecutions
 - Reporting Changes
 - Future key issues
- ii. Environmental Status
 - Works undertaken during the month with illustrations including key personnel contact names and telephone numbers
 - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations

- iii. Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological and visual impacts, as recommended in the project EIA study report, summarised in the updated EMIS.

- iv. Monitoring Results

To provide monitoring results (in both hard and diskette copies) together with the following information:

- Monitoring methodology
 - Name of laboratory and types of equipment used and calibration details
 - Parameters monitored
 - Monitoring locations (and depth)
 - Monitoring date, time, frequency, and duration
 - Weather conditions during the period
 - Any other factors which might affect the monitoring results
 - QA/QC results and detection limits
- v. Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
 - Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)

- Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary
 - Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control 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-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures
 - a description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance
- 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
- vii. Appendices
- AL levels
 - Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
 - i) major activities being carried out on site during the period;
 - ii) weather conditions during the period; and
 - iii) any other factors which might affect the monitoring results.
 - Monitoring schedule for the present and next reporting period
 - Cumulative statistics on complaints, notifications of summons and successful prosecutions
 - Outstanding issues and deficiencies

5.3.3 Final EM&A Review Reports.

The final EM&A Review Report shall be prepared after the completion of works and submitted within 15 days of completion of the post project monitoring (which will proceed for two weeks). The report should contain the following:

- 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 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:
 - (i) mitigation measures, as recommended in the EIA report;
 - (ii) environmental impact hypotheses tested;
 - (iii) environmental quality performance limits (Action and Limit Levels);
 - (iv) all monitoring parameters; and
 - (v) 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, summarised in the updated EMIS;
- vi. graphical plots and the statistical analysis of the trends of monitored parameters over the course of the project, including the post-project monitoring (or the past twelve months for annual reports) for all monitoring stations annotated against;
 - 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
- 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 procedures taken;
- xi. a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation, locations and nature of the breaches, investigation, follow-up actions taken and results;
- xii. a review of the validity of EIA predictions and identification of shortcomings in EIA recommendations;
- xiii. a review of the effectiveness and efficiency of the mitigation measures; and

- xiv. a review of success of the EM&A programme to cost effectively identify deterioration and to initiate prompt effective mitigatory action when necessary.

5.3.4 Data Keeping

The site document such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the monthly EM&A reports for submission. However, the document shall be well kept by the ET Leader and be ready for inspection upon request.

All relevant information shall be clearly and systematically recorded in the document.

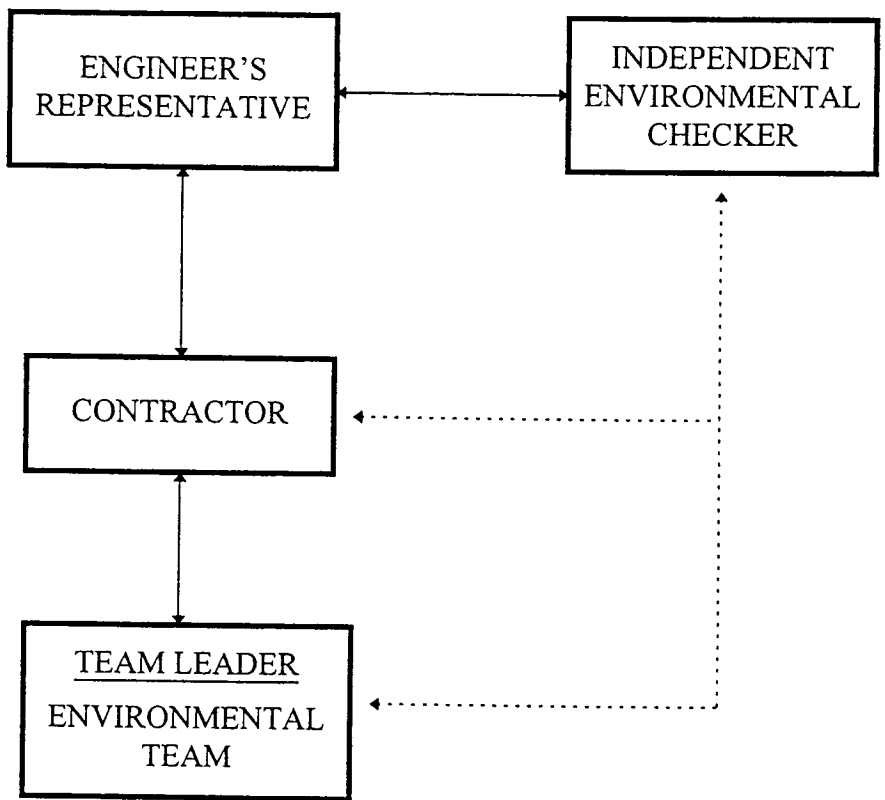
The monitoring data shall also be recorded in magnetic media form, and the software copy can be available upon request.

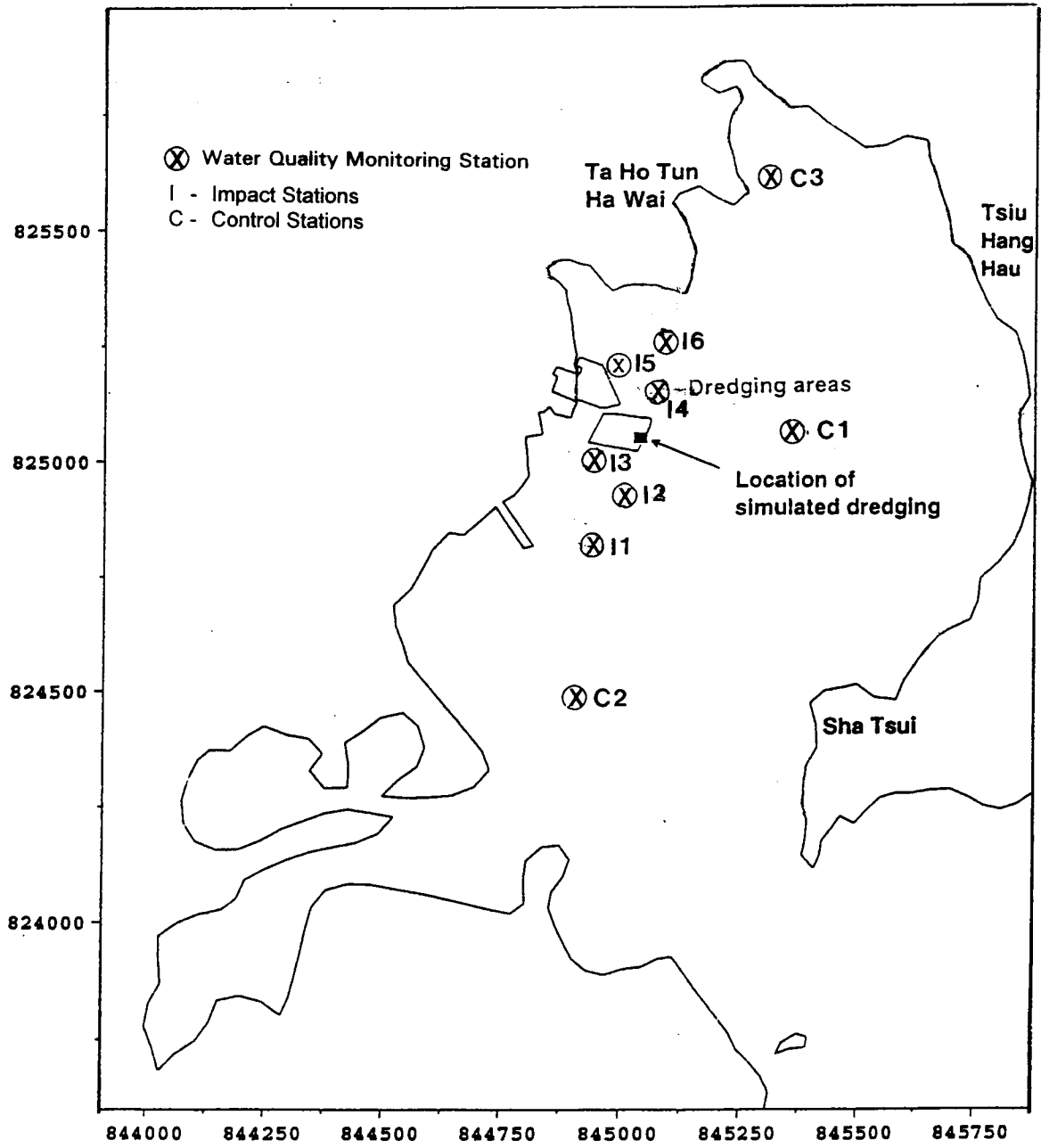
The water quality data software format shall be agreed with EPD.

All the documents and data shall be kept for at least one year after completion of the construction contract.

5.3.5 Interim Notifications of Environmental Quality Limit Exceedances

With reference to Event and Action Plans in Table 2.3, when the environmental quality limits are exceeded, the ET Leader shall immediately notify the IC(E) & EPD, as appropriate. The notification shall be followed up with advice to IC(E) and EPD 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 Appendix B2.

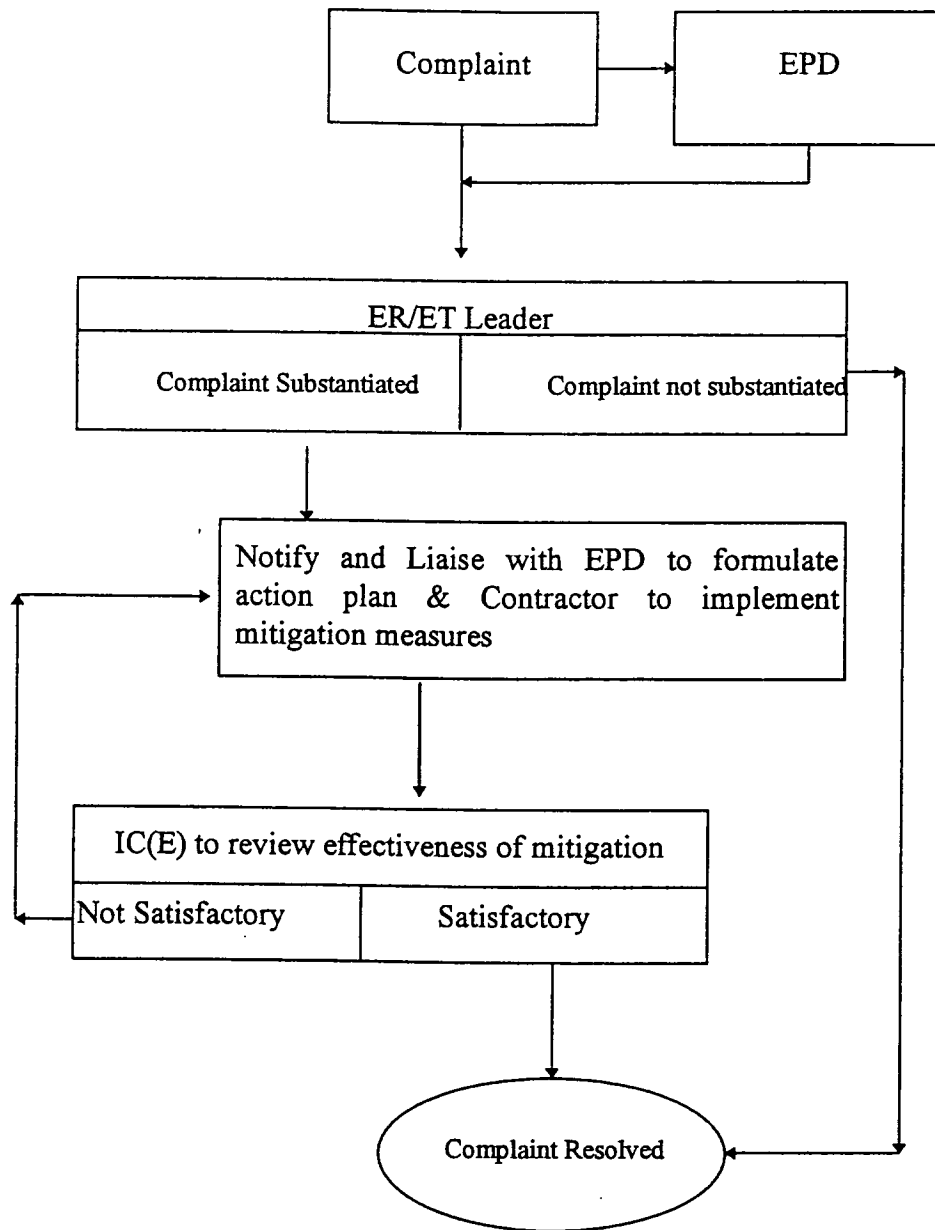




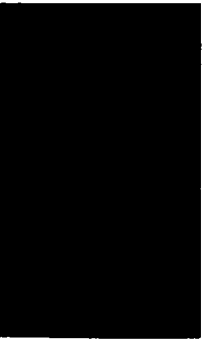
Hebe Haven Yacht Club Development - Phase 2 EM&A

Figure 2.1 Study Area and Water Monitoring Locations

Job No. EA00501

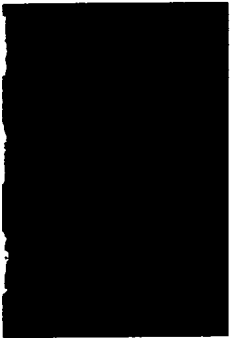


Appendix



Appendix A

Environmental Mitigation Implementation Schedule (EMIS)



Appendix A Environmental Mitigation Implementation Schedule (EMIS)

Item No.	EIA Ref.	Activity (What)	Where	(When)	(Who)	Audit Method (Why)	Implementation Status	Auditor signature
1	EIA Section 7.5 EM&A Manual Section 2.2-2.6	Water quality monitoring for duration of dredging works Samples collected for laboratory testing to be analysed using a HOKLAS accredited testing procedures. Parameters to be tested include suspended solids, turbidity and dissolved oxygen.	At impact stations 1-6 and control stations 1-3; figure 2.1 EM&A manual	Frequency is three times per week on mid ebb and mid flood. For the duration of the Dredging operations	Contractor/ET to ensure samples collected are sent to an HOKLAS accredited laboratory, to the satisfaction of the IC(E)	IC(E) / ET Leader to check results and laboratory testing procedures against HOKLAS methodologies, Water Quality objectives and the Event Contingency Plan (table 2.3 EM&A manual). (To ensure acceptable water quality is maintained as per the modelling predictions)		
2	EIA Section 5.2	Dredging: The dredger grab capacity shall be no greater than 6 m ³ , and "sweeping practice" shall not be used.	Dredging area as defined in the EIA Figure 2.5	For the duration of the dredging operations	Contractor responsible for implementation, to the satisfaction of the IC(E)	IC(E)/ ET Leader to carry out regular site inspections (To minimise the dispersion of suspended matter)		
3	EIA Section 5.9	Dredging: Daily dredging hours should be restricted to normal working hours 9a.m to 7 p.m.	Dredging area as defined in the EIA Figure 2.5	For the duration of the dredging operations.	Contractor responsible for implementation, to the satisfaction of the IC(E).	IC(E)/ ET Leader to carry out regular checks (To minimise disturbance to residential areas and minimise period of disturbance to sediments and hence water quality impacts)		
4	EIA Section 9.5	Dredging: Only one dredger is in use on the site at any one time	Dredging area as defined in the EIA Figure 2.5	For the duration of the dredging operations.	Contractor responsible for implementation, to the satisfaction of the IC(E).	IC(E)/ ET Leader to carry out regular checks To maintain water quality impacts at acceptable levels as per the EIA predictions		

IC(E) = Independent Checker (Environment) / ET = Environmental Team

Appendix B1

Water Quality Monitoring Data Record Sheet



Appendix B1 Water Quality Monitoring Data Record Sheet

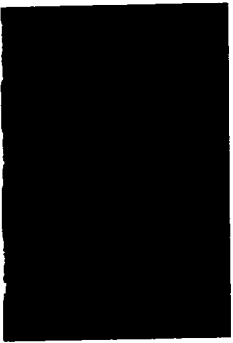
Location				
Date				
Start Time (hh:mm)				
Weather				
Sea Conditions				
Tidal Mode				
Water Depth (m)				
Monitoring Depth		S	M	B
Salinity				
Temperature (°C)				
DO Saturation (%)				
DO (mg/l)				
Turbidity (NTU)				
SS Sample Identification				
SS (mg/l)				
Observed Construction	<100m from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

	<u>Name & Designation</u>	<u>Signature</u>	<u>Date</u>
Recorded By :	_____	_____	_____
Checked by :	_____	_____	_____

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

Appendix B2

Incident Report on Action Level or Limit Level Non-compliance



Appendix B2 Incident Report on Action 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	

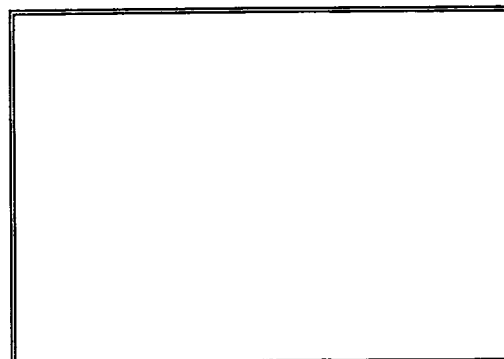
Location Plan

Prepared by : _____

Designation : _____

Signature : _____

Date : _____



Appendix C

Database Structure for Water Quality

Appendix C Database Structure for Water Quality

1. The data base structure for water quality monitoring is listed below. The ET shall select the related field names to create their own data recording sheet.

Field Name	Type	Width	Dec	Remark
Project/contract ID	C	3		Given by EPD
Work Area ID	C	2		Given by EPD
Sam Stn	C	3		Sampling Station
Latitude	C	10		Latitude of Sampling Station
Longitude	C	10		Longitude of Sampling Station
Easting	C	6		HK Grid (Easting) of Sampling Station
Nothing	C	6		HK Grid (Nothing) of Sampling Station
Date	C	8		Sampling Date
Time	C	5		Sampling Time
Replicate	C	1		1= first sample; 2= duplicated sample; etc.
Stu Purpose	C	1		Purpose of Sampling Station (c= control; I= impacts; s= sensitive receiver; etc.)
Sam Purpose	C	1		Purpose of Sample (B= baseline, I= Impact)
Weather	C	20		(sunshine, precipitation, humidity, air temperature)
Tide Status	C	10		Tidal Status (e.g. mid, ebb; mid-flood)
Water Depth	N	4	1	Depth of water column in meter
Sam Depth M	N	4	1	Depth of sample taken in meter
Sam Depth	C	1		Depth of sample taken (S= surface; M= middle; B= bottom)
Water Temp	N	4	1	Water Temperature
Salinity	N	6	2	
DO	N	6	2	Dissolved Oxygen
DOS	N	6	2	Dissolved Oxygen in % saturation
Trubidity	N	6	2	
SS	N	6	2	Suspended solids
Metal T...	N	6	2	Total metals (approx. 7 parameters, and can be more)
Metals D...	N	6	2	Dissolved metals (approx. 7 parameters, and can be more)
Trace organic...	N	6	2	Trace organic (e.g. PAHs, PCBs etc. can be a lot)
Nutrients	N	6	2	Nutrients (include several parameters such as NO ₂ N, NO ₃ , N, Nhs, N, TP, OP etc.)
BOD	N	6	2	
COD	N	6	2	
Chlorophyll a	N	6	2	
E.coli	N	6	2	
F coliform	N	10	0	Faecal coliform
PARA...	N	10	0	Other parameters not listed above (Confirm with EPD individually)

(Remark: enter 999.99 to any numeric fields that have no reading. Please note that "Zero" is also a valid data)

2. Details of water quality analytical methods and detection limits for different parameters.

Parameter	Limits of detection for WQ parameters	Units of measurement for WQ parameters	Analytical methods
e.g. DO			
e.g. Cd T			
etc.....			

3. Apart from 1 and 2 above, the following information shall also be provided:
- i. Project name, contract number, consultant name and telephone, contractor name, contract person and telephone number, site staff and telephone number.
 - ii. Project commencement data and the proposed completion data, frequency of sampling and project work nature, e.g. dumping, dredging or reclamation.
 - iii. List of site instrument(s) for water quality monitoring.