

## **1. Environmental Specialist and Independent Checker**

1.1 All the environmental monitoring and audit (EM&A) work as stated in this programme including the field measurements, sampling, laboratory testings, analysis of monitoring results, reporting and auditing shall be carried out by an independent specialist company (hereafter called Environmental Specialist) which shall be employed by the Contractor but shall not be in any way an associated company of the Contractor. The Environmental Specialist shall have at least 7 years experience in the EM&A, and shall provide suitable qualified and trained technicians for the EM&A works.

1.2 The Environmental Specialist shall be responsible for conducting the EM&A programme and ensuring the Contractor's compliance with the environmental performance requirements and regulations. The Environmental Specialist shall also be responsible for reviewing the construction programme and methodology, undertaking environmental site inspection, and providing advice to the Engineer on the environmental protection matters including action to be taken by the Contractor, effectiveness of remedial action proposed by the Contractor, review and audit of the Contractor's design and construction for all environmental protection and pollution prevention/mitigation measures. The Environmental Specialist shall also be responsible for liaising and reporting directly to the Engineer and the Director of Environmental Protection (DEP) on matters related to EM&A.

1.3 The Contractor shall employ an independent checker (hereafter called Independent Checker (Environment)) to carry out environmental audit of the construction project. The Independent Checker (Environment) shall be independent from the management of construction works and shall not be in any way an associated company of the Contractor. The Independent Checker (Environment) shall have at least 7 years experience in both EM&A and project management.

1.4 The Independent Checker (Environment) shall advise the Engineer on environmental issues related to the project. The Independent Checker (Environment) shall be responsible for auditing the environmental performance of construction, including validation of monitoring results, random site inspection, review of the effectiveness of environmental mitigation measures taken by the Contractor, checking of EM&A report and signing off relevant EM&A proformas.

1.5 Details of the Environmental Specialist and the Independent Checker (Environment) to be employed by the Contractor shall be submitted to the Engineer and DEP for approval prior to appointment and within one week after the commencement of the Works. Termination of the Environmental Specialist or the Independent Checker (Environment) shall be subject to the approval of the Engineer and DEP. The Contractor shall not terminate the service of the approved Environmental Specialist or Independent Checker (Environment) unless a suitable replacement has been approved by the Engineer and DEP so as to ensure no disruption to the EM&A works. The Engineer and DEP shall also have the authority to withdraw the approval of the Environmental Specialist or the Independent Checker (Environment) at any time. If such approval shall be withdrawn, the Contractor shall provide a suitable replacement approved by the Engineer and DEP within 3 weeks after receiving notice in writing of such approval.

## **2. Water Quality Monitoring**

### **2.1 Water Quality Requirements**

2.1.1 The Contractor shall minimise adverse impacts resulting from the Contractor's operations on the water quality. To achieve these requirements the Contractor shall design and implement methods of working that :

- (a) Prevent spillage and leakage of concrete during transporting, handling and placing processes when constructing concrete marine structures;
- (b) Prevent the unacceptable reduction, due to the Works, of the dissolved oxygen content of the water adjacent to the Works;
- (c) Prevent excess suspended solids from being present in the water within and adjacent to the Works; and
- (d) Prevent avoidable deterioration in the water quality causing adverse effects on the marine life.

### **2.2 Water Quality Monitoring**

2.2.1 The Environmental Specialist shall collect water samples at the Designated Monitoring and Control Stations and send to approved laboratory accredited by HOKLAS for determining the Suspended Solids content.

2.2.2 Monitoring shall be carried out in-situ and in accordance with the following :

- (a) Baseline conditions for the various water quality parameters are to be established immediately after the commencement of the Contract and at the latest within 5 weeks prior to the commencement of the marine works under the Contract. The Environmental Specialist shall establish the baseline conditions by measuring the following water quality parameters - dissolved oxygen (DO in mg/l), Turbidity (Tby in NTU), suspended solids (SS in mg/l), and both water and ambient temperature at all Designated Monitoring and Control Stations, on 3 sampling days per week, at mid-flood and mid-ebb, for 4 consecutive weeks immediately after the commencement of the Contract and at the latest 6 weeks before the marine works start. Water samples and measurements shall be taken at three water depths, namely, 1m below water surface, mid-depth and 1m above sea bed. If the water depth is less than 6m, samples shall be taken at 1 m below water surface and 1m above seabed. If the water depth is less than 3m, samples shall be taken at mid-depth only.
- (b) During the course of the piling and demolition works, monitoring shall be undertaken three days a week, each day at mid-flood and mid-ebb. During the course of other marine works, monitoring shall be undertaken one day per week at mid-flood and mid-ebb. Monitoring at each Designated Monitoring and Control Station shall be undertaken on a Working day. The interval between each series (mid-ebb and mid-flood) of samplings shall not be less than 36 hours

unless otherwise agreed by the Engineer's Representative. The values of DO, Tby and SS shall be determined at all designated Monitoring and Control Stations. Two measurements of turbidity, salinity, DO, DOS and temperature at each depth of each station shall be taken. The probes must be removed from water after the first measurement and then redeployed for the second measurement. Where the difference in value between the first and second reading of each set is more than 25% of the value of the first reading, the readings shall be discarded and further readings shall be taken. Two samples for SS measurements shall be taken at each depth and at each Designated Monitoring and Control Station. The samples shall be stored at 4°C during delivery to laboratory and before commencement of the analysis. The SS determination work shall start within 24 hours after collection of the water samples. For the purpose of evaluating the water quality, all values for Tby and SS shall be depth averaged.

- (c) If any monitoring data exceeds the limits specified in clause 2.2.3 below and are, in the opinion of the Engineer, indicative of a deteriorating situation, then the Engineer may direct that monitoring shall be undertaken daily at each Designated Monitoring and Control Station until the recorded values of these parameters indicate to the satisfaction of the Engineer an improving and acceptable level of water quality.
- (d) As an audit stage, on completion of all marine works, the Environmental Specialist shall further measure the water quality parameters at the Designated Monitoring/Control stations for four consecutive weeks, 3 days per week, at mid-flood and mid-ebb.

2.2.3 The Action and Limit (AL) levels for water quality monitoring shall be formulated based on baseline monitoring. A framework of AL levels is shown in Table 1.

### **2.3 Water quality monitoring stations**

Designated Monitoring and Control Stations shall be established at locations as indicated on the attached Drawing No. TS 2189. Samples shall be taken at all Designated Monitoring and Control Stations in accordance with Clause 2.2.2.

### **2.4 Water quality monitoring equipment**

2.4.1 The Contractor shall provide immediately after and at the latest five weeks before the date of commencement of the marine works of the Site the following equipment :

- (a) Dissolved Oxygen and Temperature Measuring Equipment

A portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and use a DC power source shall be provided. 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. 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 (YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or similar approved). Should salinity compensation not be built-in in the DO equipment, in-situ salinity shall be measured to calibrate the DO equipment prior to each DO measurement.

(b) Turbidity Measurement Instrument

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

(c) Suspended Solids/Water Sampler

A water sampler, made of a transparent PVC or glass cylinder (capacity not less than 2 litres) which can be effectively sealed with 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 (Kahlsico Water Sampler 135WB203 or similar approved). Water samples shall be kept in high density polythene bottles and packed in ice container (cooled to 4°C without frozen) for transport to the laboratory as soon as possible. Upon arrival at the laboratory, the suspended solid shall be determined in accordance with the 2540D of Standard Methods for the Examination of Water and Wastewater (APHA, 18<sup>th</sup> edition, 1989). The detection limit shall be 1 mg/L or better. An accurate electronic balance with precision level not less than 0.1 mg (i.e. 0.0001 g) shall be used.

(d) Positioning Device

A hand-held or boat-fixed type of digital Global Position System (GPS) or other equivalent position instrument of similar accuracy shall be provided and brought along during monitoring to ensure the monitoring vessel is at the correct position before taking measurements.

(e) Water Depth Detector

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

2.4.2 All in-situ monitoring instrument shall be checked, calibrated and certified by an approved laboratory accredited by HOKLAS before use, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring. Sufficient stocks of spare parts shall be maintained for replacements when necessary so that monitoring can proceed uninterrupted.

## **2.5 Reporting of Water Quality Monitoring Data**

- 2.5.1 The results of all in situ Water Quality Monitoring shall be provided by the Contractor to the Engineers, in an agreed format, no later than 24 hours after sampling. All other parameters shall be reported no later than 2 weeks after sampling.
- 2.5.2 Monthly reports should be prepared on each month during the works and submitted, through the Engineer, to the DEP for comments. The reports should contain a summary of the activities, exceedance of AL levels, causes of exceedance and mitigation measures being taken; all monitoring data with the information indicating the sampling/measurement location, time and weather conditions; detailed description of the findings from auditing of monitoring data, exceedances and actions taken.

The raw data sheets of the monitoring data should be maintained properly and to be accessible when it is requested. Moreover, the monitoring data should be stored in a floppy disk with the format agreed with the Engineer and DEP. The disk should be submitted to EPD, through the Engineer, together with the monthly report.

A report should be made to EPD, through the Engineer, following exceedance of the Limit level by any parameter for more than two consecutive days giving details of raw monitoring data, mitigation measures implemented so far and the proposed actions to ensure that recurrence will be prevented.

## **2.6 Actions on exceedance of action and limit levels**

- 2.6.1 Where monitoring results of any water quality parameter exceed the AL levels, the Engineer may direct more frequent monitoring to be carried out until exceedance stops.
- 2.6.2 The Contractor shall take all necessary steps to ensure that the actions of the Contractor are not contributing to the deterioration. These steps shall include, but not be limited to the following :
- (a) checking of all marine plant and equipment;
  - (b) maintenance or replacement of any marine plant or equipment contributing to the deterioration;
  - (c) checking and maintenance of silt curtains;
  - (d) review of all working methods; and
  - (e) slow down the construction rate.
- 2.6.3 In addition, the Contractor shall follow the Action Plan for Water Quality shown in Table 2.
- 2.6.4 The Engineer shall be kept informed of all steps taken; and written reports and proposals for action shall be passed to the Engineer by the Contractor whenever monitoring shows any adverse impact upon the environment.

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- 2.6.5 After the Contractor have implemented the mitigating measures according to the Action Plan while the compliance monitoring record levels of suspended solids levels still indicate an environmentally unacceptable situation, the Engineer can temporarily suspend the site activities until the problem is under control and an acceptable water quality is restored.
- 2.6.6 In case the Contractor fails to implement mitigation measures as stated in the Action Plan or the Engineer finds that the environmental impact persists despite the mitigation measures, the Engineer can direct the Contractor to slow down or suspend his work until the Engineer is convinced that the mitigation measures have restored the water quality to an acceptable level.

**Table 1 Action and Limit Levels for Water Quality**

Parameters	Action	Limit
DO in mg/l (Surface, Middle & Bottom)	<u>Surface &amp; 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 &amp; Middle</u> 4 mg/l or 1%-ile of baseline data for surface and middle layer, whichever is higher  <u>Bottom</u> 2 mg/l or 1%-ile of baseline data for bottom layer, whichever is higher
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, whichever is lower	99%-ile of baseline or 130% of upstream control station's SS at the same tide of the same day, whichever is lower
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, whichever is lower	99%-ile of baseline or 130% of upstream control station's Tby at the same tide of the same day, which is lower

Notes:

- "depth-averaged" is calculated by taking the arithmetic means of reading all three depths.
- For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- For SS and Tby, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
- All the figures given in the table are used for reference only and the Engineer may amend the figures whenever it is considered as necessary.

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**Table 2 Event and Action Plan for Water Quality**

EVENT	ENVIRONMENTAL SPECIALIST	INDEPENDENT CHECKER (ENVIRONMENT)	ENGINEER	CONTRACTOR
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Repeat in-situ measurement to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform Independent Checker (Environment) Contractor and the Engineer;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with Independent Checker (Environment), the Engineer and Contractor;</li> <li>6. Repeat measurement on next day of exceedance.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with Environmental Specialist and Contractor on the mitigation measures;</li> <li>2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly;</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with the Independent Checker (Environment) on the proposed mitigation measures;</li> <li>2. Make agreement on the mitigation measures to be implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the Engineer and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment;</li> <li>4. Consider changes of working methods;</li> <li>5. Discuss with Environmental Specialist and Independent Checker (Environment) and propose mitigation measures to Independent Checker (Environment) and the Engineer;</li> <li>6. Implement the agreed mitigation measures.</li> </ol>
Action level being exceeded by more than one consecutive sampling days	<ol style="list-style-type: none"> <li>1. Repeat in-situ measurement to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform Independent Checker (Environment), Contractor and the Engineer;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with Independent Checker (Environment), the Engineer and Contractor;</li> <li>6. Ensure mitigation measures are implemented;</li> <li>7. Prepare to increase the monitoring frequency to daily;</li> <li>8. Repeat measurement on next day of exceedance.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with Environmental Specialist and Contractor on the mitigation measures;</li> <li>2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly;</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with Independent Checker (Environment) on the proposed mitigation measures;</li> <li>2. Make agreement on the mitigation measures to be implemented;</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the Engineer and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment;</li> <li>4. Consider changes of working methods;</li> <li>5. Discuss with Environmental Specialist and Independent Checker (Environment) and propose mitigation measures to Independent Checker (Environment) and the Engineer within 3 working days;</li> <li>6. Implement the agreed mitigation measures.</li> </ol>

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**Table 2 Event and Action Plan for Water Quality (Cont'd)**

EVENT	ENVIRONMENTAL SPECIALIST	INDEPENDENT CHECKER (ENVIRONMENT)	ENGINEER	CONTRACTOR
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Repeat in-situ measurement to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform Independent Checker (Environment), Contractor, the Engineer and EPD;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with Independent Checker (Environment), the Engineer and Contractor;</li> <li>6. Ensure mitigation measures are implemented;</li> <li>7. Increase the monitoring frequency to daily until no exceedance of Limit level.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with Environmental Specialist and Contractor on the mitigation measures;</li> <li>2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly;</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with Independent Checker (Environment), Environmental Specialist and Contractor on the proposed mitigation measures;</li> <li>2. Request Contractor to critically review the working methods;</li> <li>3. Make agreement on the mitigation measures to be implemented;</li> <li>4. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the Engineer and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment;</li> <li>4. Consider changes of working methods;</li> <li>5. Discuss with Environmental Specialist, Independent Checker (Environment) and the Engineer and propose mitigation measures to Independent Checker (Environment) and the Engineer within 3 working days;</li> <li>6. Implement the agreed mitigation measures.</li> </ol>
Limit level being exceeded by more than one consecutive sampling days	<ol style="list-style-type: none"> <li>1. Repeat in-situ measurement to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform Independent Checker (Environment), Contractor, the Engineer and EPD;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with Independent Checker (Environment), the Engineer and Contractor;</li> <li>6. Ensure mitigation measures are implemented;</li> <li>7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with Environmental Specialist and Contractor on the mitigation measures;</li> <li>2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly;</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with Independent Checker (Environment), Environmental Specialist and Contractor on the proposed mitigation measures;</li> <li>2. Request Contractor to critically review the working methods;</li> <li>3. Make agreement on the mitigation measures to be implemented;</li> <li>4. Assess the effectiveness of the implemented mitigation measures;</li> <li>5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the marine work until no exceedance of Limit level.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the Engineer and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment;</li> <li>4. Consider changes of working methods;</li> <li>5. Discuss with Environmental Specialist, Independent Checker (Environment) and the Engineer and propose mitigation measures to Independent Checker (Environment) and the Engineer within 3 working days;</li> <li>6. Implement the agreed mitigation measures</li> <li>7. As directed by the Engineer, to slow down or to stop all or part of the marine work or construction activities.</li> </ol>



## **2.17 Water Quality Mitigation Measures**

### **2.17.1 Discharge into sewers and drains**

- (a) The Contractor shall not discharge directly or indirectly (by runoff) or cause or permit or suffer to be discharged into any public sewer, storm-water drain, channel, stream-course or sea any effluent or foul or contaminated water or cooling or hot water without the prior consent of the Engineer who may require the Contractor to provide, operate and maintain within the premises or otherwise, suitable works for the treatment and disposal of such effluent or foul or contaminated or cooling or hot water. The design of such treatment works shall be submitted to the Engineer for approval not less than one month prior to the commencement of construction or as agreed by the Engineer.
- (b) If any office, site canteen or toilet facilities is erected, foul water effluent shall be directed to a foul sewer or to a sewage treatment facility either directly or indirectly by means of pumping or other means approved by the Engineer.
- (c) The Contractor's attention is drawn to the Buildings Ordinance and to the Water Pollution Control Ordinance.

### **2.17.2 Water Pollution Control – General Requirements**

- (a) The Contractor shall carry out the Works in such a manner as to minimise adverse impacts on the water quality during execution of the Works. In particular, he shall arrange his method of working to minimise the effects on the water quality within the Site, adjacent to the Site, on the transport routes and at the loading and unloading areas.
- (b) The Contractor shall design methods of working to minimise adverse impact upon water quality stemming from his operation in Hong Kong waters and shall provide experienced personnel with suitable training to ensure that these methods are implemented.
- (c) On the date for the commencement of the Works, the Contractor shall submit to the Engineer proposed methods of working and allow sufficient time for the Engineer's examination before executing the works on the Site.
- (d) After commencement of the Works if the plants or work methods are considered by the Engineer to be causing unacceptable adverse impacts upon water quality, the Contractor shall immediately initiate remedial measures to the plants or working methods so as to halt such deterioration. Where such remedial measures include the use of additional or alternative plant, such plant shall not be used on the Works until agreed by the Engineer. Where remedial measures include maintenance or modification of previously approved plant, such plant shall not be used on the Works until such maintenance or modification is completed and the adequacy of the maintenance or modification is demonstrated to the satisfaction of the Engineer.

### 2.17.3 Water Pollution Control – Silt curtain

- (a) Silt curtain shall be provided during all demolition works and piling works within the Site. The Contractor shall be responsible for designing, agreeing with the Engineer, installing and properly maintaining the silt curtains throughout the duration of the above works. The Contractor shall, not later than 3 weeks before the commencement of the demolition works or piling works, submit details of silt curtains to be used, including dimensions, exact locations and method of installation and removal, to the Engineer for approval.
- (b) Silt curtain shall be formed from tough, abrasion-resistant permeable membranes suitable for the purpose, supported on floating booms in such a way as to ensure that the passage of turbid water to the surrounding water shall be restricted. The permeable membranes shall be ‘ProPex 6074’ woven geotextile or products having equivalent functions or performance as approved by the Engineer. The membranes shall satisfy the following requirements :

Tensile strength (mean value)	: 55 kN/m
Mass (mean value)	: 330 g/m <sup>2</sup>
Maximum O <sub>90</sub> pore opening size	: 190 μm

- (a) The boom of the curtain shall be formed and installed in such a way that tidal rise and fall are accommodated, and that the ingress of turbid waters is limited. The removal and reinstallation of such curtains during typhoon conditions shall be as agreed with the Engineer and the Director of Marine.
- (b) The Contractor shall regularly inspect the silt curtains and shall ensure that they are adequately moored and marked to avoid danger to marine traffic. Any damage to the silt curtain shall be repaired by the Contractor promptly to the satisfaction of the Engineer.
- (c) The Contractor shall be responsible for re-positioning of the silt curtain to suit the construction programme.

### **3. Site Environmental Audit**

#### **3.1 Site surveillance**

- 3.1.1 Site surveillance shall be undertaken regularly and routinely by the Environmental Specialist to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are implemented. The Environmental Specialist is responsible for formulation of the environmental site inspection, deficiency and remedial action reporting system, and for carrying out the site inspection works. He shall in consultation with the Independent Checker (Environment), prepare a procedure for the site inspection, deficiency and remedial action reporting requirements; and submit to the Contractor for agreement and to the Engineer for approval, within 21 days of the commencement to the construction contract.
- 3.1.2 Regular site inspections shall be carried out at least once per week for all works areas. The inspections shall cover the environmental situation, pollution control and mitigation measures within the site; they shall also review the environmental situation outside the site area which is likely to be affected, directly or indirectly, by the site activities. The Environmental Specialist shall make reference to the following information in conducting the inspection :
- (a) environmental protection and pollution control mitigation measures;
  - (b) works progress and programme;
  - (c) individual construction works methodology proposals (which shall include proposal on associated pollution control measures);
  - (d) the contract specifications for environmental protection and pollution prevention control;
  - (e) the relevant environmental protection and pollution control laws, ProPECC Notes; and
  - (f) previous site inspection results.
- 3.1.3 The Contractor shall update the Environmental Specialist with all relevant information of the construction contract for him to carry out the site inspections. The inspection report results and its recommendations for any necessary improvements in the environmental performance shall be submitted, in a site inspection proforma, to the Independent Checker (Environment), the Engineer and the Contractor within 24 hours, for reference and the taking of immediate remedial action. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and remedial action reporting system (formulated by the Environmental Specialist) to report on any remedial measures subsequent to the site inspections.
- 3.1.4 Ad hoc site inspections shall also be carried out by the Environmental Specialist and/or the Independent Checker (Environment) if major unacceptable or unforeseen

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 for environmental monitoring and audit.

### **3.2 Environmental compliance**

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

In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the Engineer for approval shall be sent to the Environmental Specialist for vetting to see whether sufficient environmental protection and pollution control measures have been included.

3.2.2 The Environmental Specialist 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.

3.2.3 The Contractor shall regularly copy relevant documents to the Environmental Specialist so that the checking of environmental performance can be carried out effectively. The document to be submitted by the Contractor shall include at least the updated Work Progress Reports, the Works programme, the application for any necessary license/permits under relevant environmental protection laws, and all the valid license/permits received to date. The site diary shall also be available for the Environmental Specialist's inspection upon his request.

3.2.4 After reviewing the documents, the Environmental Specialist shall advise the Engineer and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control. The Contractor shall require to take follow-up and appropriate remedial actions. If the Environmental Specialist's review concludes that the current status on license/permit application and any planned environmental protection and pollution control work may not cope with the works programme, or potential violation of environmental protection and pollution control requirements may arise, he shall advise the Contractor and the Engineer accordingly. The review shall be copied to the Independent Checker (Environment) for any follow-up action.

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

3.2.6 All the works method statements submitted by the Contractor to the Engineer for approval shall be sent to the Environmental Specialist for vetting. The Environmental Specialist shall, in accordance with established standards and guidelines, 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. The Environmental Specialist shall provide a

completed copy of the Proactive Environmental Protection Proforma to the Independent Checker (Environment) for approval. The Independent Checker (Environment) shall audit the review of the construction method and endorse the proposal on the basis of no adverse environmental impacts and/or any established standards or guidelines.

#### **4. Reporting**

##### **4.1 General**

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

##### **4.2 Baseline monitoring report**

4.2.1 The Environmental Specialist shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. A maximum of six copies of the Baseline Environmental Monitoring Report shall be submitted to each of the four parties: the Independent Checker (Environment), the Contractor, the Engineer and EPD. The Environmental Specialist shall liaise with the relevant parties on the exact number of copies they want. The form and content of the report and the representation of the baseline monitoring data shall be in a format to the satisfaction of the Engineer and EPD.

4.2.2 The baseline monitoring report shall include, but not limited to the following :

- (a) up to half a page executive summary;
- (b) brief project background information;
- (c) drawings showing locations of the baseline monitoring stations;
- (d) an updated construction programme with milestones of environmental protection / mitigation activities.
- (e) 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;
- (f) 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;
- (g) determination of the Action and Limit 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;
- (h) revisions for inclusion in the EM&A Manual; and
- (i) comments and conclusions.

#### **4.21 EM&A reports**

4.21.1 The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the Environmental Specialist. The EM&A report shall be prepared by the Environmental Specialist and endorsed by the Independent Checker (Environment) 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 six copies of each monthly EM&A report shall be submitted to each of the four parties: the Independent Checker (Environment), the Contractor, the Engineer and EPD. Before submission of the first EM&A report, the Environmental Specialist 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.

4.21.2 The Environmental Specialist shall review the number and location of monitoring stations and parameters to monitor every 6 months or on as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

#### **4.22 First monthly EM&A report**

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

- (a) Executive Summary (1-2 pages)
  - breaches of AL levels;
  - complaint log;
  - notifications of any summons and successful prosecutions;
  - reporting changes;
  - future key issues;
- (b) Basic Project Information
  - project organisation including key personnel contact names and telephone numbers;

- construction programme with fine tuning of construction activities showing the inter-relationship with environmental protection / mitigation measures for the month;
  - management structure; and
  - works undertaken during the month;
- (c) Environmental Status
- works undertaken during the month with illustrations, such as location of works; and
  - drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (d) Summary of EM&A requirements
- all monitoring parameters;
  - environmental quality performance limits (Action and limit levels);
  - Event-Action Plans;
  - environmental mitigation measures;
  - environmental requirements in contract documents;
- (e) Implementation Status
- advice on the implementation status of environmental protection and pollution control/ mitigation measures, including measures for ecological and visual impacts, summarised in the updated implementation schedule;
- (f) 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;
  - graphical plots of the monitored parameters in the month annotated against;
  - the major activities being carried out on site during the period;
  - weather conditions that may affect the results;
  - any other factors which might affect the monitoring results; and
  - QA/QC results and detection limits;
- (g) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions

- record of all noncompliance (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 legislations, 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; and
  - description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance;
- (h) Others
- an account of the future key issues as reviewed from the works programme and work method statements;
  - advice on the solid and liquid waste management status; and
  - submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule and complaint log summarizing the EM&A of the period.

#### **4.68 Subsequent monthly EM&A reports**

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

- (a) Executive Summary (1-2 pages)
- Breaches of AL levels
  - Complaint Log
  - Notifications of any summons and successful prosecutions
  - Reporting Changes
  - Future key issues
- (b) Environmental Status
- Construction Programme with fine tuning of construction activities showing the inter-relationship with environmental protection / mitigation measures for the month;
  - Works undertaken during the month with illustrations including key personnel contact names and telephone numbers; and



- Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations

(c) Implementation Status

Advice on the implementation status of environmental protection and pollution control / mitigation measures, including measures for ecological and visual impacts, summarised in the updated implementation schedule;

(d) 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;
- Graphical plots of the monitored parameters in the month annotated against;
- The major activities being carried out on site during the period;
- Weather conditions that may affect the results;
- Any other factors which might affect the monitoring results; and
- QA/QC results and detection limits;

(e) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions

- Record of all noncompliance (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 legislations, 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; and
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance;

- (f) Others
  - An account of the future key issues as reviewed from the works programme and work method statements; and
  - Advice on the solid and liquid waste management status;
  
- (g) Appendix
  - 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

#### **4.112 Quarterly EM&A summary reports**

4.112.1 The quarterly EM&A summary report which should generally be around 5 pages (including about 3 of text and tables and 2 of figures) should contain at least the following listed information. Apart from these, the first quarterly summary report should also confirm that the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works.

- (a) up to half a page executive summary;
- (b) basic project information including a synopsis of the project organisation, programme, contracts of key management, and a synopsis of work undertaken during the quarter;
- (c) a brief summary of EM&A requirements including :
  - Monitoring parameters;
  - Environmental quality performance limits (Action and Limit levels); and
  - Environmental mitigation measures;
- (d) advice on the implementation status of environmental protection and pollution control/ mitigation measures, summarised in the updated implementation schedule;

- (e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (f) 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;
- (g) advice on the solid and liquid waste management status;
- (h) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (i) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- (j) an quarterly assessment of construction impacts on suspended solids at the project site, including, but not limited to, a comparison of the difference between the quarterly mean and 1.3 times of the ambient mean, which is defined as 30% increase of the baseline data or EPD data, of the related parameters by using appropriate statistical procedures. Suggestion of appropriate mitigation measures if the quarterly assessment analytical results demonstrate that the quarterly mean is significantly higher than the 1.3 on water quality times of the ambient mean ( $p < 0.05$ );
- (k) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- (l) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (m) a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection / pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;
- (n) comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
- (o) proponents' contacts and any hotline telephone number for the public to make enquiries.

#### **4.134 Final EM&A summary reports**

4.134.1 The termination of EM&A programme shall be determined on the following basis:

- (a) completion of construction activities and insignificant environmental impacts of

the remaining outstanding construction works;

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

4.137.1 The proposed termination may be required to consult related local community such as village representative / committee and/or District Board and the proposal should be endorsed by the Independent Check (Environment) and Engineer prior to final approval from the DEP.

4.137.2 The final EM&A summary report shall include, inter alia, the following:

- (a) an executive summary;
- (b) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the entire construction period;
- (c) a brief summary of EM&A requirements including:
  - monitoring parameters;
  - environmental quality performance limits (Action and Limit levels); and
  - environmental mitigation measures;
- (d) advice on the implementation status of environmental protection and pollution control / mitigation measures, summarised in the updated implementation status proformas;
- (e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (f) graphical plots of the trends of monitored parameters over the construction period for representative 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; and
  - the return of ambient environmental conditions in comparison with baseline data;
- (g) compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies;
- (h) provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;
- (i) advice on the solid and liquid waste management status;
- (j) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (k) a brief review of the reasons for and the implications of non-compliance

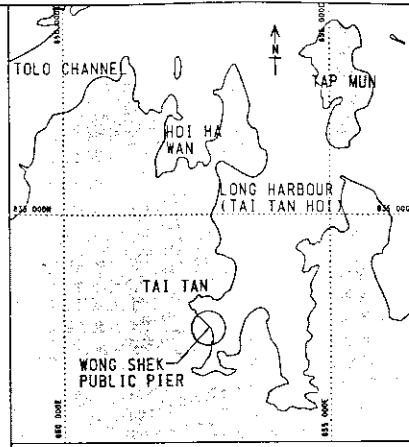
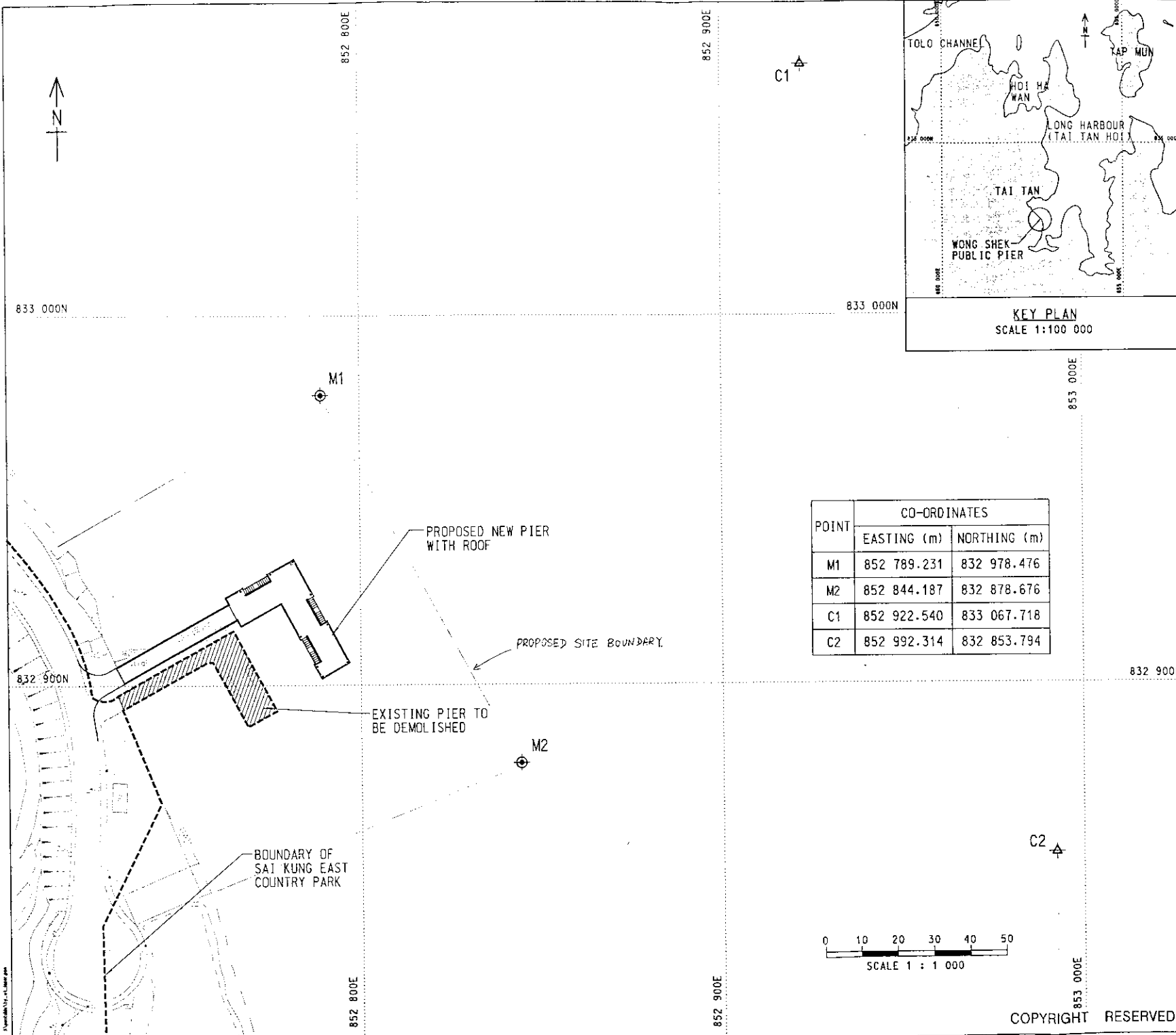
- including review of pollution sources and working procedures;
- (l) a summary description of the actions taken in the vent of non-compliance and any follow-up procedures related to earlier non-compliance;
  - (m) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
  - (n) review the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness);
  - (o) a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection / pollution control legislations, locations and nature of the breaches, investigations, follow-up actions taken and results;
  - (p) review the practicality and effectiveness of the EM&A programme (e.g. effectiveness and efficiency of the mitigation measures), recommend any improvement in the EM&A programme; and
  - (q) a conclusion to state the return of ambient and/or the predicted scenario.

#### **4.162 Data keeping**

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

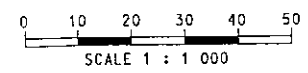
#### **4.163 Interim notifications of environmental quality limit exceedances**

With reference to Event/Action Plans in Table 2, when the environmental quality limits are exceeded, the Environmental Specialist shall immediately notify the Engineer and EPD. The notification shall be followed up with advice to the Engineer and EPD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. The format for the interim notifications shall be agreed with the Engineer and EPD.



KEY PLAN  
SCALE 1:100 000

POINT	CO-ORDINATES	
	EASTING (m)	NORTHING (m)
M1	852 789.231	832 978.476
M2	852 844.187	832 878.676
C1	852 922.540	833 067.718
C2	852 992.314	832 853.794



- NOTES
1. ALL DIMENSIONS ARE IN METRES.
  2. ALL CO-ORDINATES REFER TO HONG KONG GEODETIC DATUM 1980 AND ARE IN METRES.

- LEGEND
- ▲ CONTROL STATION
  - ⊕ MONITORING STATION

no	date	description	checked	approved
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REVISION

	name	initial	date
designed	C H CHAN		10.11.03
drawn	K L CHAN		10.11.03
traced	K L CHAN		10.11.03
checked	Y W LI		10.11.03

approved

(N P TONG)  
Chief Engineer  
date 10.11.03

contract no. -

file no. -

project no. -

contract

drawing title  
RECONSTRUCTION OF WONG SHEK PUBLIC PIER - PROPOSED WATER QUALITY CONTROL AND MONITORING STATIONS

drawing no. TS 2189	scale 1 : 1 000
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office  
TECHNICAL SERVICES DIVISION  
CIVIL ENGINEERING OFFICE

CIVIL ENGINEERING DEPARTMENT  
HONG KONG

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