

## EM&A MANUAL



**AXON**  
CONSULTANCY

**Asia Pacific Gateway (APG) – Tseung Kwan O**

**Asia Pacific Gateway (APG) – 將軍澳**

**EM&A Manual**

January 2014

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**Environmental Resources Management**

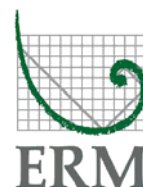
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**For and on behalf of**  
**ERM-Hong Kong, Limited**  
香港環境資源管理顧問有限公司

Approved by 批核: Terence Fong



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Position 職位: Partner

Date 日期: January 2014

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# 1 INTRODUCTION

## 1.1 BACKGROUND

In order to help meet the tremendous telecommunication services requirements for intra-Asia connectivity between South East Asia and North Asia, the **APG Consortium** has decided to build a submarine telecommunication cable system, which will be approximately 10,400 km in length, connecting the major business hubs across the region – the Asia Pacific Gateway (APG). The cable will link up with several countries, including Malaysia, Singapore, Vietnam, Taiwan, Mainland China, Japan, Korea and the Hong Kong Special Administrative Region (HKSAR). Since the cable that branches to HKSAR will ultimately connect to land at Tseung Kwan O (TKO), for the purposed of this EM&A Manual the HKSAR section of the submarine cable will be referred to at the APG-TKO cable.

As one of the members of the APG Consortium, **China Mobile International Limited (CMI)** proposes to install the APG-TKO section of the cable and the route of the proposed APG-TKO is depicted in *Figure 1.1*. The APG-TKO landing site is situated within the TKO Industrial Estate, behind a rubble mound sea wall, on the reclaimed land (See *Figure 1.2*). CMI is responsible for securing the approval to land the APG-TKO in TKO and The proposed cable would land via an existing Beach Manhole (BMH) and ultimately connect with a Cable Landing Station in the TKO Industrial Estate which is presently under construction and has been approved by the Buildings Department (BD no. 2/9229/11 (P)). The Cable Landing Station is scheduled for completion in 2014. The shore end of the APG cable segment will connect to the existing BMH via the existing conduit laid under the seawall. In order to complete the link between the BMH and the Cable Landing Station, the land cable will be installed in a conduit along the terrestrial route. Part of the underground cable conduit from the BMH to Chun Yat Street already exists but along Chun Yat Street to the Cable Landing Station the underground cable conduit will have to be newly installed (See *Figure 1.2*). It should be noted that Tseung Kwan O is currently the landing site for a number of submarine cables. The proposed submarine cable will travel west and southward from TKO as it approaches the Tathong Channel. After crossing the Tathong Channel and near to Cape Collinson, the cable then runs approximately parallel to the Tathong Channel until north of Sung Kong Island where it then turns eastward to the boundary of HKSAR waters where it enters the South China Sea. *Figure 1.1* depicts the proposed APG submarine cable route.

The Project Profile (PP-496/2013) (which includes an assessment of the potential environmental impacts associated with the installation of the submarine telecommunications cable system within HKSAR, including the connection to land at TKO), was prepared and submitted to the Environmental Protection Department (EPD) under section 5(1)(b) and 5(11) of the Environmental Impact Assessment Ordinance (EIAO) for the application

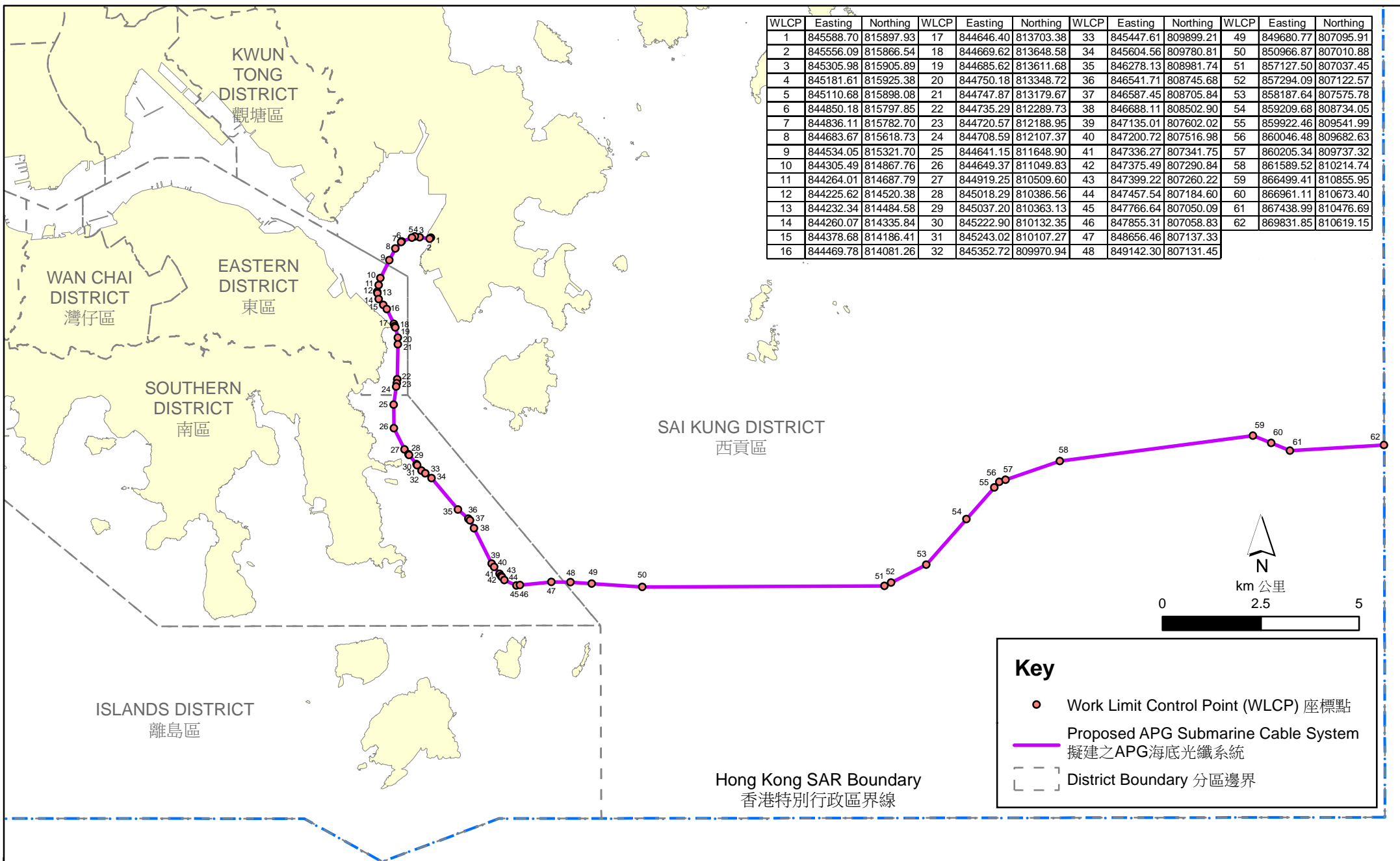


Figure 1.1  
圖 1.1

Proposed APG Submarine Cable System  
擬建之APG海底光纖系統

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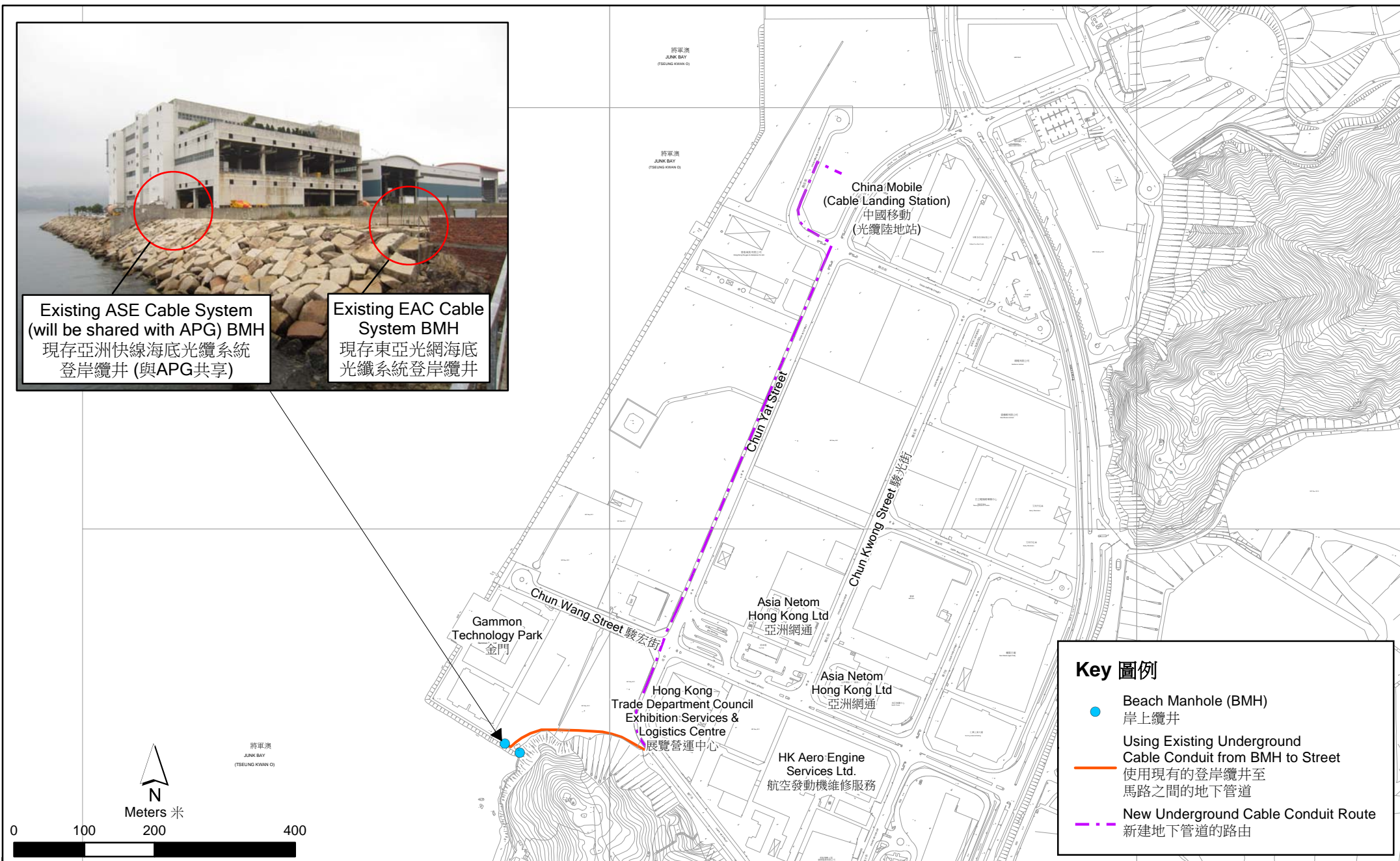


Figure 1.2  
圖 1.2

Location of APG Landing Site and Terrestrial Cable Route  
APG海底光纖系統登岸地點及陸上路由

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for Permission to apply directly for Environmental Permit (EP). The Environmental Protection Department, subsequently issued an approval letter on Application for Permission to Apply Directly for Environmental Permit on 15<sup>th</sup> November 2013 (Ref: (13) in EP2/G/C/163 Pt.2). The assessment was based on information compiled by the Project Proponent describing the expected Project installation activities.

Once installed and operating smoothly, the cable will not result in any impact to the environment.

Although no unacceptable environmental impacts have been identified, it is recommended that during APG-TKO installation works an Environmental Monitoring and Audit (EM&A) programme is conducted to: verify whether monitoring results are in line with predicted impacts; monitor the effectiveness of any precautionary or control measures employed; and, ensure that if any adverse impacts to sensitive receivers are detected, they are addressed appropriately.

The key aspects of the EM&A programme include Water Quality Monitoring and Coral Monitoring as well as the implementation a Marine Mammal Exclusion Zone (conducted according to the location of works) to verify and ensure that the project works will not result in any impacts to water quality, marine ecology or fisheries. :

The key mitigation measures proposed in the Project Profile (PP-496/2013) during the cable installation works include:

- The crane barge used for the transport of debris recovered from the seabed during route clearance shall be fitted with tight bottom seals in order to prevent leakage of material during loading and transport;
- The crane barge should be filled to a level which ensures that material does not spill over during loading and transport to the disposal site and that adequate freeboard is maintained to ensure that the decks are not washed by wave actions;
- The forward speed of installation barge will be limited to a maximum of 1 km hr<sup>-1</sup> so that the amount of seabed sediment disturbed and dispersed during the cable installation process can be kept to a minimum;
- A crane barge with tight bottom seas will be used for the transport of debris recovered from the seabed during route clearance, and be loaded appropriately;
- Good house-keeping practices for onshore activities at the cable landing will serve to avoid impacts to water quality;
- Multi-layer Silt curtain will be employed around the seawall area and near Cape Collinson to reduce the dispersion of sediments;

- A Water Quality Monitoring Programme will be conducted to verify that adverse impacts do not occur to water quality, marine ecology and fisheries due to the Project works;
- A coral monitoring programme will be conducted at Cape Collinson and Tai Long Pai as well as the control site Tung Lung Chau prior to, and after, the cable installation works to verify that no adverse impacts occur to the corals that are in the vicinity of the cable alignment zone.
- A marine mammal exclusion zone within a radius of 250 m from the cable installation barge will be implemented during the cable installation works in certain areas, to verify that the area is clear of marine mammals prior to the commencement of works and to reduce any disturbance to them.

## 1.2

### *PURPOSE OF THE MANUAL*

ERM-Hong Kong, Limited (ERM) has been appointed by CMI to undertake the environmental permitting and prepare the Environmental Monitoring and Audit (EM&A) Manual (“the Manual”) for this Project. This Manual is a supplementary document of the project entitled *Asia Pacific Gateway (APG) – Tseung Kwan O* (Application No.: DIR-233/2013) and is required to be submitted to the Director of Environmental Protection for approval prior to the application for an environmental permit as listed under the *Conditions Imposed under Section 5(12) of the EIA Ordinance for Permission to Apply Directly for Environmental Permit*.

The EM&A Manual has been prepared to:

- Monitor the effectiveness of the control measures employed during the cable installation (laying works as well as testing and finalisation) ;
- Verify that the project works are not resulting in any impacts to water quality at seawater intakes at Junk’s Bay and Siu Sai Wan, coral communities and Fish Culture Zone at Tung Lung Chau, and coral communities at Tai Long Pai, Fat Tong Chau, Sung Kong and Waglan Island;
- To ensure that any adverse impacts are detected during the cable laying process and that appropriate action is undertaken in the event that there impacts identified to sensitive receivers are found to be associated with the cable installation works;
- Carry out coral monitoring works at Impact stations (Cape Collinson and Tai Long Pai) which are in the vicinity of the alignment of cable and at Control station (Tung Lung Chau) to ensure corals (ie hard corals, octocorals and black corals) are not affected by the cable laying works; and
- Verify the project works are not carried out if marine mammals (ie Finless Porpoise) are within a radius of 250 m from the cable alignment site, so to ensure they will not be disturbed by the cable laying works.



### 1.3 ORGANIZATION AND STRUCTURE OF THE EM&A

#### 1.3.1 *General*

The Project will be led and managed by CMI. Planning and construction of the submarine cable system will be undertaken by NEC Corporation on behalf of CMI.

CMI will 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. The ET shall have previous experience with managing similarly sized EM&A programmes and the Environmental Team Leader (ET Leader) shall be a recognized environmental professional, preferably with a minimum of 7 years relevant experience in impact assessment and impact monitoring programmes.

To maintain strict control of the EM&A process, CMI shall appoint an independent environmental consultant to act as an "Independent Environmental Checker" (IC(E)) to verify and validate the environmental performance of the Contractor and his Environmental Team.

#### 1.3.2 *Project Organisation*

The roles and responsibilities of the various parties involved in the EM&A process are further expanded in the following sections. The ET Leader will be responsible for, and in charge of, the Environmental Team; and shall be the person responsible for executing the EM&A requirements.

##### *Contractor*

Reporting to CMI, the Contractor shall:

- Work within the scope of the Project installation contract and other tender conditions;
- Provide assistance to the ET in conducting the required environmental monitoring;
- Participate in the site inspections undertaken by the ET, as required, and undertake any corrective actions instructed by CMI;
- Implement measures to reduce impact where Action and Limit levels are exceeded; and
- Take responsibility and strictly adhere to the guidelines of the EM&A programme and complementary protocols developed by their project staff.

CMI

CMI will:

- Employ an ET to undertake monitoring, laboratory analysis and reporting of the EM&A requirements outlined in this Manual;
- Employ an IC(E) to verify and validate the environmental performance of the Contractor and his Environmental Team
- Monitor the Contractor's compliance with contract specifications, including the effective implementation and operation of environmental mitigation measures and other aspects of the EM&A programme;
- Comply with the agreed Event and Action Plan in the event of any exceedance; and
- Instruct the Contractor to follow the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

*Environmental Team*

The duties of the Environmental Team (ET) and Environmental Team Leader (ET Leader) are to:

- Monitor the various environmental parameters as required by this or subsequent revisions to the EM&A Manual;
- Assess the EM&A data and review the success of the EM&A programme determining the adequacy of the mitigation measures implemented and the validity of the Project Profile predictions as well as identify any adverse environmental impacts before they arise;
- Conduct regular site inspections and to investigate and inspect the Contractor's equipment and work methodologies with respect to pollution control and environmental mitigation, monitor compliance with the environmental issues that may require mitigation before the problem arises;
- Audit environmental monitoring data and report the status of the general site environmental conditions and the implementation of mitigation measures resulting from site inspections;
- Review Contractor's working programme and methodology, and comment as necessary;
- Investigate and evaluate complaints, and identify corrective measures;
- Advice to the Contractor on environmental improvement, awareness, enhancement matters, etc., on site;

- Report on the environmental monitoring and audit results and the wider environmental issues and conditions to the IC(E), Contractor, CMI and the EPD; and
- Adhere to the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

The ET shall be led and managed by the ET leader. The ET leader shall have relevant education, training, knowledge, experience and professional qualifications. Suitably qualified staff shall be included in the ET, and ET should not be in any way an associated body of the Contractor.

#### *Independent Environmental Checker*

An Independent Environmental Checker [IC(E)], independent from the management of Project installation works, shall be appointed to audit and verify the overall environmental performance of the works and to assess the effectiveness of the ET in their duties. The main objectives will be to:

- Review and monitor the implementation of the EM&A programme and the overall level of environmental performance being achieved;
- Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers, especially the distance between locations of the major coral communities at Tai Long Pai and Cape Collinson and the alignment of cable;
- Check complaint cases and the effectiveness of corrective measures; and
- Review EM&A report submitted by the ET leader and feedback review results to ET by signing off relevant EM&A proformas.

The IC(E) should not be in any way an associated body of the Contractor or ET.

### **1.4** *STRUCTURE OF THE EM&A MANUAL*

The remainder of the Manual is set out as follows:

- *Section 2* details the requirements for water quality baseline, impact and Post Project monitoring, and lists relevant monitoring equipment, compliance and Event and Action Plans (EAPs);
- *Section 3* details the requirements for Baseline and Post Project surveys of coral monitoring, and lists relevant monitoring equipment, compliance and EAPs;
- *Section 4* describes the requirements for marine mammals (ie Finless Porpoise) monitoring and lists the relevant actions needed to be taken;

- *Section 5* describes the scope and frequency of site auditing; and
- *Section 6* describes the handling of environmental complaints.

The EM&A Manual is an evolving document that should be updated to maintain its relevance as the Project progresses. Revisions to the original EM&A Manual may take place:

- a) once the monitoring locations have been agreed with CMI, Independent Environmental Checker [IC(E)] and EPD; and
- b) when the proposed work processes and activities had been determined following any supplementary environmental reviews which are required.

The primary focus for reviews are to ensure the impacts predicted and the recommended mitigation measures remain consistent and appropriate to the manner in which the works are to be carried out.

Potential impacts on water quality associated with the Project works have been identified in the Project Profile. Mitigation measures associated with water quality and recommended in the Project Profile, include:

- Limiting the forward speed of the installation barge to a maximum of 1 km hour-1;
- Provision of a multi-layer silt curtain as a precautionary measure for the closest water sensitive receiver (WSR) E8 at the south of Cape Collinson (see Figure 2.1 below);

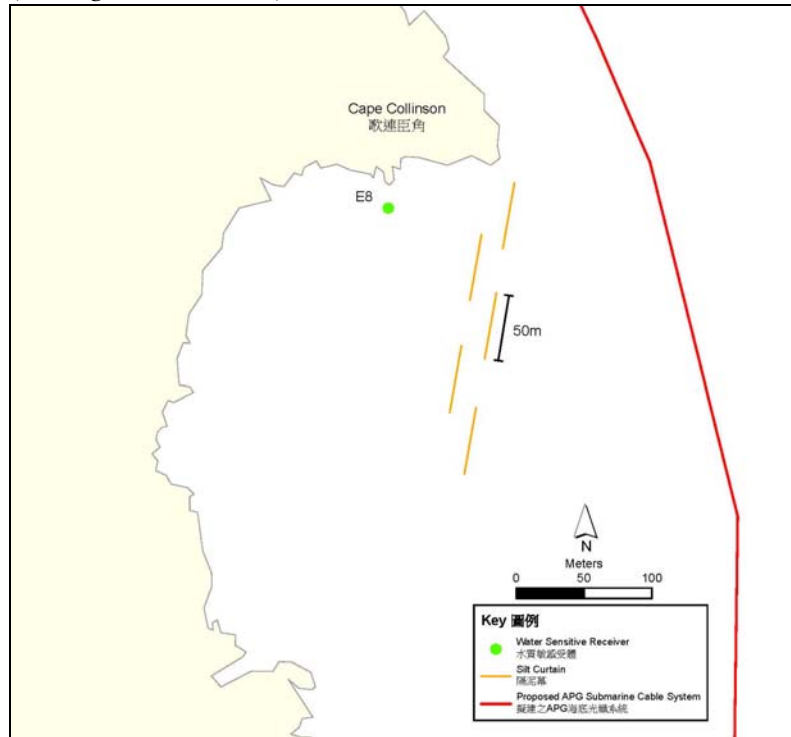


Figure 2.1 Indicative Location of Silt Curtain proposed for WSR E8

- The crane barge used for the transport of debris recovered from the seabed during route clearance
  - is fitted with tight bottom seals in order to prevent leakage of material during loading and transport;
  - is filled to a level which ensures that material does not spill over during loading and transport to the disposal site; and
  - maintains adequate freeboard to ensure that the decks are not washed by wave actions;
- Conducting a Water Quality Monitoring Programme (as detailed below).

In addition to the above, water quality protection measures during land based cable installation will also be incorporated as part of good working practices and these include:

- Stockpiles of materials will be covered with tarpaulin or similar fabric to minimise runoff during the rainy season;

- Care will be taken during the cable landing and construction to avoid any spillage of materials to the adjacent marine waters and to ensure that spoil materials are not discharged into adjacent waters;
- All construction waste and drainage will be handled and disposed of in accordance with the *Waste Disposal Ordinance and Practice Note for Professional Persons, Construction Site Drainage (ProPECC PN1/94)*; and
- Best Management Practices (BMPs) will be applied to avoid and minimise contaminated runoff from work sites, marine plants and vessels.

The following Section provides details of the Water Quality Monitoring Programme during the installation (laying, testing and finalisation) of the submarine cable.

## 2.1 SAMPLING AND TESTING METHODOLOGY

### 2.1.1 Parameters Measured

The parameters to be measured *in situ* are:

- dissolved oxygen (DO) (% saturation and mgL<sup>-1</sup>)
- temperature (°C)
- turbidity (NTU)
- salinity (‰ or ppt)

The only parameter to be measured in the laboratory is:

- suspended solids (SS) (mgL<sup>-1</sup>)

In addition to the water quality parameters, other relevant data shall also be measured and recorded in field logs, including the location of the sampling stations and cable burial machine at the time of sampling, water depth, time, weather conditions, sea conditions, tidal state, current direction and speed, special phenomena and work activities undertaken around the monitoring and works area that may influence the monitoring results.

### 2.1.2 Equipment

For water quality monitoring, the following equipment shall be supplied and used by the environmental contractor.

- ***Dissolved Oxygen and Temperature Measuring Equipment*** - The instrument shall be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and shall be operable from a DC power source. It shall be capable of measuring: dissolved oxygen levels in the range of 0 – 20 mgL<sup>-1</sup> and 0-200% saturation; and a temperature of 0-45 degrees Celsius.

It shall have a membrane electrode with automatic temperature compensation complete with a cable of not less than 35 m in length. Sufficient stocks of spare electrodes and cable shall be available for



replacement where necessary (for example, YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).

- ***Turbidity Measurement Equipment*** - Turbidity should be measured from a split water sample from the SS sample. A suitable turbidity test kit should be used to measure the turbidity level.
- ***Salinity Measurement Instrument*** - A portable salinometer capable of measuring salinity in the range of 0-40 ppt shall be provided for measuring salinity of the water at each monitoring location.
- ***Water Depth Gauge*** - No specific equipment is recommended for measuring the water depth. However, water depth gauge affixed to bottom of the water quality monitoring vessel is preferred. The environmental contractor shall seek approval of their proposed equipment with the client prior to deployment.
- ***Current Velocity and Direction*** - No specific equipment is recommended for measuring the current velocity and direction. However, the environmental contractor shall seek approval of their proposed equipment with the client prior to deployment.
- ***Positioning Device*** - A Global Positioning System (GPS) shall be used during monitoring to ensure the accurate recording of the position of the monitoring vessel before taking measurements. The use of DGPS is preferred for positioning device, which should be well calibrated at appropriate checkpoint (e.g. Quarry Bay Survey Nail).
- ***Water Sampling Equipment*** - A water sampler, consisting of a transparent PVC or glass cylinder of not less than two litres, which can be effectively sealed with cups at both ends, shall be used (Kahlsico Water Sampler 13SWB203 or an approved similar instrument). The water 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.

### 2.1.3 ***Sampling/Testing Protocols***

All *in situ* monitoring instruments shall be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use, and subsequently re-calibrated at-monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes shall be checked with certified standard solutions before each use.

For the on-site calibration of field equipment, the BS 1427: 1993, Guide to Field and On-Site Test Methods for the Analysis of Waters shall be observed. Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when equipment is under maintenance, calibration etc.

Water samples for SS measurements shall be collected in high density polythene bottles, packed in ice (cooled to 4° C without being frozen), and delivered to a HOKLAS laboratory as soon as possible after collection.

At least two (2) replicate samples should be collected from each of the monitoring events for *in situ* measurement and lab analysis.

#### 2.1.4 *Laboratory Analysis*

All laboratory work shall be carried out in a HOKLAS accredited laboratory. Water samples of about 1,000 mL shall be collected at the monitoring and control stations for carrying out the laboratory determinations. The determination work shall start within the next working day after collection of the water samples. The SS laboratory measurements shall be provided to the client within 2 days of the sampling event (48 hours). The analyses shall follow the standard methods as described in APHA Standard Methods for the Examination of Water and Wastewater, 19th Edition, unless otherwise specified (APHA 2540D for SS).

The submitted information should include pre-treatment procedures, instrument use, Quality Assurance/Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per-batch etc), detection limits and accuracy. The QA/QC details shall be in accordance with requirements of HOKLAS or other internationally accredited scheme (e.g. NATA of Australia and CNAS of China which are under mutual recognition agreements with HOKLAS).

## 2.2 *MONITORING LOCATIONS*

The monitoring station locations have been established to identify potential impacts to water and ecological sensitive receivers.

Prior to, during, and after Project marine installation works, water quality sampling will be undertaken at stations situated around the cable laying works at Junk Bay and near to Tung Lung Chau and Tai Long Pai. The monitoring at these stations is to ensure the Project marine installation works of the Project do not affect the sensitive area nearby (shown in *Figure 2.2*).

- B1 is an Impact Station to monitor the impacts of cable installation works on the Big Wave Bay Beach;
- B2 is an Impact Station to monitor the impacts of cable installation works on the Rocky Bay Beach;
- B3 is an Impact Station to monitor the impacts of cable installation works on the Shek O Beach;
- E1 is an Impact Station to monitor impacts of cable installation works on Cape d'Aguilar Marine Reserve;



Figure 2.2  
圖 2.2

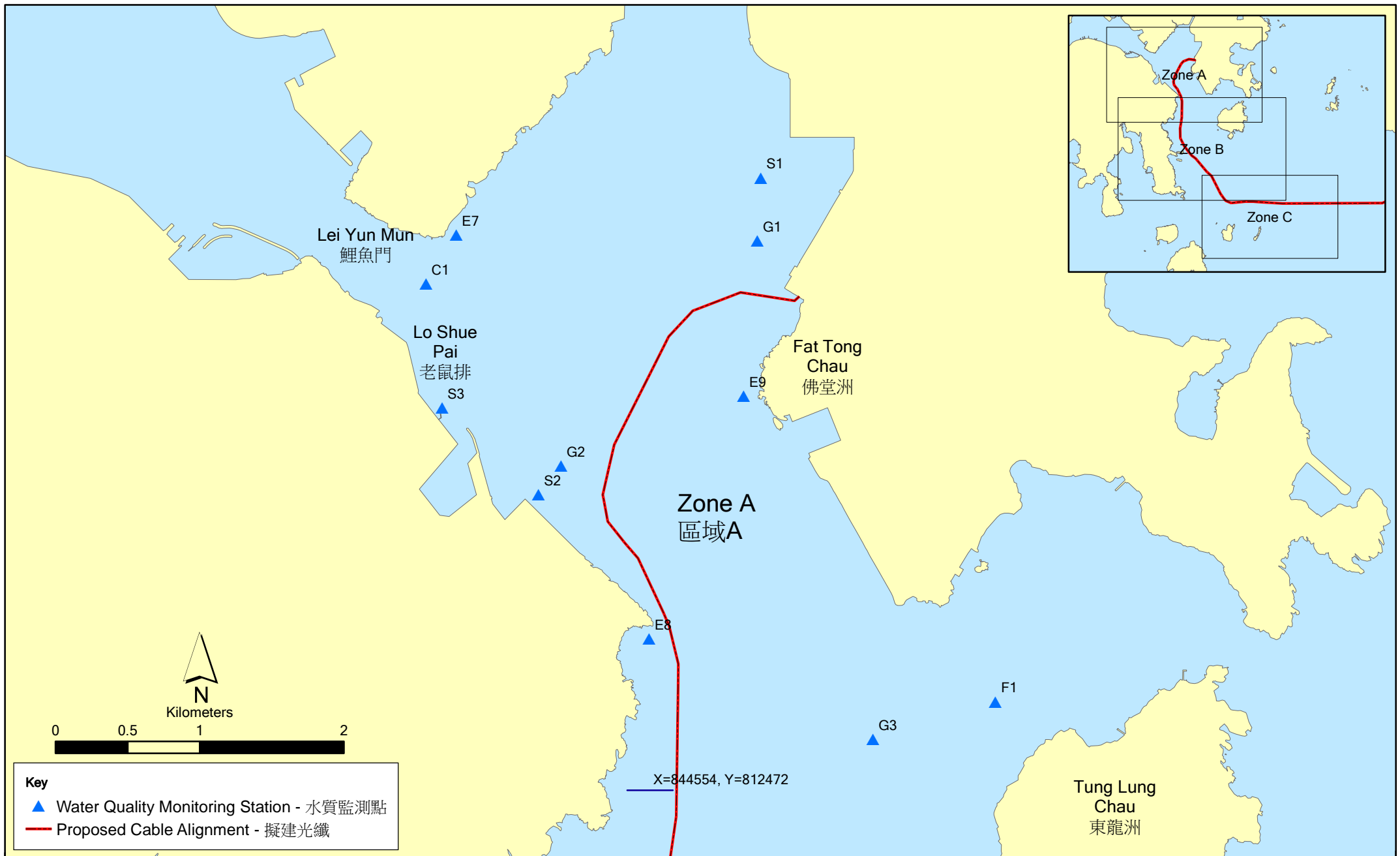
Proposed Water Quality Monitoring Station  
擬建水質監測點

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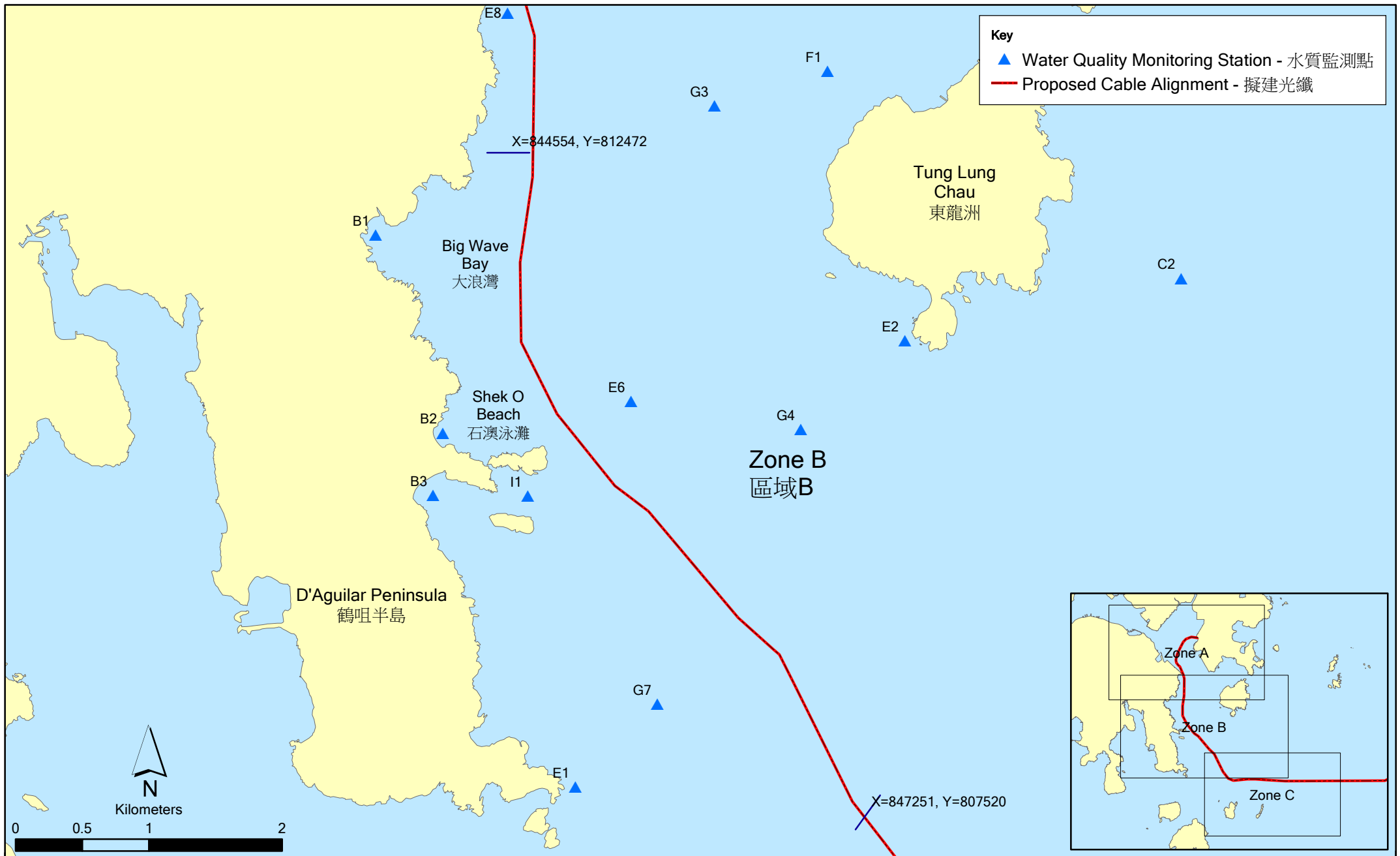


Figure 2.4  
圖 2.4

Proposed Water Quality Monitoring Station (Zone B)  
擬建區域B內的水質監測點

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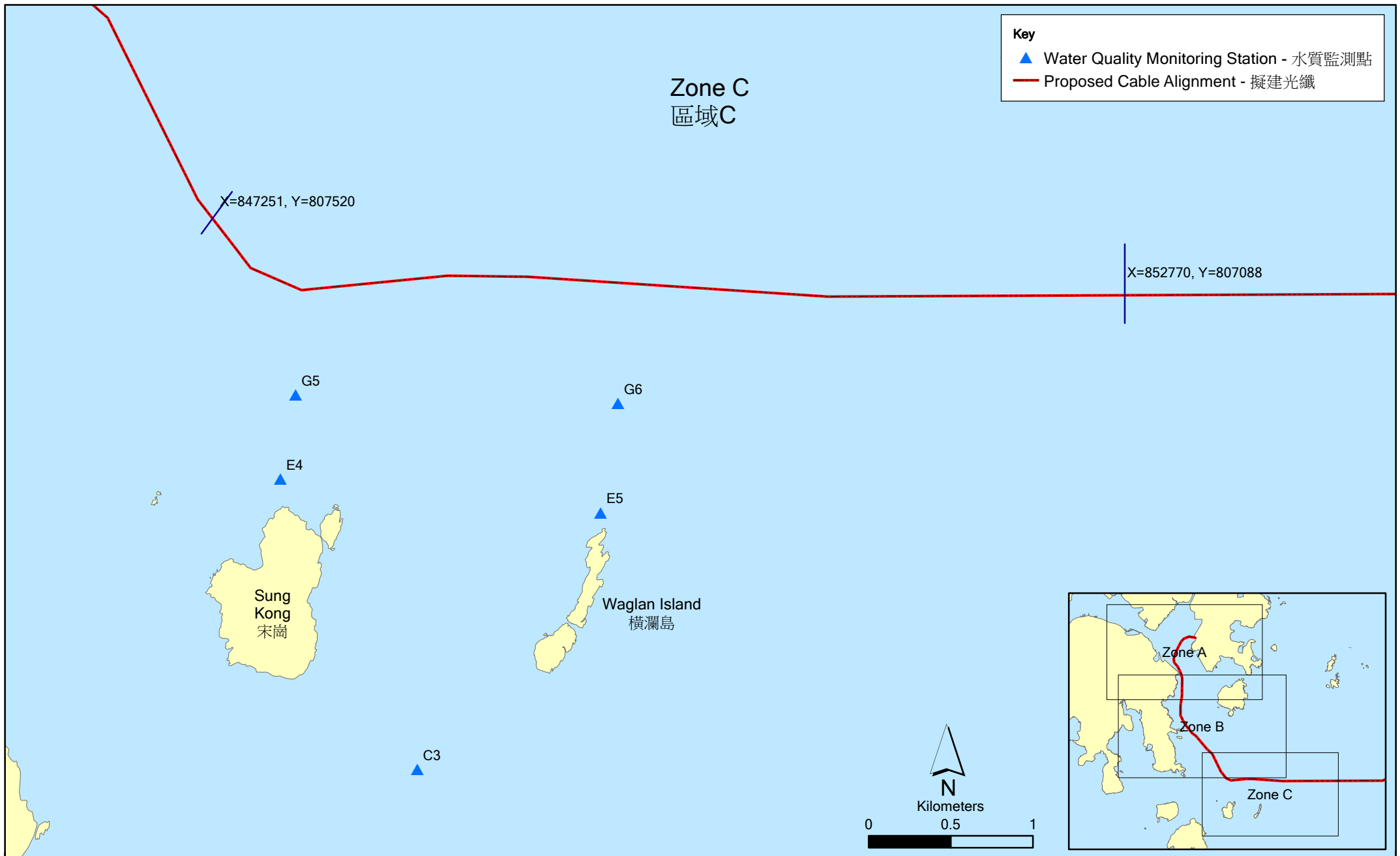


Figure 2.5  
圖 2.5

Proposed Water Quality Monitoring Station (Zone C)  
擬建區域C內的水質監測點

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- E2 is an Impact Station to monitor the impacts of cable installation works on the coral communities at Tung Lung Chau;
- (There is no Impact Station E3 as E3 represents coral communities along the coast of Ninepins, over 5 km from the cable installation works, and will not be affected by the Project due to the distance)
- E4 is the Impact Station to monitor the impacts of cable installation works on the coral communities at the coast of Sung Kong;
- E5 is the Impact Station to monitor the impacts of cable installation works on the coral communities at the coast of Waglan Island;
- E6 is an Impact Station to monitor the impacts of cable installation works on the coral communities at Tai Long Pai (the Gradient Station is not set due to the insufficient distance between this Impact Station and the nearby proposed cable works which may affect the cable laying works);
- E7 is an Impact Station to monitor the impacts of cable installation works on the coral communities along Junk Bay – South West;
- E8 is an Impact Station to monitor the impacts of cable installation works on the coral communities at Cape Collinson (the Gradient Station is not set due to the insufficient distance between this Impact Station to nearby proposed cable works which may affect the cable laying works);
- E9 is an Impact Station to monitor the impacts of cable installation works on the coral communities at Fat Tong Chau (the Gradient Station is not set due to the insufficient distance between this Impact Station to nearby proposed cable works which may affect the cable laying works);
- F1 is an Impact Station to monitor the impacts of cable installation works on the Tung Lung Chau Fish Culture Zone;
- I1 is an Impact Station to monitor the impacts of cable installation works on the Shek O Headland SSSI;
- S1 is an Impact Station situated at the WSD Seawater Intake Point in Junk Bay. It is located within 500 m north of the cable alignment at Junk Bay and set up to monitor the effect of cable laying works in the area;
- S2 is an Impact Station to monitor the impacts of cable installation works on the WSD Seawater Intake at Siu Sai Wan;
- S3 is an Impact Station to monitor the impacts of cable installation works on the Pamela Youde Nethersole Eastern Hospital Cooling Water Intake at Heng Fa Chuen;
- G1 is a Gradient Station between S1 and the cable alignment;
- G2 is a Gradient Station between S2 and the cable alignment;
- G3 is a Gradient Station between F1 and the cable alignment;
- G4 is a Gradient Station between E2 and the cable alignment;
- G5 is the Gradient Station between E4 and the alignment;
- G6 is the Gradient Station between E5 and the alignment;

- G7 is a Gradient Station between E1 and the cable alignment;
- C1 is a Control Station (approximately 3 km from the proposed cable alignment) for Zone A. It is not supposed to be influenced by the cable laying works due to its remoteness to the construction works;
- C2 is a Control Station (approximately 4 km from the proposed cable alignment) for Zone B. It is not supposed to be influenced by the cable laying works due to its remoteness to the construction works; AND
- C3 is a Control Station (approximately 3 km from the proposed cable alignment) for Zone C. It is not supposed to be influenced by the cable laying works due to its remoteness to the construction works.

The monitoring works will be carried out at C1, E7, E8, E9, F1, G1, G2, G3, S1, S2, and S3 (ie elevn (11) stations) when the cable laying vessel moves inside Zone A (Figure 2.'). Similarly, the monitoring works will be carried out at B1, B2, B3, C2, E1, E2, E6, E8, F1, G3, G4, G7 and I1 (ie thirteen (13) stations) when the vessel moves inside Zone B (Figure 2.()). Monitoring works will start at C3, E4, E5, G5 and G6 (ie five (5) stations), when the vessel enters Zone C (Figure 2.)).

The suggested co-ordinates of these monitoring stations are listed in Table 2.1 and the exact co-ordinates should be confirmed before commencement of Baseline Monitoring (prior to cable laying).

The above monitoring stations shall be sampled during Baseline Monitoring (prior to Project marine installation works in the relevant zone(s)), Impact Monitoring (during Project marine installation works in the relevant zone(s)) and Post Project Monitoring (after completion of Project marine installation works in the relevant zone(s)).

**Table 2.1** *Co-ordinates of Sampling Stations (HK Grid)*

| <b>Station</b> | <b>Nature</b>  | <b>Easting</b> | <b>Northing</b> |
|----------------|--|----------------|-----------------|
| B1             | Impact Station (Beach)                               | 843556.84      | 811853.46       |
| B2             | Impact Station (Beach)                               | 844062.02      | 810369.19       |
| B3             | Impact Station (Beach)                               | 843988.33      | 809902.13       |
| E1             | Impact Station (Marine Reserve)                      | 842021.64      | 816547.02       |
| E2             | Impact Station (Coral Communities)                   | 847527.33      | 811059.83       |
| E4             | Impact Station (Coral Communities)                   | 848471.60      | 804135.73       |
| E5             | Impact Station (Coral Communities)                   | 845056.10      | 807712.89       |
| E6             | Impact Station (Coral Communities)                   | 848503.03      | 811247.01       |
| E7             | Impact Station (Coral Communities)                   | 849586.94      | 805696.09       |
| E8             | Impact Station (Coral Communities)                   | 844547.04      | 813522.78       |
| E9             | Impact Station (Coral Communities)                   | 845202.76      | 815205.38       |
| F1             | Impact Station (Fish Culture Zone)                   | 846948.57      | 813085.03       |
| I1             | Impact Station (Site of Special Scientific Interest) | 844698.75      | 809894.80       |
| S1             | Impact Station (Seawater Intakes)                    | 845297.24      | 816281.54       |
| S2             | Impact Station (Seawater Intakes)                    | 844070.53      | 814783.54       |
| S3             | Impact Station (Seawater Intakes)                    | 846099.31      | 812825.53       |
| G1             | Gradient Station                                     | 847365.06      | 810245.78       |
| G2             | Gradient Station                                     | 843936.91      | 814720.04       |
| G3             | Gradient Station                                     | 849692.91      | 806360.59       |

| Station | Nature           | Easting   | Northing  |
|---------|------------------|-----------|-----------|
| G4      | Gradient Station | 846748.01 | 810394.92 |
| G5      | Gradient Station | 845320.83 | 816717.97 |
| G6      | Gradient Station | 843779.38 | 814520.41 |
| G7      | Gradient Station | 843110.53 | 815125.70 |
| C1      | Control Station  | 842999.91 | 815984.25 |
| C2      | Control Station  | 845297.24 | 816281.54 |
| C3      | Control Station  | 844070.53 | 814783.54 |

Note: The actual co-ordinates may be fine-tuned on site subject to water depth, site condition and the safety distance required by the cable installation barge during cable laying.

## 2.3 SAMPLING PROCEDURES

### 2.3.1 Monitoring Frequency

#### *Baseline Monitoring*

Baseline Monitoring will comprise sampling on three occasions (days) prior to, but no more than six weeks before, the start of Project marine installation work. The interval between two sets of monitoring shall not be less than 36 hours. The monitoring will be undertaken at a selection of all (ie twenty-six [26]) monitoring stations, as shown in *Figure 2.2* (and zoom in *Figures 2.3* to *2.5*) and in *Table 2.1* according to where Project marine installation works will be carried out (Zone A, B and/ or C). Samples will be taken during mid-flood and mid ebb tidal state on each sampling occasion.

#### *Impact Monitoring*

Impact Monitoring at C1, E7, E8, E9, F1, G1, G2, G3, S1, S2, and S3 (ie eleven (11) stations) will commence when the cable installation barge works are within Zone A. The sampling works will cease once the cable barge is outside Zone A or no cable laying works are being undertaken.

Similarly, Impact Monitoring at B1, B2, B3, C2, E1, E2, E6, E8, F1, G3, G4, G7, and I1 (ie thirteen (13) stations) will commence when cable installation barge works move to within Zone B.

The monitoring works will start at E4, E5, G5, G6 and C3( ie five (5) stations) when the vessel goes into Zone C.

The water quality sampling works will cease once the cable laying works are outside Zones A, B and C or when no cable laying works are being undertaken for the Project.

*In-situ* data and SS data will be collected at monitoring stations (actual time interval subject to the sampling vessel travelling time among stations) during the cable installation works for each zone.

#### *Post Project Monitoring*

Post Project Monitoring will comprise sampling on three occasions (days) within three weeks after completion of the Project marine installation works at

the same stations as where Baseline Monitoring was conducted for the works, during mid-flood and mid-ebb tides. The interval between two sets of monitoring shall not be less than 36 hours.

### 2.3.2 *Timing*

For Baseline and Post Project Monitoring, water quality sampling will be undertaken within a 4 hour window of 2 hour before and 2 hour after mid-flood and mid-ebb tides.

For Impact Monitoring, *In-situ* data and SS data of each station will be collected at least 4 times (estimated 4-hour sampling intervals to be required for each zone, actual time interval subject to the sampling vessel travelling time among stations) during the cable installation works for each zone within a day. Impact Monitoring will be conducted as soon as marine works commence and will be undertaken throughout the Project works, including for route clearance operations.

The environmental contractor will be responsible for liaison with the engineering contractor to ensure installation works are being undertaken during the water quality sampling. Tidal range for flood and ebb tides should not be less than 0.5 m for capturing representative tides.

### 2.3.3 *Depths*

Each station will be sampled and measurements will be taken at three depths, 1 m below the sea surface, mid-depth and 1 m above the seabed. For stations that are less than 3 m in depth, only the mid depth sample shall be taken. For stations that are less than 6 m in depth, only the surface and seabed sample shall be taken.

## 2.4 *COMPLIANCE/ACTION EVENT PLAN*

Water quality monitoring results will be evaluated against Action and Limit levels shown in *Table 2.2*.

**Table 2.2 *Action and Limit Level for Water Quality (based on the result of the Baseline Report)***

| <b>Parameter</b>                                    | <b>Action Level (d)</b>  | <b>Limit Level (e) (d)</b>  |
|---|--|---|
| SS in mgL <sup>-1</sup><br>(Depth-averaged) (a) (c) | 95%-ile of baseline data, or<br>120% of the corresponding data from<br>respective control station at the same<br>tide of the same day                  | 99%-ile of baseline data, and<br>130% of the corresponding data<br>from respective control station<br>at the same tide of the same day                                |
| DO in mgL <sup>-1</sup> (b)                         | <u>Surface and Middle</u><br>5%-ile of baseline data for surface and<br>middle layer<br><br><u>Bottom</u><br>5%-ile of baseline data for bottom layers | <u>Surface and Middle</u><br>5mg/L or 1%-ile of baseline for<br>surface and middle layer<br><br><u>Bottom</u><br>2mg/L or 1%-ile of baseline<br>data for bottom layer |

| Parameter  | Action Level <sup>(d)</sup>  | Limit Level <sup>(e) (d)</sup>  |
|--|--|---|
| Turbidity in NTU (Depth-averaged) <sup>(c)</sup> | 95%-ile of baseline data, or 120% of the corresponding data from respective control station at the same tide of the same day | 99%-ile of baseline data, and 130% of the corresponding data from respective control station at the same tide of the same day |

**Notes:**

- a. "Depth-averaged" is calculated by taking the arithmetic means of reading of all sampled depths.
- b. For DO, non-compliance of the water quality limits occurs when the monitoring result is lower than the limits. These levels are for both FCZ and non-FCZ.
- c. For SS and turbidity, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
- d. Limit level for DO was derived from the Water Quality Objectives (WQO) for Junk Bay, Eastern Buffer, and Mirs Bay Water Control Zones under the Water Pollution Control Ordinance (WPCO) Chapters 358L, 358Y, and 358I respectively.

The measures that will be undertaken in the event that the Action or Limit Levels are exceeded are shown in *Table 2.3*.

**Table 2.3** *Event Action Plan for Water Quality*

| Event                   | Contractor  |
|-------------------------|---|
| Action Level Exceedance | <p><b>Step 1</b> - repeat sampling event.</p> <p><b>Step 2</b> - Inform EPD and AFCD and confirm notification of the non-compliance in writing;</p> <p><b>Step 3</b> - discuss with cable installation contractor the most appropriate method of reducing suspended solids during cable installation (e.g. reduce cable laying speed/volume of water used during installation.</p> <p><b>Step 4</b> - repeat measurements after implementation of mitigation for confirmation of compliance.</p> <p><b>Step 5</b> - if non-compliance continues, increase measures in Step 3 and repeat measurements in Step 3. If non-compliance occurs a third time, suspend cable laying operations.</p> |
| Limit Level Exceedance  | Undertake <b>Steps 1-4</b> immediately, if further non-compliance continues at the Limit Level, suspend cable laying operations until an effective solution is identified.  |

Schedule for baseline and impact monitoring should be submitted to the Environmental Protection Department (EPD) at least 2 weeks before the commencement of the monitoring works, for agreement.

The reports to be provided shall include:

- Baseline Monitoring Report;
- Weekly Impact Monitoring Reports; and
- Post Project Monitoring Report.

A Baseline Monitoring Report shall be provided no later than two weeks before the start of Project marine installation work and should be submitted to EPD for agreement on the Action/Limit Levels. An Impact Monitoring Report will be provided weekly within three days after the relevant monitoring data are collected or become available during Project marine installation work. A Post Project Monitoring Report to review the environmental status after Project marine installation and compare with the results as presented in the relevant Baseline Monitoring Report shall be provided within one month after completion of the Project marine installation works.

A Baseline Monitoring Report shall include the following details:

- brief project background information;
- drawings showing locations of the baseline monitoring stations;
- an updated Project marine installation works programme with milestones of environmental protection/mitigation activities annotated;
- monitoring results together with the information including monitoring methodology, parameters monitored, monitoring locations (and depth), monitoring date, time, frequency and duration;
- details on influencing factors, including major activities, if any, being carried out on the Site during the period, weather conditions during the period and other factors which might affect the results;
- determination of the Action and Limit Levels (AL levels) for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored; and
- comments and conclusions.



A Weekly Impact Monitoring shall include, but not limited to, the following details:

- Basic Project Information – Project marine installation works programme with fine tuning of activities showing the inter-relationship with environmental protection/mitigation measures for the week and works undertaken during the week;
- Operating practices of any Project marine installation works machinery (e.g. cable burial machine) during sampling (including: position, speed, cable burial depth) and an interpretation of monitoring results; and
- The monitoring data should be provided graphically to show the relationship between the Control and the Impact monitoring stations and compliance or non-compliance with respect to the Action/Limit Levels.

A Post Project Monitoring Report shall include the following details:

- brief project background information;
- drawings showing locations of the baseline monitoring stations;
- full Project marine installation works programme with milestones of environmental protection/mitigation activities annotated;
- monitoring results together with the information including monitoring methodology, parameters monitored, monitoring locations (and depth), monitoring date, time, frequency and duration. The monitoring results should show the relationship between the Control and the Impact monitoring stations and compliance or non-compliance with respect to the Action/Limit Levels
- review the environmental status after Project marine installation works and compare with results presented in the relevant Baseline Monitoring Report;
- comments and conclusions.

Coral communities at Cape Collinson and Tai Long Pai which are in the vicinity of the cable alignment may have the potential to be indirectly disturbed through impact on water quality during cable-laying works. However, no unacceptable adverse indirect impacts on coral communities are expected to occur due to the following reasons.

- Firstly, both coral communities at Cape Collinson and Tai Long Pai are beyond the maximum distance of transport for the suspended sediments. The sediment plume calculation indicated that the disturbed sediments would have settled onto the seabed in less than 4 minutes before they can travel to the coral communities at Cape Collinson and Tai Long Pai.
- Secondly, the cable installation works will be of small-scale, short-term and temporary (approximately 15 working days for the whole cable installation while only several workings hours for the sections near Cape Collinson and Tai Long Pai).
- Thirdly, precautionary measure –silt curtain of multi-layers will be installed at the south of Cape Collinson during cable laying operation near Cape Collinson to ensure no disturbance from the water quality impact.

Nevertheless, coral monitoring is recommended to verify that the cable installation works are not resulting in any unacceptable adverse impacts to the coral communities at Cape Collinson and Tai Long Pai. Coral monitoring is not recommended to be undertaken at TKO Industrial Estate and Fat Tong Chau which are in close vicinity to the proposed cable landing site, and Shek O Headland which is near to the proposed cable alignment, given that low abundance and diversity of corals were recorded at the subtidal hard bottom habitat of these areas.

The following Section provides details of the coral monitoring programme for the installation of the submarine cable.

### **3.1** *OBJECTIVES AND APPROACH*

The objective of the coral monitoring programme is to verify whether any adverse impacts to coral communities at Cape Collinson and Tai Long Pai occur as a result of the Project marine installation works.

The coral monitoring programme comprises the following two surveys:

1. Baseline Surveys will be conducted within one month before any jetting works for the Project marine installation works start. The objective of Baseline Surveys is to identify suitable coral monitoring locations and to collect baseline monitoring data of corals at those locations for comparison with data collected during Post Project Surveys.

2. Post Project Surveys will be conducted within one month after completion of the Project marine installation works. During Post Project Surveys, data will be collected at the same locations and using the same methodology as Baseline Surveys. Data from Post Project Surveys will be used to compare with relevant baseline data in order to determine any detectable changes in coral conditions after Project marine installation works.

Coral monitoring will not be undertaken during jetting works as the works near Cape Collinson and Tai Long Pai will only last for several hours which will not allow adequate time for completion of the coral monitoring surveys at the monitoring locations.

Coral monitoring data will be reviewed in conjunction with the water quality monitoring data which will measure the levels of suspended solids generated during jetting works.

## 3.2 *MONITORING LOCATIONS*

Coral monitoring will be undertaken at Cape Collinson and Tai Long Pai (Monitoring Station), and a Control Station at Tung Lung Chau which is located more than 2 km from the cable alignment and thus unlikely to be impacted by the works. The monitoring locations are shown in *Figure 3.1* and detailed below:

*Monitoring Stations:*

- Zone A: Cape Collinson; and
- Zone B: Tai Long Pai.

*Control Station:*

- Zone C: Tung Lung Chau.

At each monitoring station, coral monitoring will be undertaken in two depth zones (ie shallow water: -2 to -5 mCD and deep water: -5 to -15 mCD). The depth ranges may be revised based on observations of coral distribution during Baseline Surveys.

## 3.3 *MONITORING METHODOLOGY*

### 3.3.1 *Monitoring Personnel*

The coral monitoring works should be undertaken by a qualified coral specialist hired by the ET. The qualified coral specialist should be a degree holder in marine sciences with at least three years of post-graduate experience in the field of marine ecology and undertaking coral surveys. The same coral specialists should be used for each dive survey to maintain consistency in the documentation of the coral condition and should be approved by AFCD in advance of undertaking the monitoring work.

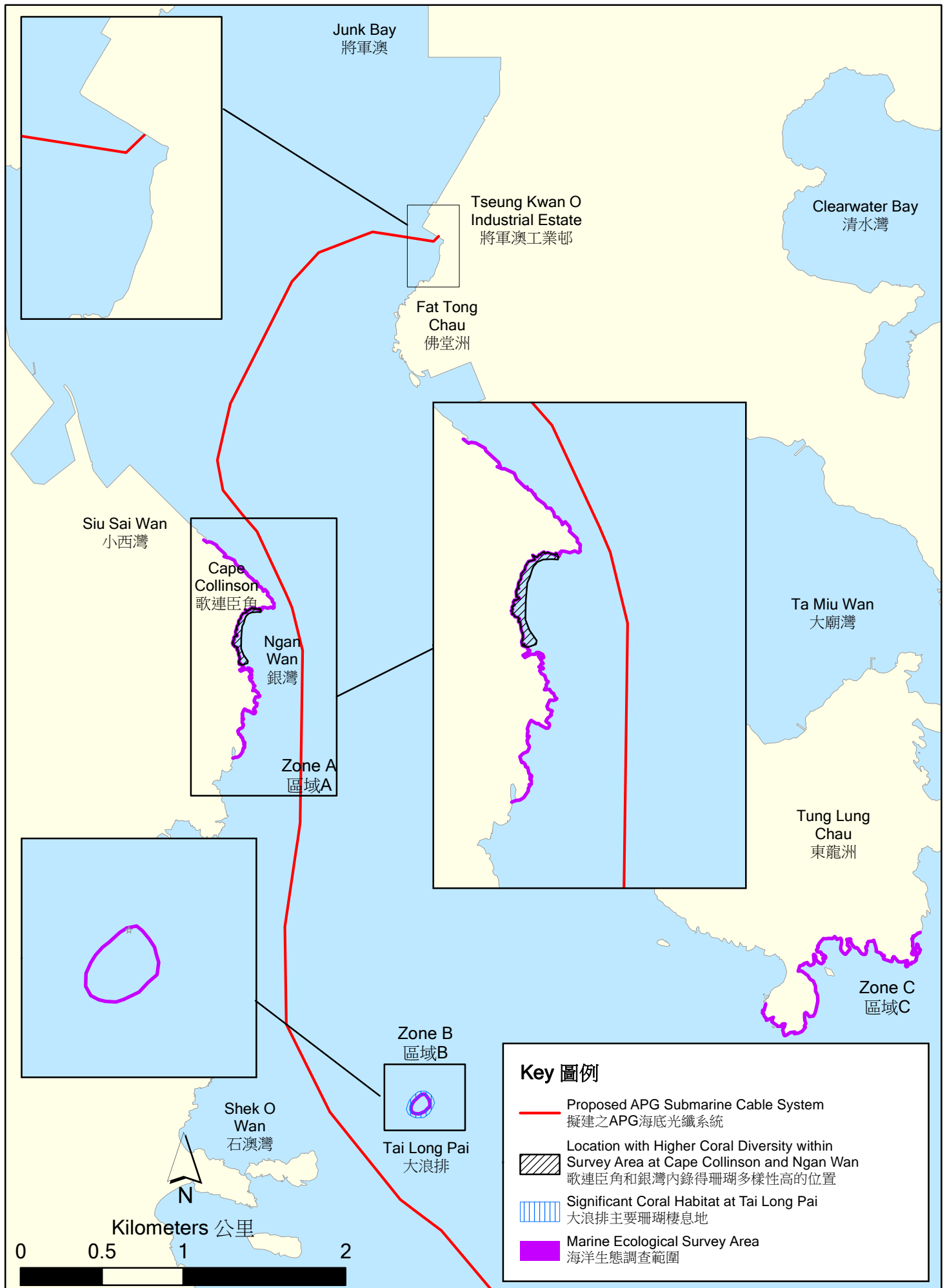


Figure 3.1  
圖 3.1  
Locations of Coral Monitoring  
珊瑚群落監測點

File: T:\GIS\CONTRACT\0174917\Mxd\0174917\_Location\_of\_Coral\_Monitoring.mxd  
Date: 16/12/2013

*Survey Methodology*

The Baseline Survey comprises the following three components:

- Qualitative spot dive survey;
- Semi-quantitative Rapid Ecological Assessment (REA) survey; and
- Coral Colony Monitoring.

Post Project Surveys comprises the same components as the Baseline Survey, except that the qualitative spot dive survey will not be undertaken. Survey methodology of the three components is described below.

*Qualitative Spot Dive Survey*

The qualitative spot dive survey will be undertaken as part of Baseline Surveys only to identify suitable coral monitoring locations at Cape Collinson, Tai Long Pai and Tung Lung Chau. During the survey, spot dive reconnaissance checks will be conducted within the designated Monitoring and Control Stations by SCUBA to collect qualitative information including coral composition, abundance and distribution. Based on the information collected, locations within which significant coral habitats will be found (defined as locations with relatively higher coral abundance and specie/genus number for the purpose of this coral monitoring programme) and selected for the subsequent REA survey and coral colony monitoring during Baseline and Post Project Surveys. The depth range (shallow and deep) to be monitored will also be finalised based on observed coral distribution.

*Rapid Ecological Assessment (REA) Survey Method*

A standardised semi-quantitative REA survey technique will be used to investigate the general conditions of the coral communities (hard, soft and black corals) associated with subtidal hard bottom habitats at the Monitoring and Control Stations. The collection of REA data during Baseline and Post-Project Surveys would allow for a comparison of coral conditions before and after cable installation works in order to determine any changes in conditions due to the works.

The REA technique allows semi-quantitative information on the ecological attributes of the subtidal habitat to be obtained in a relatively simple way without compromising scientific rigour. This technique is the standard practices for EIA marine baseline surveys in Hong Kong and has been modified from the standardised REA survey technique established for the assessment of coral communities on the Great Barrier Reef <sup>(1)</sup> for marine environment of Hong Kong <sup>(2)</sup>.

(1) DeVantier, L.M., G.De' Ath, T.J. Done and E. Turak (1998). *Ecological assessment of a complex natural system: A case study from the Great Barrier Reef*. Ecological Applications 8: 480-496.

(2) Fabricius, K.E. and D. McCorry. (2006). *Changes in octocoral communities and benthic cover along a water quality gradient in reefs of Hong Kong*. Marine Pollution Bulletin 52: 22-23.

A series of REA surveys will be conducted by qualified coral ecologists by SCUBA at the Monitoring stations (Cape Collinson and Tai Long Pai; *Figure 4.1*) and Control Station (Tung Lung Chau; *Figure 4.1*) with the aim to record the condition of substratum, estimate the diversity and relative abundance of coral assemblages (ie hard corals, octocorals and black corals) and with all hard coral colonies identified to species level while octocorals and black corals recorded to genus level. The survey will be undertaken on REA transects laid onto the seabed, each of which measure 100 m in length, at the following two depth zones of each station:

- Shallow depth region: -2 to -5 m CD (typically the depth range of hard coral colonies associated with subtidal hard bottom habitat); and
- Deep depth region: -5 to -15 m CD.

The location of the REA transects as well as the depth ranges of the monitored depth zones will be determined based on findings from the qualitative spot dive survey. A total of three (3) REA transects will be monitored at each depth region of Cape Collinson and Tung Lung Chau, while two (2) transects will be monitored at each depth region of Tai Long Pai due to limited survey area at this Monitoring Station.

Following the laying of the transect line, the coral specialist will swim along the transect slowly and conduct the REA survey. The REA methodology will encompass an assessment of the benthic cover (Tier I) and taxon abundance (Tier II) undertaken in a swathe ~ 4 m wide, 2 m either side of each transect. The belt transect width was dependent on underwater visibility and might be adjusted to a swathe ~ 2 m wide, 1 m either side of each transect in case of reduced visibility. An explanation of the two assessment categories (Tiers) used in the survey is presented below.

#### Tier I – Categorisation of Benthic Cover

Upon the completion of each survey transect, five ecological and seven substratum attributes will be assigned to one of seven standard ranked (ordinal) categories (Table 3.1 and 3.2).

**Table 3.1** *Categories used in the REA Surveys – Benthic Attributes*

| <b>Ecological</b>   | <b>Substratum</b>       |
|---------------------|-------------------------|
| Hard coral          | Hard Substratum         |
| Dead standing coral | Continuous pavement     |
| Soft coral          | Bedrock                 |
| Black coral         | Rubble                  |
| Macroalgae          | Sand                    |
| Turf Algae          | Silt                    |
|                     | Large boulders (>50 cm) |
|                     | Small boulders (<50 cm) |
|                     | Rocks (<26 cm)          |

| Rank | Percentage Cover (%) |
|------|----------------------|
| 0    | None recorded        |
| 1    | 1-5                  |
| 2    | 6-10                 |
| 3    | 11-30                |
| 4    | 31-50                |
| 5    | 51-75                |
| 6    | 76-100               |

#### Tier II - Taxonomic Inventories to Define Types of Benthic Communities

An inventory of benthic taxa will be compiled for each transect. Taxa will be identified *in situ* to the following levels:

- Scleractinian (hard) corals to species wherever possible;
- Soft corals, gorgonians, black corals, anemones and conspicuous macroalgae recorded according to morphological features and to genus level where possible; and
- Other benthos (including sponges, zoanthids, ascidians and bryozoans) recorded to genus level wherever possible but more typically to phylum plus growth form.

Following the completion of each transect survey, each taxon in the inventory will be ranked in terms of abundance in the community (Table 3.3). These broad categories rank taxa in terms of relative abundance of individuals, rather than the contribution to benthic cover along each transect. The ranks are subjective assessments of abundance, rather than quantitative counts of each taxon.

**Table 3.3** Ordinal Ranks of Taxon Abundance

| Rank | Abundance           |
|------|---------------------|
| 0    | Absent              |
| 1    | Rare <sup>(a)</sup> |
| 2    | Uncommon            |
| 3    | Common              |
| 4    | Abundant            |
| 5    | Dominant            |

Note:

(a) The classification of "rare" abundance refers to low abundance (small quantity) on the transect, rather than in terms of distribution in Hong Kong waters.

A set of environmental site descriptors will be recorded for each REA transect as follows:

- The degree of exposure to prevailing wave energy is ranked from 1 - 4, where:
  - 1 = sheltered (highly protected by topographic features from prevailing waves);

- 2 = semi-sheltered (moderately protected);
  - 3 = semi-exposed (only partly protected); and
  - 4 = exposed (experiences the full force of prevailing wave energy).
- Sediment deposition on the reef substratum (particle sizes ranging from very fine to moderately coarse) rated on a four point scale, from 0 -3, where:
    - 0 = no sediment;
    - 1 = minor (thin layer) sediment deposition;
    - 2 = moderate sediment deposition (thick layer), but substrate can be cleaned by fanning off the sediment; and
    - 3 = major sediment deposition (thick, deep layer), and substrate cannot be cleaned by fanning.
  - A suite of representative photographs will be taken for each REA transect. All field data will be checked upon completion of each REA transect and a dive survey proforma sheet will be completed at the end of the fieldwork day. Photographs will be compiled for each REA transect which will then be reviewed and REA data be verified.
  - Verified REA data will be presented in terms of:
    - Site (transect) information (Tier I and II data), depth and environmental descriptors; and
    - Species abundance data for each transect.
    - Species lists, species richness and mean values for ecological and substratum types will be compiled. The rank abundance values will be converted to a mid-value percentage cover.

#### *Coral Colony Monitoring*

Coral colony monitoring will be undertaken during Baseline and Post Project Surveys to identify any evidence of sediment stress to corals before and after cable installation works. At each coral monitoring station, a total of fifteen (15) hard coral colonies and fifteen (15) octocoral/black coral colonies will be selected for monitoring. Priority will be given to selecting colonies of horizontal plate-like and massive growth forms which present large stable surfaces for the interception and retention of settling solids. Each of the selected corals will be identified to species or genus levels and photographed. The following data will be collected:

- Maximum diameter of the identified hard coral and soft coral colonies;
- Maximum height and width of the identified gorgonians and black corals;



- Percentage of sediment cover on the identified colonies and the colouration, texture and approximate thickness of sediment on the coral colonies and adjacent substrate. Any contiguous patches of sediment cover >10 % were recorded;
- Percentage of bleached area on the identified colonies of which two categories were recorded: a. blanched (ie pale) and b. bleached (ie whitened);
- Percentage of colony area showing partiality mortality; and
- Physical damage to colonies, tissue distension, mucous production and any other factors relevant will be noted in the field.

Other information such as the survey date, time, weather, sea and tidal conditions should also be recorded. The coral colony monitoring exercise will be undertaken to ensure colonies of similar growth forms and size will be selected for Baseline and Post Project Monitoring. Although coral tagging is a common practice for repeated monitoring of individual colony, this technique will not be employed in this monitoring programme due to difficulties in locating the tagged corals given the generally low visibility in the area and low light conditions in deep water.

Schedule for Baseline and Post Project Survey should be submitted to the Environmental Protection Department (EPD) prior to the commencement of the monitoring works for agreement.

The reports to be provided should include Baseline Monitoring and Post Project Monitoring Reports.

A Baseline Monitoring Survey Report should be submitted within two weeks after the completion of baseline monitoring and the report should include the following details:

- Brief project background information;
- Monitoring results together with the information including monitoring methodology, parameters monitored, monitoring locations (and depth), monitoring date, time, frequency and duration; and
- Comments and conclusions.

Post Project Survey Report should be submitted within one month after completion of the Project marine installation works and should include, but not be limited to, the following details:

- Basic project information;
- Review of the coral conditions at the monitoring stations and the health status of the corals after the Project marine installation works and comparison with results as presented in relevant Baseline Monitoring Report; and
- Discussion of any detected adverse impacts to coral communities as a result of the cable installation works.

Project marine installation works may result in a minor and short term increase in underwater sound from marine vessels. Given that Finless Porpoises use high frequency ultrasonic clicks for foraging and communication, the low frequency underwater sound associated with vessels, jetting and cable laying would not be expected to interfere significantly with Finless Porpoises. No unacceptable adverse impacts to Finless Porpoises from underwater sounds are expected to occur. The actual cable installation works will be short-term and temporary, and be carried by one cable installation barge within about 15 working days in Hong Kong waters, with limited additional days required for testing and finalisation works as circumstances dictate. The Finless Porpoises are hence not expected to be disturbed by the cable laying vessel.

However, precautionary measure will be instituted for marine mammals during the Project marine installation works depending on the Zone in which the works are conducted (Refer to Figures 2.2-2.5 for delineation of Zones A to C respectively). This is elaborated upon below.

A marine mammal exclusion zone within a radius of 250 m from the cable installation barge will be implemented during the cable installation works taking place in daylight hours along the section outside Zone A (ie Zones B & C and from C to the boundary of HKSAR waters). The marine mammal exclusion zone will be monitored by qualified observer(s) <sup>(1)</sup> with an unobstructed, elevated view of the area. The view will be undertaken from the cable installation barge. The viewpoint will be agreed with the Independent Environmental Checker.

Qualified observer(s) will stand on the open upper decks of the barge, allowing for observer eye heights of 4 to 5 m above water level and relatively unobstructed forward visibility between 270° and 90°. Vessel-based observation by the observer(s) shall be conducted by searching the 180° swath in front of the barge (270° to 90°) with appropriate marine binoculars, scanning the same area with the naked eyes and occasional binocular check.

Qualified observer(s) will scan the 250 m exclusion zone for at least 30 minutes prior to the start of cable installation. If cetaceans are observed in the exclusion zone, cable installation works will be delayed until they have left the area. This measure will confirm that the area in the vicinity of the cable installation work is clear of marine mammals prior to the commencement of works and will serve to reduce any disturbance to marine mammals. As per previous practice in Hong Kong, should cetaceans move into the works area during cable installation, it is considered that cetaceans will have acclimatised

(1) The qualification and experience of the qualified observer(s) shall be to the satisfaction of the Director of Agriculture, Fisheries and Conservation (DAFC). The qualified observer(s) for the marine mammal monitoring must be suitably trained to conduct the visual monitoring works. CVs of the qualified observer(s) will be provided to the DAFC prior to commencement of monitoring surveys.

themselves to the works therefore cessation of cable installation is not required<sup>(1)</sup>.

The marine mammal exclusion zone monitoring will be required during periods when there are cable installation works. Daily monitoring will be conducted until the completion of cable installation works.

(1) This precautionary measure is consistent with conditions for grab dredging works inside the Sha Chau and Lung Kwu Chau Marine Park included in the issued Environmental Permit for the Permanent Aviation Fuel Facility for Hong Kong International Airport project

### 5.1 SITE INSPECTIONS

The site inspection will be undertaken at the landing point (ie Beach Manhole (BMH) in Tseung Kwan O (TKO) Industrial Estate) to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented in accordance with the Project Profile (PP-496/2013). In addition, the ET Leader will be responsible for defining the scope of the inspections (*Annex A*), detailing any deficiencies that are identified, and reporting any necessary action or additional mitigation measures that were implemented as a result of the inspection.

A weekly site inspection will be carried out at the proposed BMH in TKO Industrial Estate until the completion of construction works at the landing point. The areas of inspection will not be limited to the site area and should also include the environmental conditions outside the site which are likely to be affected, directly or indirectly, by the site activities. The ET will make reference to the following information while conducting the inspections:

- the Project Profile and EM&A recommendations on environmental protection and pollution control mitigation measures;
- ongoing results of the EM&A programme;
- works progress and programme;
- the relevant environmental protection and pollution control laws; and
- previous site inspection results and the results of Environmental Performance Reviews undertaken by the IC(E).

The Contractor(s) will update the ET with relevant information on the construction works prior to carrying out the site inspections. The site inspection results will be submitted to CMI and the Contractor(s) within 72 hours. Should actions be necessary, the ET will follow up with recommendations on improvements to the environmental protection and pollution control works and will submit these recommendations in a timely manner to CMI and the Contractor(s). They will also be presented, along with the remedial actions taken, in the EM&A report. The Contractor(s) will follow the procedures and time frame stipulated in the environmental site inspection for the implementation of mitigation proposal and the resolution of deficiencies. An action reporting system shall be formulated and implemented to report on any remedial measures implemented subsequent to the site inspections.

The ET will undertake the following procedures (*Figure 6.1*) upon receipt of a complaint:

- (i) log complaint and date of receipt into the complaint database;
- (ii) investigate the complaint and discuss with the Contractor(s) and CMI to determine its validity and to assess whether the source of the issue is due to works activities;
- (iii) if a complaint is considered valid due to the works, the ET will identify mitigation measures in consultation with the Contractor(s) and CMI;
- (iv) if mitigation measures are required, the ET will advise the Contractor(s) accordingly;
- (v) review the Contractor(s)'s response on the identified mitigation measures and the updated situation;
- (vi) if the complaint is transferred from EPD, an interim report will be submitted to EPD on the status of the complaint investigation and follow-up action within the time frame assigned by EPD;
- (vii) undertake additional monitoring and audit to verify the situation if necessary and ensure that any valid reason for complaint does not recur;
- (viii) report the investigation results and the subsequent actions on the source of the complaint for responding to complainant. If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD; and
- (ix) record the complaint, investigation, the subsequent actions and the results in the EM&A report.

During the complaint investigation work, the Contractor(s) and CMI will cooperate with the ET in providing the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor(s) will promptly carry out the mitigation measures. CMI will approve the proposed mitigation measures and the ET will check that the measures have been carried out by the Contractor(s).

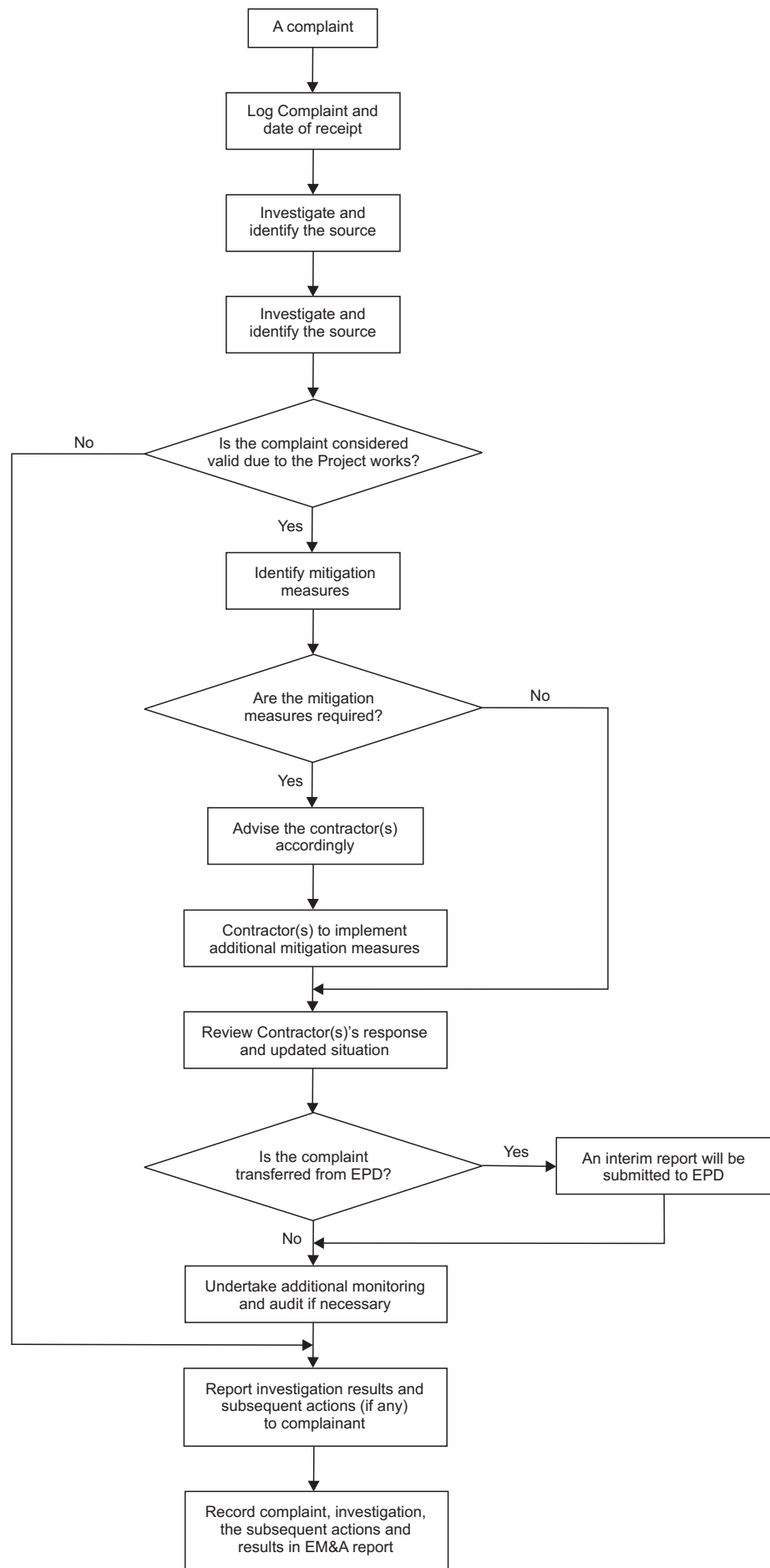


Figure 6.1

Flow Chart for Handling Environmental Complaints

Annex A

## Site Inspection Log



Site:

Inspected By:

Inspection Date:

Time:

**Weather**

**Condition**  Sunny  Fine  Overcast  Drizzle  Rain  Storm  Hazy

**Temperature**  °C **Humidity**  High  Moderate  Low

**Wind**  Calm  Light  Breeze  Strong

**A Noise**

|  | N/A or not observed   | Yes                      | No                       | Photo/Remarks |
|--|---|--------------------------|--------------------------|---------------|
| A1 Are all plant and equipment well maintained and in good operating condition?  | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| A2 Is idle equipment turned off or throttled down?   | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| A3 Are powered mechanical equipment covered or shielded by acoustic materials?   | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| A4 Are silenced equipment used where practicable?  | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| A5 Do mobile plants be sited as far away from NSRs as possible?  | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| A6 Do plants known to emit noise strongly in one direction be oriented away from nearby NSRs?                              | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| A7 Major noise source(s) <input type="checkbox"/> Traffic <input type="checkbox"/> Construction activities outside of site | <input type="checkbox"/> Construction activities inside of site <input type="checkbox"/> Others |                          |                          | _____         |
| A8 Any remedial action undertaken?   | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/> | _____         |

**B Water Quality**

|  | N/A or<br>not observed   | Yes                      | No                       | Photo/Remarks |
|--|--------------------------|--------------------------|--------------------------|---------------|
| B1 Is drainage system adequate?<br>Are there temporary ditches for runoff discharge into appropriate | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B2 Watercourse?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B3 With silt retention pond?   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B4 Do permanent drainage channels have: sediment basin?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B5 traps and baffles?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B6 Are there sediment tanks for settling runoff prior to disposal?                                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B7 Are there oil interceptors in drainage system?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B8 Oil and grease removed regularly?   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B9 Bypass to prevent flushing during periods of heavy rain?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B10 Is drainage system well maintained?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B11 Is exposed earth stabilized after earthworks have been completed?                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B12 Are exposed slope surfaces covered (by tarpaulin or other means)?                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B13 Are open stockpiles of more than 20 m <sup>3</sup> covered during rainstorm?                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B14 Are manholes covered and sealed?   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| Rainy Season   |                          |                          |                          |               |
| B15 Drainage system adequately designed for storm flow?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B16 Sediment control measures inspected and maintained after rain storms?                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B17 Is debris and rubbish on site collected and disposed of properly?                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B18 Is wastewater discharge license available for inspection?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B19 Measures to prevent the washing away of sand/silt to drains?                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |
| B20 Is there any sediment plume observed existing the marine works area?                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |

**C Environmental Complaint**

C1 Number of Environmental Complaint Received from \_\_\_\_\_ to \_\_\_\_\_.  \_\_\_\_\_

**D General / Housekeeping**

|  | N/A or<br>not observed   | Yes                      | No                       | Photo/Remarks |
|--|--------------------------|--------------------------|--------------------------|---------------|
| D1 Are potential stagnant pools cleared and mosquito breeding prevented? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____         |

**Items for Inspection**

**Notes / Issues Recorded On Site**

**Corrective Actions**

**Signatures:**  
ET:

\_\_\_\_\_  
(Name: \_\_\_\_\_ )