

# **Improvement Works to Tung Ping Chau Public Pier Environmental Monitoring and Audit Programme**

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Appendix A – Action / Event Plan for Water Quality Monitoring (Table 2)

Drawing No. PW-TPC-006 – Environmental Monitoring

Drawing No. PW-TPC-004 – Coral Survey

## **1. Water Quality Monitoring**

### **1.1 General**

1.1.1 The works to be executed include the following major items:

- (a) Setting up of a temporary site office;
- (b) Cutting of the 6 nos. of concrete columns to appropriate level above water and the existing catwalk into several segments before delivery to a designated site to be assigned by Agriculture, Fisheries and Conservation Department as artificial reefs;
- (c) Construction of about 33m long and 5.5m wide catwalk;
- (d) Installation of 2 caissons with rock anchors as the foundation of the new catwalk;
- (e) Widening of the existing rubble causeway from 3.0m to 5.5m; and
- (f) Construction of a new roof at the existing pier head.

1.1.2 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.

1.1.3 The Contractor shall appoint an Environmental Team (ET) to conduct the monitoring and auditing works and to provide specialist advice on the undertaking and implementation of environmental responsibilities.

1.1.4 The ET shall have previous relevant experience with managing similarly sized EM&A programmes and the Environmental Team Leader (ET Leader) shall be a recognised environmental professional, with at least 7 years experience in impact assessments and impact monitoring programmes.

1.1.5 To maintain strict control of the EM&A process, the Contractor shall appoint independent environmental consultants to act as an "Environmental Auditor"

(EA) to verify and validate the environmental performance of the Contractor and his Environmental Team, including validation of all monitoring results and random site inspection.

1.1.6 The EA shall also advise the Contractor and the Engineer the necessary mitigatory measures and assess the effectiveness of them. He should review the monthly reports stated as described hereafter.

1.1.7 The EA shall be independent from the management of construction works and shall not be in any way an associated company of the Contractor. The EA shall have at least 7 years experience in Environmental Monitoring and Audit.

1.1.8 The ET 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.

1.1.9 Details of the ET and EA to be employed by the Contractor shall be submitted to the Engineer for approval prior to appointment. Termination of ET or EA shall be subject to the approval of the Engineer. The Contractor shall not terminate the service of the approved ET or EA unless a suitable replacement has been approved by the Engineer so as to ensure no disruption to the EM&A works.

## **1.2 Monitoring Parameters**

The water quality parameters, namely, dissolved oxygen (DO in mg/l), turbidity (Tby in NTU), suspended solids (SS in mg/l), and both water and ambient temperature at all monitoring stations should be measured.

## **1.3 Monitoring Stations**

Designated Monitoring and Control Stations shall be established at locations as indicated on the attached Drawing No. PW-TPC-006. Samples shall be taken at all Designated Monitoring and Control Stations in accordance with Section 1.4.

## **1.4 Monitoring Methodology and Frequency**

### **1.4.1 Baseline Monitoring**

Collection of baseline conditions for the various water quality parameters shall commence not later than 5 weeks prior to the commencement of works. EPD should be informed of the baseline monitoring schedule at least one week prior to the commencement of the baseline monitoring.

The ET shall establish the baseline conditions by measuring the monitoring

parameters stated in Section 1.2 at all Designated Monitoring and Control Stations, on 3 sampling days per week, at mid-flood and mid-ebb, for 4 consecutive weeks. The interval between 2 sets of monitoring shall not be less than 36 hours.

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.

#### 1.4.2 Impact Monitoring

During the execution of works items (b) and (d) in Section 1.1.1, monitoring shall be undertaken three days a week, each day at mid-flood and mid-ebb. During the execution of works items (c) and (e) in Section 1.1.1, 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 parameters stated in Section 1.2 shall be determined at all designated Monitoring and Control Stations. Two measurements of these parameters 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.

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. If any monitoring data exceeds the limits in Table 1 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.

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

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

Notes:

- “depth-averaged” is calculated by taking the arithmetic means of reading 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.
- The Engineer, after seeking agreement from EPD, may amend the figures given in the table whenever it is considered as necessary.

### 1.4.3 Post Construction Monitoring

On completion of works items (b), (c), (d) and (e) in Section 1.1.1, the ET 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.

## 1.5 **Water Quality Monitoring Equipment**

1.5.1 The Contractor shall provide 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.

1.5.2 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.

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

1.6.1 The results of all in situ Water Quality Monitoring shall be provided by the Contractor to the Engineers, in an agreed format, not later than 24 hours after sampling. The results of suspended solids shall be reported not later than 2 weeks after sampling.

1.6.2 Monthly reports should be prepared on each month during the works and submitted, through the Engineer, to the EPD. 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 EPD. The disk should be submitted to EPD, through the Engineer, together with the monthly report.

Following exceedance of the Limit level by any parameter for two consecutive days or more, EPD should be notified, through the Engineer, of the Limit level exceedance and the measures to prevent its recurrence.

## **1.7 Actions on Exceedance of Action and Limit Levels**

1.7.1 Where monitoring results of any water quality parameter exceed the AL levels, the ET, Contractor and the Engineer shall follow the Action/Event Plan for Water Quality Monitoring shown in Table 2 at *Appendix A*.

## **1.8 Water Quality Mitigation Measures**

1.8.1 Discharge into sewers and drains

- (a) The Contractor shall not discharge within the site boundary any wastewater arising from construction activities.

- (b) If any office, site canteen or toilet facilities is erected, temporary storage tank for the wastewater generated from kitchens shall be provided and portable chemical toilets for site office shall be used. The wastewater shall then be transported to government sewage treatment plant for disposal, or other means approved by the Engineer so that discharge of any effluent on or near the Tung Ping Chau island will not result.

#### 1.8.2 Water Pollution Control – General Requirements

- (a) During demolition of the existing catwalk, the concrete footings/column shall be left on the seabed and abandoned so as to avoid dredging and impacts on coral found around the footings.
- (b) No dredging and dumping activities shall be carried out for the Project within the site boundary.
- (c) No percussive piling shall be carried out for the Project.

#### 1.8.3 Water Pollution Control – Silt curtain

- (a) Silt curtain shall be provided during the execution of works items (b) and (d) in Section 1.1.1. 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 8 weeks before the commencement of works items (b) and (d) in Section 1.1.1, submit details of silt curtains to be used, including dimensions, exact locations and method of installation and removal, to the Engineer for approval.
- (b) During execution of works items (d), the area “ABCD” as shown in Drawing No. PW-TPC-004 shall be the area for silt curtain deployment. Silt curtain shall be installed enclosing the catwalk supporting columns foundation works area at all time throughout construction of foundation to minimize water quality impact. Divers with knowledge about corals should be present underwater during installation of the silt curtain to ensure no corals would be hit and only the least number of corals would be enclosed by the silt curtain. Decommissioning of silt curtain shall be properly controlled to avoid sudden dispersion of large quantity of muddy waters.
- (c) 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 :



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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

- (d) 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.
- (e) 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.
- (f) The Contractor shall be responsible for re-positioning of the silt curtain to suit the construction programme.

## **2. Contingency Plan for Accidental Leakage of Wastewater, Fuel and/or Other Chemicals**

### **2.1 Responsibilities of Parties Concerned**

The Contractor shall inform ET and the ER on the incident, while the ER shall notify EPD and AFCD immediately. The ET should carry out investigations/ underwater surveys as soon as possible to find out the reason of accidental leakage and the impact to the nearby marine ecology in particular coral communities resulting from the leakage and based on the investigation results, advise on any potential impact of the spilled substances to the marine environment and the nearby corals and details of the subsequent monitoring (including water quality, not limited to DO, SS and turbidity, and coral if required) in agreement with EPD and AFCD. The ET is required to monitor the environmental condition (including water quality and coral if required) until the baseline levels are restored. In case of spillage of chemical, ET, in addition to the actions above, shall also advise on the potential hazard and safety measures in handling of the substance. The Contractor shall cleanup any substances spilt over the sea. ET shall advise subsequently, if necessary, on the proper management of any waste arising from the incident.

### **2.2 Spill Prevention Measures**

The following spill prevention measures shall be carried out to minimize the occurrence of leakage of wastewater, fuel and/or other chemicals:

- (a) Construction activities with potential for leakage, including concrete batching, concrete cutting, transportation and handling of fuel, should only be undertaken with the measures in (b) or (c) below implemented to prevent the potential spillage;
- (b) Use impermeable barrier to enclose plant/equipment including concrete mixer, pneumatic breaker and fuel containers which is with potential for spillage;
- (c) Maintain adequate space between plant/equipment such as concrete mixer and fuel containers which is with potential for spillage and the edge of barge;
- (d) Perform daily visual inspection of sea surface within the site area for signs of leakage;
- (e) Storage of wastewater/fuel/chemicals on barge should be limited to absolute minimum and are to be removed from sites at the earliest opportunity;
- (f) Suitable containers should be used to hold the wastewater/fuel/chemicals to avoid leakage or spillage during storage, handling and transport;

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- (g) Avoid disorder and storage of unnecessary materials on barge/working areas;
- (h) Fuel/chemicals stored on land should be on hard standings within a bunded area;
- (i) Inspect the storage area to check for any leaking or defective containers on a regular basis;
- (j) Keep necessary protective devices/safety equipment including safety helmet and goggles, gloves which can resist chemical reaction, protective boot and clothing, first-aid kits and face visor, containers and cleanup materials such as oil absorbing materials on site for emergency use; and
- (k) Train staff to handle the spillage/leakage of fuel/chemicals.

### 2.3 Contingency Plan for Accidental Leakage of Wastewater, Fuel and/or Other Chemicals

The contingency plan for handling any possible accidental leakage of wastewater, fuel and/or other chemicals during construction is provided in Table 3.

**Table 3 – Contingency Plan for Accidental Leakage of Wastewater, Fuel and/or Other Chemicals**

| Leakage Material | Contractor   | Environmental Team (ET)  | Engineer's Representative (ER)  |
|------------------|--|--|---|
| Wastewater       | <p>Investigate the source of the leakage and control it <b>immediately</b>;</p> <p>Slow down and review the working method <b>immediately</b>;</p> <p>Inform ET, ER and AFCD <b>immediately</b>;</p> <p>Discuss with ER and propose further remedial measures to ER <b>within 48 hours</b>;</p> <p>Enhance the spill prevention measures in Section 2.2 <b>if necessary</b>.</p> | <p>Study if there are signs of stress or damages to corals resulting from the leakage. If affirmative, a coral monitoring plan should be submitted to AFCD for agreement <b>within 48 hours</b>;</p> <p><b>Within 48 hours</b>, start to conduct daily water quality monitoring on SS, DO and turbidity (and coral monitoring if required) until the baseline water quality levels are restored;</p> <p>Compare the monitoring data collected above (including coral monitoring if required) with the baseline data and identify the degree of impact caused by the leakage and report the results to ER</p> | <p>If leakage is due to working method of the Contractor and is continuous, request the Contractor to slow down and review the working method <b>immediately</b>;</p> <p>Inform EPD of the incident <b>within 48 hours</b>;</p> <p>Inform EPD and AFCD of the monitoring results <b>within 24 hours upon receipt from ET</b>.</p> <p>Review effectiveness of the remedial measures. Arrange ad-hoc meeting with EPD and AFCD <b>if necessary</b>.</p> |

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|                             |   |   |  |
|-----------------------------|---|---|--|
|                             |   | <p><b>within 24 hours from the monitoring;</b></p> <p>Ensure remedial measures are properly implemented by the Contractor.</p>  |  |
| Fuel and/or other chemicals | <p>Investigate the source of the leakage and control it <b>immediately;</b></p> <p>Inform ET, ER and AFCD <b>immediately;</b></p> <p>If the leakage is due to the Contractor, <b>immediately</b> provide containment boom to deter the spread of the spills;</p> <p><b>Immediately</b> use suitable absorbing materials to clean up the spills.</p> | <p>Study if there are signs of stress or damages to corals resulting from the leakage. If affirmative, a coral monitoring plan should be submitted to AFCD for agreement <b>within 48 hours;</b></p> <p><b>Within 24 hours</b>, start to conduct daily water quality monitoring on the relevant parameters indicating the presence of the fuel/chemicals (and coral monitoring if required) until the monitoring data indicate that the fuel/chemicals are undetectable for two consecutive days;</p> <p>Review the monitoring data collected above (including coral monitoring if required) and identify the degree of impact caused by the leakage and report the results to ER <b>within 24 hours from the monitoring;</b></p> <p>Ensure remedial measures are properly implemented by the Contractor.</p> | <p>If leakage is due to plant/equipment of the Contractor and is continuous, request the Contractor to remove the plant/equipment off site <b>immediately;</b></p> <p>Inform EPD of the incident <b>within 48 hours;</b></p> <p>Inform EPD and AFCD of the monitoring results <b>within 24 hours upon receipt from ET.</b></p> <p>Review effectiveness of the remedial measures. Arrange ad-hoc meeting with EPD and AFCD <b>if necessary.</b></p> |

### **3. Coral Monitoring**

#### **3.1 General Requirement**

3.1.1 “Foundation” in this Section means the foundation described in Section 1.1.1 (d).

3.1.2 The Contractor shall minimise adverse impacts resulting from the Contractor’s operations on the coral colonies. To achieve these requirements the Contractor shall carry out the following :-

- (a) The Contractor shall set up marker buoys to indicate the restricted area shown in the Environmental Permit. All working vessels shall be restricted to encroach the restricted area.
- (b) The Contractor shall ensure no overloading of the working barges during operation and shall avoid movement of the working barges, particularly close to the pier and shallow areas, during low tide.
- (c) The Contractor shall conduct an initial coral survey around the foundation as shown in the attached Drawing No. PW-TPC-004 to ascertain no coral colony is located in the foundation area prior to installation of silt curtain. The area “ABCD” as shown in Drawing No. PW-TPC-004 includes the areas for foundation laying and silt curtain deployment.
- (d) The coral surveys, including the initial survey, impact monitoring and post construction monitoring, shall be carried out by a person with relevant ecology degree and at least three years of relevant experience in coral survey. They may be carried out by the ET or other specialists as approved by the Engineer in agreement with the Director of Environmental Protection.

3.1.3 All field surveys must not cause any unnecessary stress or damage to the existing habitats or wildlife. Prior approval from AFCD is required for collection of coral specimens.

#### **3.2 Initial Survey**

3.2.1 The Contractor shall conduct a quantitative dive survey before commencement of works to ascertain the existence and location of coral colonies, if any, distributed within the area of coral survey as shown in the attached Drawing No. PW-TPC-004. The schedule of the initial survey shall be properly arranged such that the survey results with details of location of the foundation could be submitted to EPD at least one month before commencement of works.

3.2.2 Information shall be recorded by observers experienced in field identification of sessile benthic taxa, swimming down-current at each location using SCUBA gear. A habitat map shall be prepared for the pier using “qualitative mapping”

techniques to estimate the impact of habitat loss, if any, due to the foundation construction.

- 3.2.3 The survey area shall be covered by belt transects entirely in order to locate all coral colonies that require translocation, if any. Each belt transect shall be 2m wide, 1m either side of the transect line. Belt transects shall be laid parallel to each other with 2 m intervals.
- 3.2.4 The belt transects at the site shall be surveyed. The exact location of any coral colonies identified within the belt transects with respect to the position along the line shall be recorded.
- 3.2.5 The species of the coral colonies found in the survey area shall be recorded. Information including their specific location, size, general condition of surrounding environment, types of substrate associated and their translocation feasibility should also be recorded.
- 3.2.6 For positioning, the exact location of each transect shall be determined with a portable Global Positioning System (GPS) unit or by other appropriate means, and shall be mapped on hardcopy against the general layout plan.
- 3.2.7 If corals exist within the survey area, a coral translocation plan will be submitted to AFCD for agreement.

### **3.3 Impact Monitoring**

- 3.3.1 Prior to the installation of caisson, a dive survey should be conducted to identify at least 15 coral colonies in the vicinity of the foundation area. The coral colonies shall be selected as the Impact Monitoring Stations (IMS). Similarly, at least 5 coral colonies, which are at least 100 m away from the foundation, shall be selected as Control Monitoring Stations (CMS) for monitoring during construction of foundation. When selecting corals for IMS and CMS, the health status, colony size, species composition, growth form and distance from the construction site will be considered. Priority should be given to tag the largest and undamaged corals as these colonies are likely to be more susceptible to impacts on sedimentation. Corals of long polyp should be avoided as far as possible as they tend to have a higher tolerance response to sedimentation. The proposed IMS and CMS should be agreed by AFCD before proceeding to tag the corals. The species, location, size, general condition of the surrounding environment, health condition of the tagged corals, as well as colour and thickness of the sediment shall be recorded.
- 3.3.2 Monitoring on the tagged corals for degree of sedimentation and area of bleaching shall be conducted at the following frequency:
  - (a) Prior to the installation of caisson – 1 time (this shall form the baseline value for future monitoring);

- (b) Within one week after commencement of foundation construction – 2 times;
- (c) If no exceedance detected for the 1<sup>st</sup> week of monitoring – once every 2 weeks (2 times) for the following month;
- (d) If no exceedance detected during the coral monitoring in paragraph 3.3.2(c) above, once every three weeks until the completion of foundation construction.

### 3.3.3 The action event plan is as follows:

**Step 1** Commence monitoring at the corals tagged in Section 2.3.1. If no increase in sedimentation cover/ bleaching is observed on the corals no action is required. Monitoring should continue as scheduled. If an increase in sedimentation cover/ bleaching is observed at one or more impact monitoring stations Step 3 should be enacted, if not, Step 2.

**Step 2** If no actions are triggered a formal report should be issued to the Engineer and AFCD along with evidentiary photographs the day following completion of the monitoring. Meanwhile monitoring work and construction works should continue uninterrupted.

**Step 3** If during the Impact Monitoring a 15% increase in the percentage of sedimentation on the corals occurs at more than 20% of the tagged coral colonies at one or more Impact Monitoring Stations that is not reported at the Control Monitoring Station, then the Action Level is exceeded (Step 4).

If during the Impact Monitoring a 15% increase in the percentage of bleaching of corals occurs at more than 20% of the tagged coral colonies at one or more Impact Monitoring Stations which is not recorded at the Control Monitoring Station, then the Action Level is exceeded. (Step 4).

If the Action Level is not exceeded Step 2 is enacted.

**Step 4** If the Action Level is exceeded the ET Leader should inform all parties (Contractor, Engineer, EPD, AFCD and Environmental Auditor). The data from the water quality monitoring should also be reviewed. If the water quality monitoring shows no attributable effects of the installation works, then the Action Level is not triggered. If the water quality data indicate exceedances (for SS and/or turbidity) the ET Leader should discuss with the Contractor the most appropriate method of reducing suspended solids during foundation construction. This mitigated method should then be enacted on the next working day.

Monitoring should proceed the following day as per Step 1.

**Step 5** If during the Impact Monitoring a 25% increase in the percentage of sedimentation on the hard corals occurs at more than 20% of the tagged coral

colonies at one or more Impact Monitoring Stations that is not reported at the Control Monitoring Station, then the Limit Level is exceeded (Step 6).

If during the Impact Monitoring a 25% increase in the percentage of bleaching of hard corals occurs at more than 20% of the tagged coral colonies at one or more Impact Monitoring Stations which is not recorded at the Control Monitoring Station, then the Limit Level is exceeded (Step 6).

If the Limit Level is not exceeded Step 2 is enacted and work continues according to the mitigated method.

**Step 6** If the Limit Level is exceeded the ET Leader should inform all parties (Contractor, Engineer, EPD, AFCD and Environmental Auditor) immediately. Should the Limit Level be exceeded, the contractor should stop works immediately and work out the solution according to the requirements of EPD and AFCD. The ET Leader should inform the Contractor to suspend construction activities until an effective solution is identified. Once the solution has been identified and agreed with all parties construction works may commence.

Monitoring should proceed the following day as per Step 1.

It should be noted, that for the success of the monitoring programme there should be an element of review and revision throughout the ecological monitoring aspects of the programme as more data are gathered. This will ensure that the programme takes account of the data as they are collected and allow for full utilisation of the available information. If no actions have been triggered then the ET Leader may proposed to reduce the scale of the monitoring works for agreement by the Engineer, EPD, AFCD and the Environmental Auditor.

### **3.4 Post Construction Monitoring**

3.4.1 A dive survey, similar to the impact monitoring, for inspection of the tagged corals should be carried out within two to three weeks from the completion of the foundation construction and removal of silt curtain.

3.4.2 All tags at Impact and Control Monitoring Stations should be removed following the completion of the post construction monitoring and acceptance of the results.

### **3.5 Reporting of Ecological Monitoring Data**

3.5.1 For initial survey, impact monitoring and post construction monitoring, the Contractor shall submit a coral survey report in both hard copy and electronic medium requirement, which has been checked by the Environmental Auditor, within 10 working days of completion of the coral survey. A maximum of total six copies of the coral survey report shall be submitted to the Engineer and AFCD. The Contractor 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 coral survey report shall be in a format to the satisfaction of the Engineer. The coral survey report shall include, but not limited to, the following:-

- (a) Mapping of the location, size and species of corals with appropriate colour code or symbol code at 1:200 and 1:500 scales;
- (b) Proposed location of silt curtain(s);
- (c) Identification of affected corals within proposed silt curtain, if any, with photo records; and
- (d) Condition of tagged corals with photo records.

### **3.6 Mitigation Measures to Minimize Ecological Impacts**

3.6.1 Silt curtain shall be installed enclosing the catwalk supporting columns foundation works area at all time throughout construction of foundation to minimize water quality impact.

3.6.2 Divers with knowledge about corals should be present underwater during installation of the silt curtain to ensure no corals would be hit.

3.6.3 Decommissioning of silt curtain shall be properly controlled to avoid sudden dispersion of large quantity of muddy waters.

## **4. Site Environmental Audit**

### **4.1 Site Surveillance**

4.1.1 Site surveillance shall be undertaken regularly and routinely by the ET to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are implemented. The ET 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 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.

4.1.2 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 ET 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.

4.1.3 In order to verify the results of site surveillance conducted by the ET and validate the environmental performance of the Contractor, random site inspection shall be performed by the EA.

4.1.4 The Contractor shall update the ET 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 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 ET) to report on any remedial measures subsequent to the site inspections.

4.1.5 Ad hoc site inspections shall also be carried out by the ET 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.

## **4.2 Environmental Compliance**

4.2.1 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 ET for vetting to see whether sufficient environmental protection and pollution control measures have been included.

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

4.2.3 The Contractor shall regularly copy relevant documents to the ET 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 licence/permits under relevant environmental protection laws, and all the valid licence/permits received to date. The site diary shall also be available for the ET's inspection upon his request.

4.2.4 After reviewing the documents, the ET 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 ET'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 Auditor for any follow-up action.

4.2.5 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.

4.2.6 All the works method statements submitted by the Contractor to the Engineer for approval shall be sent to the ET for vetting. The ET 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 ET shall

**Improvement Works to Tung Ping Chau Public Pier  
Environmental Monitoring and Audit Programme**

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provide a completed copy of the Proactive Environmental Protection Proforma to the Environmental Auditor. The Auditor 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.

## **5. Reporting**

### **5.1 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.

### **5.2 Baseline Monitoring Report**

5.2.1 The ET shall prepare and submit a Baseline Environmental Monitoring Report not later than one week after the commencement of works. A maximum of six copies of the Baseline Environmental Monitoring Report shall be submitted to each of the three parties: the Contractor, the Engineer and EPD. The ET 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.

5.2.2 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.

### **5.3 Monthly Reports**

5.3.1 Monthly reports shall be prepared each month during the Works and submitted to EPD through the Engineer for information. The reports should contain an executive 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 locations, time and weather conditions; detailed description of the findings from auditing of monitoring data, exceedances and actions taken.

5.3.2 The raw data sheets of the monitoring data should be maintained properly and be accessible when they are requested. Moreover, the monitoring data should be stored in a floppy disk with the agreed format. The disk should be submitted together with the monthly report.

5.3.3 Following exceedance of the Limit level by any parameter for two consecutive days or more, EPD should be notified, through the Engineer, of the Limit level exceedance and the measures to prevent its recurrence.

**Appendix A**

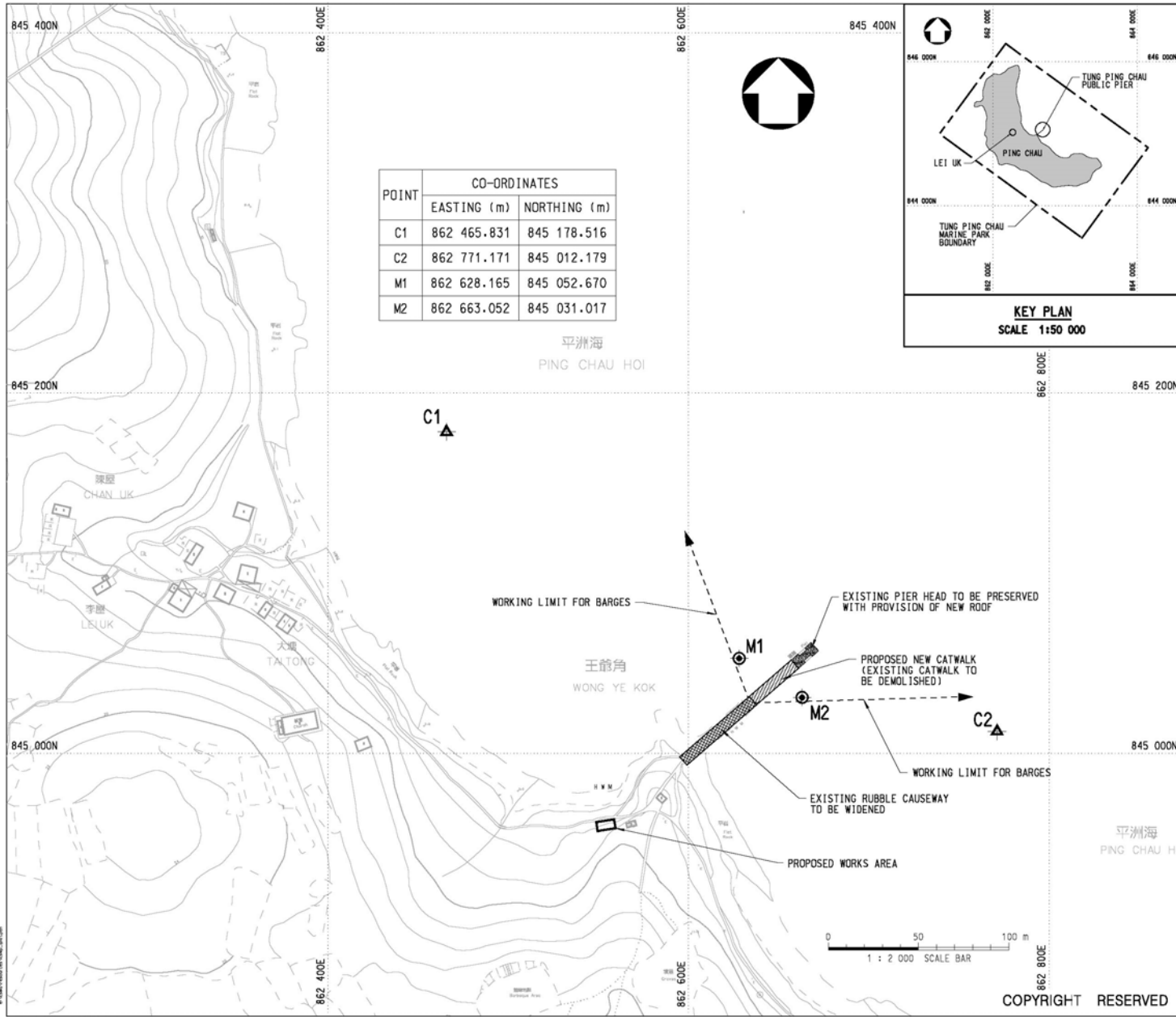
**Table 2 – Action / Event Plan for Water Quality Monitoring**

| Exceedance   | Environmental Team   | Contractor   | Engineer's Representative (ER)   |
|--|--|--|--|
| <p><b>Action level</b><br/>being exceeded by one sampling day</p>                      | <p>Repeat in-situ measurement to confirm findings;<br/>Investigate cause(s);<br/>Inform ER and Contractor;<br/>Check monitoring data, all plant, equipment and contractor's working methods;<br/>Discuss mitigation measures with the ER and Contractor;<br/>Repeat measurement on the next day of exceedance.</p>   | <p>Inform the ER and confirm notification of exceedance in writing;<br/>Review working methods and rectify unacceptable practice;<br/>Check all plant and equipment;<br/>Propose mitigation measures to ER and discuss with Environmental Team and the ER;<br/>Implement the agreed mitigation measures.</p>   | <p>Discuss with Environmental Team and the Contractor on the proposed mitigation measures;<br/>Make agreement on the mitigation measures to be implemented;<br/>Assess the effectiveness of the implemented mitigation measures.</p> |
| <p><b>Action level</b><br/>being exceeded by two or more consecutive sampling days</p> | <p>Repeat in-situ measurement to confirm findings;<br/>Investigate cause(s) and identify source(s) of impact;<br/>Inform ER and Contractor;<br/>Check monitoring data, all plant, equipment and contractor's working methods;<br/>Discuss mitigation measures with the ER and Contractor;<br/>Ensure mitigation measures are implemented;<br/>Prepare to increase the number of monitoring stations and monitoring frequency to daily;<br/>Repeat measurement on the next day of exceedance.</p> | <p>Inform the ER and confirm notification of exceedance in writing;<br/>Review working methods and rectify unacceptable practice;<br/>Check all plant and equipment;<br/>Propose mitigation measures to Engineer within 3 working days upon the notification and discuss with Environmental Team and the ER;<br/>Implement the agreed mitigation measures.</p> | <p>Discuss with Environmental Team and the Contractor on the proposed mitigation measures;<br/>Make agreement on the mitigation measures to be implemented;<br/>Assess the effectiveness of the implemented mitigation measures.</p> |

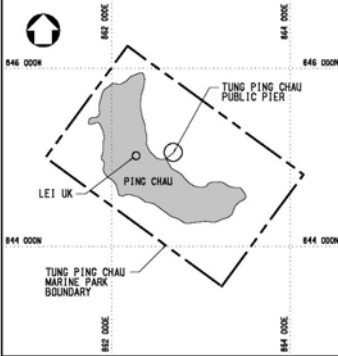
**Table 2 – Action / Event Plan for Water Quality Monitoring (Continued)**

|  |   |   |   |
|--|---|---|---|
| <p><b>Limit level</b><br/><br/>being exceeded by one sampling day</p>                      | <p>Repeat in-situ measurement to confirm findings;<br/><br/>Investigate cause(s) and identify source(s) of impact;<br/><br/>Inform ER, Contractor and EPD immediately by fax;<br/><br/>Check monitoring data, all plant, equipment and contractor’s working methods;<br/><br/>Discuss mitigation measures with the ER and Contractor;<br/><br/>Ensure mitigation measures are implemented;<br/><br/>Increase the monitoring frequency to daily until no exceedance of Limit level.</p>  | <p>Inform ER and confirm notification of exceedance in writing;<br/><br/>Review critically the working methods and rectify unacceptable practice; check all plant and equipment;<br/><br/>Propose mitigation measures to ER within 3 working days upon the notification and discuss with Environmental Team and the Engineer;<br/><br/>Implement the agreed mitigation measures.</p>  | <p>Discuss with Environmental Team and the Contractor on the proposed mitigation measures;<br/><br/>Request contractor to critically review the working methods;<br/><br/>Make agreement on the mitigation measures to be implemented;<br/><br/>Assess the effectiveness of the implemented mitigation measures.</p>  |
| <p><b>Limit level</b><br/><br/>being exceeded by two or more consecutive sampling days</p> | <p>Repeat in-situ measurement to confirm findings;<br/><br/>Investigate cause(s), identify source(s) of impact and consider what portion of the work is responsible;<br/><br/>Check monitoring data, all plant, equipment and contractor’s working methods;<br/><br/>Inform ER, Contractor and EPD immediately by fax;<br/><br/>Discuss mitigation measures with the ER and Contractor; Arrange meeting with EPD and ER to discuss the remedial actions to be taken and provide reports to EPD.<br/><br/>Ensure mitigation measures are implemented;<br/><br/>Access effectiveness of Contractor's remedial actions and keep EPD and ER informed of the results;<br/><br/>Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.</p> | <p>Inform ER and confirm notification of exceedance in writing;<br/><br/>Review critically the working methods and rectify unacceptable practice; check all plant and equipment;<br/><br/>Propose mitigation measures to ER within 3 working days upon the notification and discuss with Environmental Team and the Engineer;<br/><br/>Implement the agreed mitigation measures.<br/><br/>As directed by ER, to slow down or STOP all or part of works items (b), (c), (d) and (e) in Section 1.1.1 until no exceedance of Limit level.</p> | <p>Discuss with Environmental Team and the Contractor on the proposed mitigation measures;<br/><br/>Request contractor to critically review the working methods;<br/><br/>Make agreement on the mitigation measures to be implemented;<br/><br/>Assess the effectiveness of the implemented mitigation measures.<br/><br/>Consider and instruct, if necessary, the Contractor to slow down or to STOP all or part of works items (b), (c), (d) and (e) in Section 1.1.1 until no exceedance of Limit level.</p> |





| POINT | CO-ORDINATES |              |
|-------|--------------|--------------|
|       | EASTING (m)  | NORTHING (m) |
| C1    | 862 465.831  | 845 178.516  |
| C2    | 862 771.171  | 845 012.179  |
| M1    | 862 628.165  | 845 052.670  |
| M2    | 862 663.052  | 845 031.017  |



**KEY PLAN**  
SCALE 1:150 000

- 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 |
|----------|------|-------------|---------|----------|
| REVISION |      |             |         |          |
|          |      | name        | initial | date     |
| designed |      | K Y LAM     |         | 20.9.05  |
| drawn    |      | C K LI      |         | 20.9.05  |
| traced   |      | C K LI      |         | 20.9.05  |
| checked  |      | W C LEUNG   |         | 20.9.05  |

approved

(W. C. LEUNG)  
Chief Engineer  
date 20.9.05

contract no.

file no.

project no.

contract

drawing title

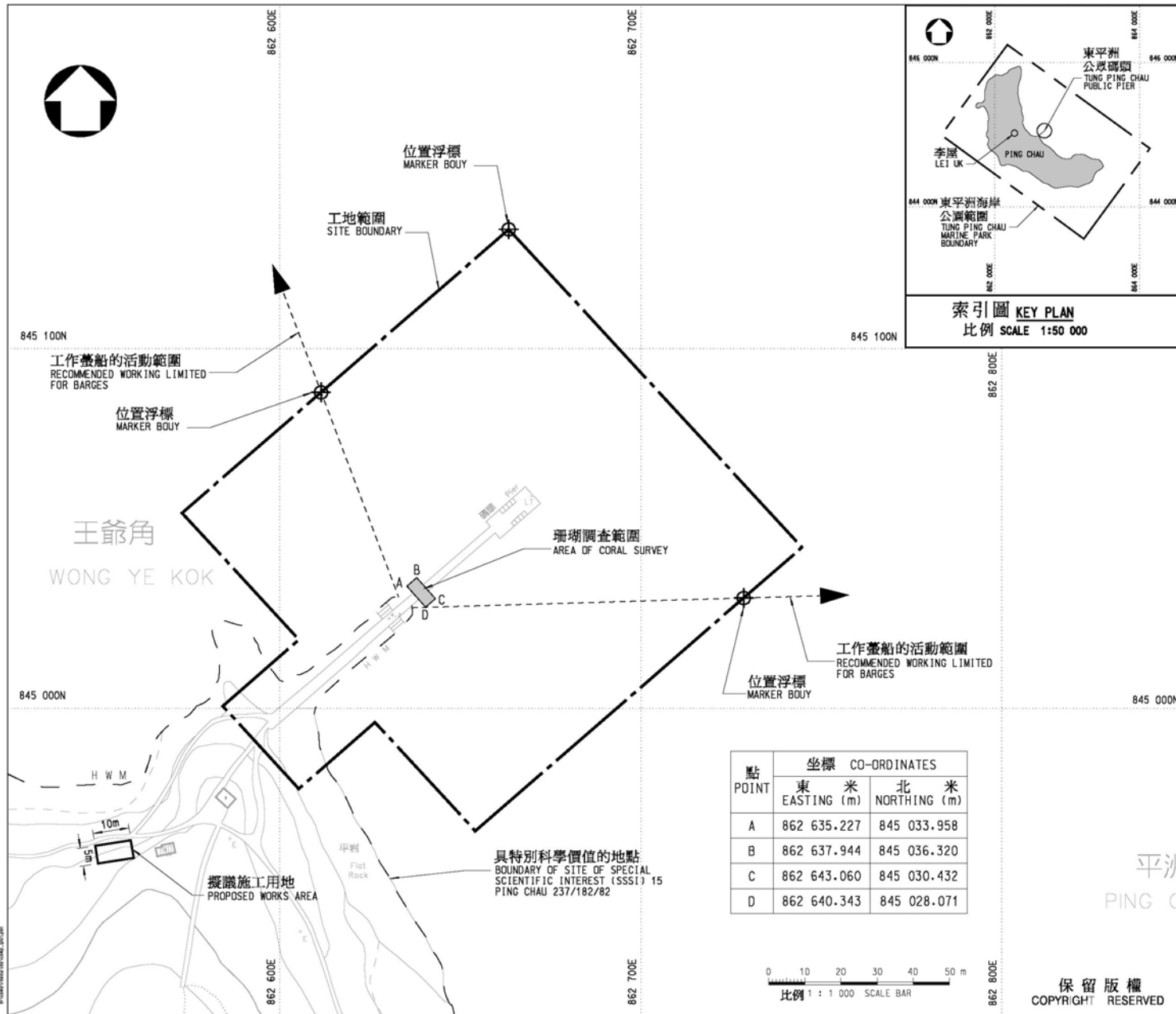
**IMPROVEMENT WORKS TO TUNG PING CHAU PUBLIC PIER - ENVIRONMENTAL MONITORING**

drawing no. **PW-TPC-006** scale 1 : 2000 OR AS SHOWN

office  
PORT WORKS DIVISION  
CIVIL ENGINEERING OFFICE

**CEDD** CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT HONG KONG

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索引圖 KEY PLAN  
比例 SCALE 1:50 000

注釋 NOTES

1. ALL DIMENSIONS ARE IN METRES. 所有尺寸均以米標示。
2. ALL CO-ORDINATES REFER TO HONG KONG GEODETIC DATUM 1980 AND ARE IN METRES. 所有坐標均根據香港1980大地基準以米標示。

| 編號<br>No.      | 日期<br>date | 說明<br>description | 核對<br>checked | 核准<br>approved |
|----------------|------------|-------------------|---------------|----------------|
| 修訂 REVISION    |            |                   |               |                |
|                |            | 姓名 name           | 簡簽 initial    | 日期 date        |
| 設計<br>designed |            | K Y LAM           |               | 25.5.05        |
| 繪圖<br>drawn    |            | K L CHAN          |               | 25.5.05        |
| 摹描<br>traced   |            | K L CHAN          |               | 25.5.05        |
| 核對<br>checked  |            | W C LEUNG         |               | 25.5.05        |

核准 approved  
 (W. C. LEUNG)  
 核准日期 date: 25.5.05

合約編號 contract no.  
 檔案編號 file no.  
 工程編號 project no.  
 合約 contract

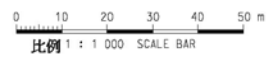
名稱 drawing title  
**IMPROVEMENT WORKS TO TUNG PING CHAU PUBLIC PIER - CORAL SURVEY**  
 東平洲公眾碼頭改善工程 - 珊瑚調查

圖則編號 drawing no. **PW-TPC-004**  
 比例 scale 1:1000 OR AS SHOWN

office 辦事處  
 PORT WORKS DIVISION 海港工程處  
 CIVIL ENGINEERING OFFICE 土木工程處



| 點 POINT | 坐標 CO-ORDINATES |                  |
|---------|-----------------|------------------|
|         | 東 米 EASTING (m) | 北 米 NORTHING (m) |
| A       | 862 635.227     | 845 033.958      |
| B       | 862 637.944     | 845 036.320      |
| C       | 862 643.060     | 845 030.432      |
| D       | 862 640.343     | 845 028.071      |



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