

## Asia Pacific Gateway (APG) - Tseung Kwan O

### *Baseline Coral Monitoring Survey Report*

9 May 2016

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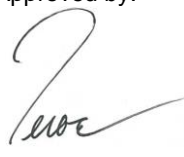


# Asia Pacific Gateway (APG) – Tseung Kwan O

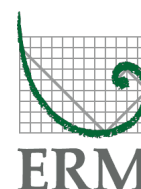
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## Baseline Coral Monitoring Survey Report

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Client:  China Mobile International Limited (CMI Ltd)		Project No:  0324228			
Summary:  This document presents the Baseline Coral Monitoring Survey Report for the proposed APG – Tseung Kwan O section of the submarine telecommunication cable system		Date: 9 May 2016			
		Approved by:    Terence Fong Partner			
v0	Baseline Coral Monitoring Survey Report	EL	JT	TF	9/5/16
Revision	Description	By	Checked	Approved	Date
<p>This report has been prepared by Environmental Resources Management the trading name of 'ERM Hong-Kong, Limited', with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.</p> <p>We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.</p> <p>This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.</p>		<p>Distribution</p> <p><input type="checkbox"/> Internal</p> <p><input checked="" type="checkbox"/> Public</p> <p><input type="checkbox"/> Confidential</p>			
		 			



## Asia Pacific Gateway (APG) – Tseung Kwan O Environmental Certification Sheet EP-485/2014

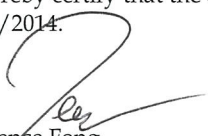
### Reference Document/Plan

Document and Plan to be Certified/ Verified:	<b>Baseline Coral Monitoring Survey Report</b> , including <i>Figure 3.1 An Enlarged Plan Showing the Coordinates and Location of the Identified Coral Communities and Cable Alignment</i>
Date of Report:	9 May 2016
Date prepared by ET:	9 May 2016
Date received by IEC:	9 May 2016


### Reference EM&A Manual

EM&A Manual:	Section 2
<i>Content: Reporting on Baseline Coral Monitoring Survey</i>	
3.4	“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.”
EP Condition:	Condition 2
<i>Content: Baseline Coral Monitoring Report</i>	
2.4	“To protect the coral communities at Cape Collinson, the Permit Holder shall confirm the identified coral communities will be more than 180m away from the cable alignment. The conditions of the identified coral communities shall be verified by coral inspections immediate prior to and after the cable laying works. The Permit Holder shall use a Differential Global Positioning System of typical real time horizontal accuracy within _10cm for the navigation system of the Cable Installation Barge. The burial tool position shall be logged during cable installation. The Permit Holder shall submit to the Director four hard copies and one electronic copy of the following, as defined in the Project Profile (Register No.:PP-496/2013):
	(i) A Baseline Monitoring Survey Report showing the monitoring results within two weeks after completion of the baseline monitoring;
	(ii) An enlarged plan showing the coordinates and location of the identified coral communities and cable alignment no later than two weeks before the commencement of construction works”

### ET Certification

I hereby certify that the above referenced document and plan complies with the above referenced condition of EP-485/2014.	
 Terence Fong, Environmental Team Leader:	Date: 9 MAY 2016

### IEC Verification

I hereby verify that the above referenced document and plan complies with the above referenced condition of EP-485/2014.	
 Vincent Lai, Independent Environmental Checker:	Date: 09-05-16

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# 1 INTRODUCTION

## 1.1 PROJECT 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), the HKSAR section of the submarine cable are referred to as the APG-TKO cable (the “Project”). The proposed submarine cable will travel west and southward from TKO as it approaches the Tathong Channel (*Figure 1.1*). 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. As one of the members of the APG Consortium, **China Mobile International Limited (CMI)** is responsible for installing the APG-TKO section of the cable.

## 1.2 OBJECTIVE OF THE BASELINE CORAL SURVEY

A *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, 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 for Permission to apply directly for Environmental Permit (EP). The EPD subsequently issued an *Environmental Permit (EP- 485/2014)* for the Project.

In accordance with the *EM&A Manual* appended with the approved *Project Profile*, Baseline Coral Survey should be conducted within one month before jetting works for the cable installation commenced. The objective of the Baseline Coral Survey is to identify suitable coral monitoring locations and to collect baseline monitoring data of corals at those locations for comparison with data collected during the Post Project Survey. The comparison of baseline and post Project data would be used to determine any observable impacts to corals as a result of the cable installation works. The Baseline Coral Monitoring Survey Report should be submitted within two weeks after the completion of the baseline monitoring.

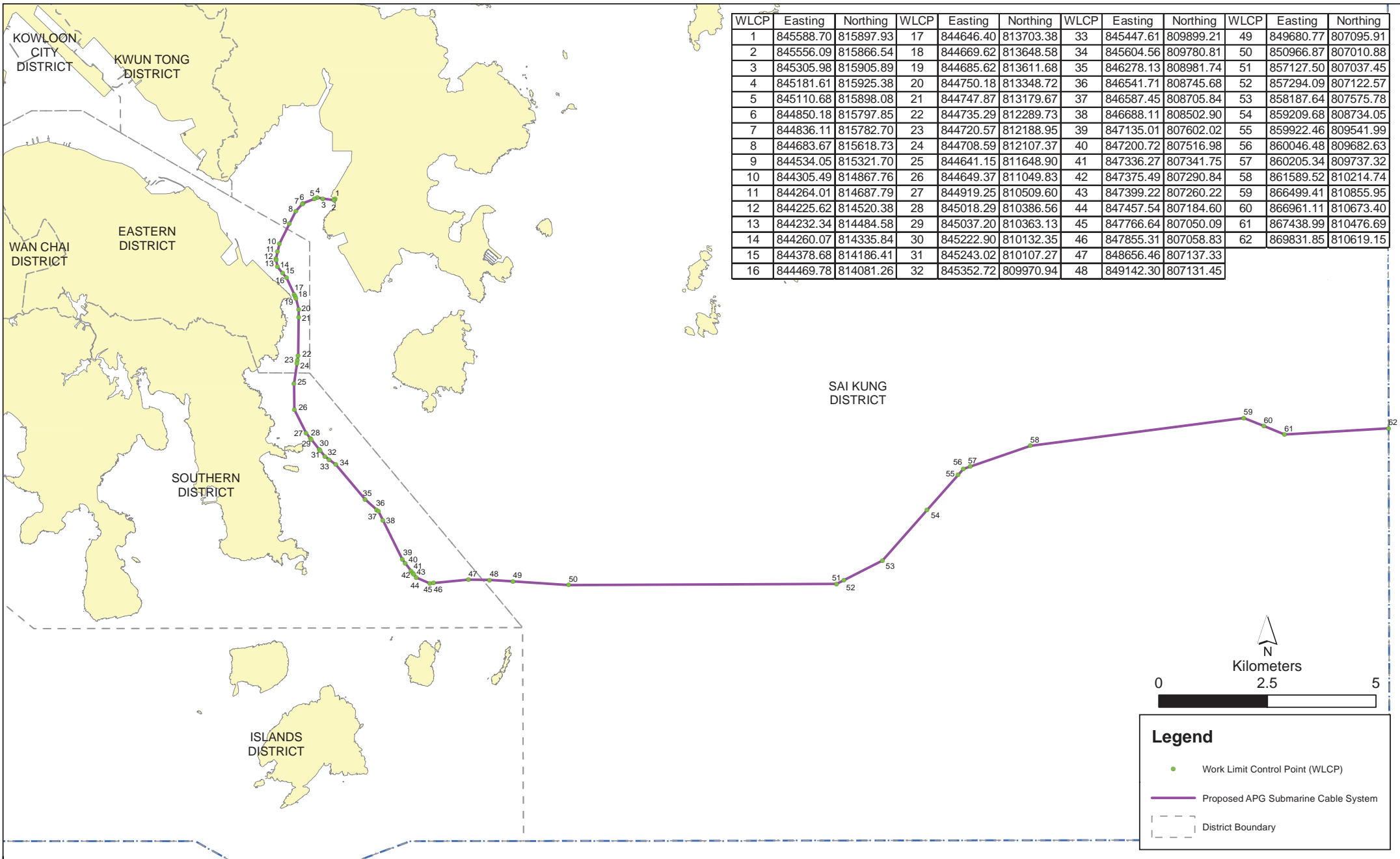


Figure 1.1

Proposed APG Submarine Cable System

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### 1.3 *PURPOSE OF THIS REPORT*

This Baseline Coral Monitoring Survey Report (“the Report”) is prepared by ERM-Hong Kong, Limited (ERM) on behalf of CMI to present the methodology and findings of the Baseline Coral Survey for the Project in accordance with requirements of the *EM&A Manual*.

### 1.4 *STRUCTURE OF THE REPORT*

The remainder of the report is structured as follows:

#### ***Section 2: Baseline Coral Monitoring Methodology***

Presents the baseline monitoring methodology, parameters monitored, monitoring locations and depth, monitoring date, time, frequency and duration in accordance with the *EM&A Manual*.

#### ***Section 3: Baseline Coral Monitoring Results***

Summarize the baseline coral monitoring results together with the information including monitoring methodology, parameters monitored, monitoring locations and depth, monitoring date, time, frequency and duration in accordance with the *EM&A Manual*.

#### ***Section 4: Conclusion***

Conclude findings from the Baseline Coral Survey of the Project.

## 2 BASELINE CORAL MONITORING METHODOLOGY

### 2.1 MONITORING LOCATIONS

Baseline coral monitoring was undertaken at Cape Collinson and Tai Long Pai (Monitoring Stations), and a Control Station at Tung Lung Chau which is located more than 2 km from the cable alignment. The monitoring locations are shown in *Figure 2.1* and detailed below:

*Monitoring Stations:*

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

*Control Station:*

- Zone C: Tung Lung Chau.

At each station, coral monitoring was undertaken in two depth zones (i.e. shallow water: -2 to -5 mCD and deep water: -5 to -15 mCD).

### 2.2 MONITORING METHODOLOGY

#### 2.2.1 *Monitoring Personnel*

The baseline coral monitoring was undertaken by a qualified coral specialist. The qualified coral specialist is a degree holder in marine sciences with more than three years of post-graduate experience in the field of marine ecology and undertaking coral surveys. The same coral specialist will be used for each subsequent dive survey to maintain consistency in the documentation of the coral condition. The specialist was approved by AFCD in advance of undertaking the baseline monitoring work.

#### 2.2.2 *Survey Methodology*

The Baseline Survey comprises the following three components:

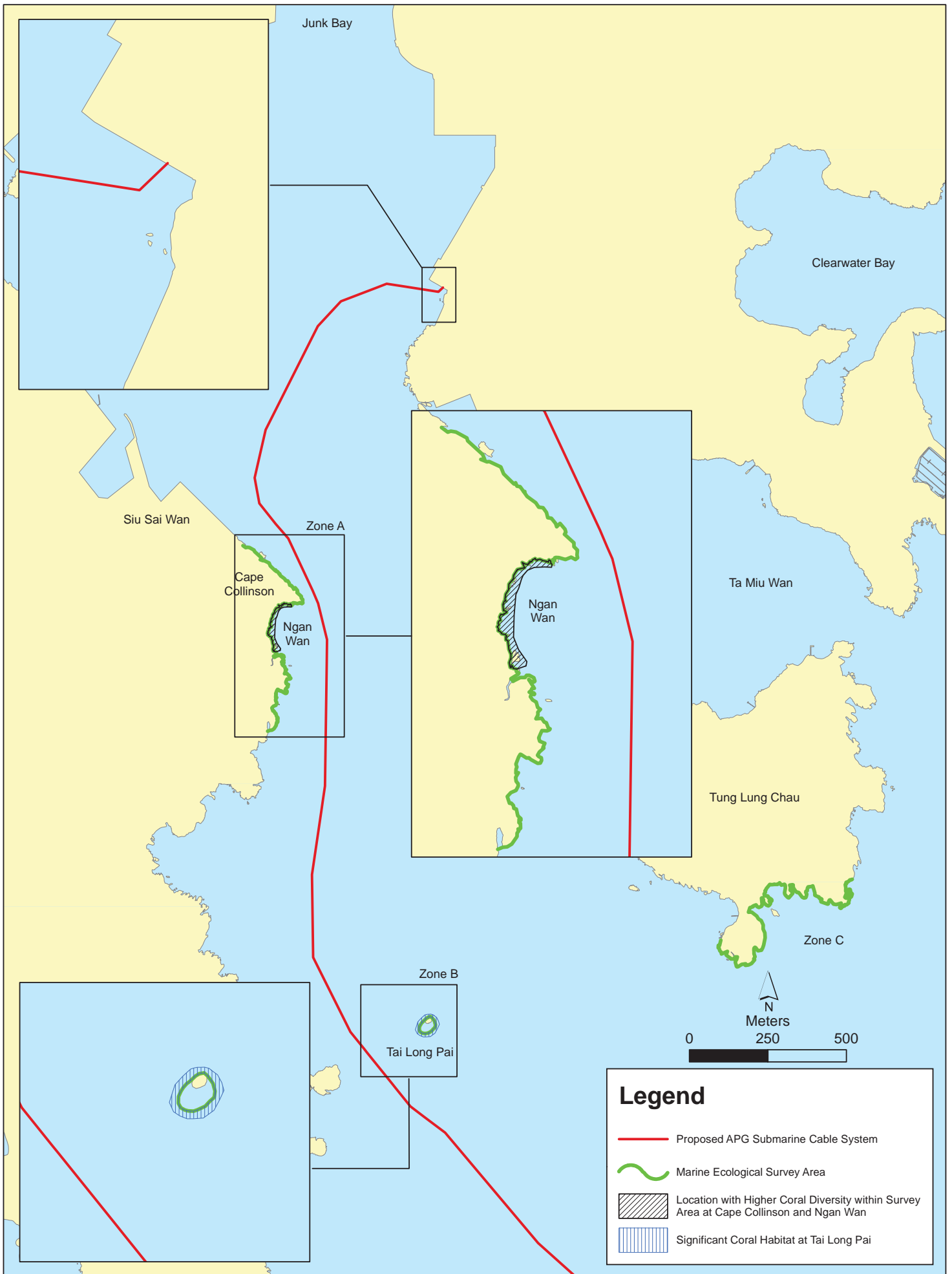
- Qualitative spot dive survey;
- Semi-quantitative Rapid Ecological Assessment (REA) survey; and
- Coral Colony Monitoring.

Survey methodology of the three components is described below.

##### *Qualitative Spot Dive Survey*

The qualitative spot dive survey was undertaken as part of the Baseline Survey to identify suitable coral monitoring locations at Cape Collinson, Tai Long Pai and Tung Lung Chau (survey areas refer to *Figure 2.1*). During the survey, qualitative spot dive survey were conducted within the designated





**Legend**

- Proposed APG Submarine Cable System
- Marine Ecological Survey Area
- Location with Higher Coral Diversity within Survey Area at Cape Collinson and Ngan Wan
- Significant Coral Habitat at Tai Long Pai

Figure 2.1

Locations of Coral Monitoring

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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 were identified (defined as locations within relatively higher coral abundance and species/ genus number for the purpose of this coral monitoring programme) and were selected for the subsequent REA survey and coral colony monitoring for this Baseline and future Post Project Coral Surveys. The depth range (shallow and deep) to be monitored were also finalized based on observed coral distribution.

#### *Rapid Ecological Assessment (REA) Survey Method*

A standardised semi-quantitative REA survey technique was used to investigate the general conditions of the coral communities (hard, soft and black corals) associated with subtidal hard bottom habitats at the selected Monitoring and Control Stations. The collection of REA data during the 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>.

A series of REA surveys were conducted by qualified coral ecologists by SCUBA at the Monitoring Stations (Cape Collinson and Tai Long Pai) and Control Station (Tung Lung Chau) with the aim to record the condition of substratum, estimate the diversity and relative abundance of coral assemblages (i.e. 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 was 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 were determined based on findings from the qualitative spot dive survey. A total of three (3) REA transects were monitored at each depth

(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.

region of Cape Collinson and Tung Lung Chau, while two (2) transects were 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 swam along the transect slowly and conduct the REA survey. The REA methodology encompassed 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 were assigned to one of seven standard ranked (ordinal) categories (Table 2.1 and 2.2).

**Table 2.1** *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)

**Table 2.2** *Categories used in the REA Surveys – Ordinal Ranks of Percentage Cover*

<b>Rank</b>	<b>Percentage Cover (%)</b>
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 was compiled for each transect. Taxa were 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 was ranked in terms of abundance in the community (*Table 2.3*). 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 2.3** *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 were recorded for each REA transect as follows:

- The degree of exposure to prevailing wave energy was 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 were taken for each REA transect. All field data were checked upon completion of each REA transect and a dive survey proforma sheet were completed at the end of the fieldwork day. Photographs were compiled for each REA transect which was then reviewed and REA data be verified.
- Verified REA data were presented in terms of:
  - Site (transect) information (Tier I and II data), depth and environmental descriptors;
  - Species abundance data for each transect; and
  - Species lists, species richness and mean values for ecological and substratum types will be compiled. The rank abundance values were be converted to a mid-value percentage cover.

### *Coral Colony Monitoring*

Coral colony monitoring was undertaken during the Baseline Coral Survey and will also be conducted during the Post-Project Survey to identify any evidence of sediment stress to corals before and after cable installation works. At each station, a total of fifteen (15) hard coral colonies and fifteen (15) octocoral/black coral colonies were selected for monitoring. Priority was 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 coral was identified to species or genus levels and photographed. The following data were 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 was also recorded. The coral colony monitoring exercise was undertaken to ensure colonies of similar growth forms and size would be selected for the Baseline and Post Project Monitoring. Although coral tagging is a common practice for repeated monitoring of individual colony,

this technique was not 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.

Coral Colony Monitoring will be undertaken in the Post Project Monitoring in which coral colonies with similar growth forms and size to those monitored during the Baseline Coral Survey will be selected and measured. The comparison of baseline and post Project data would allow for determination of any observable adverse impacts to the health conditions of coral colonies as a result to the cable laying works.

The Baseline Coral Survey was conducted over two days on 21 and 27 April 2016. The weather condition was mainly cloudy with sunny intervals, with moderate (Force 3 – 4) south to southeasterly winds. Slight to moderate swell was present in the sea on the two survey days. The visibility was moderate and generally ranged between 1.5 to 3.0 m.

### 3.1 RESULTS OF QUALITATIVE SPOT DIVE SURVEY

#### 3.1.1 Zone A - Cape Collinson

Results of qualitative spot dive survey at Cape Collinson (Zone A; *Figure 3.1*) confirmed that the seabed was composed of hard bottom substrates which were mainly bedrocks and large boulders. Generally, cover of hard corals was less than 5% in the shallow water (from -2 to -5m CD) with 16 hermatypic hard coral species and one (1) ahermatypic coral species recorded. The estimated cover of hard coral was lower in the deep water (from -5 to -15m CD) than the shallow water region. Octocoral and black coral assemblage was also observed at low estimated cover of 5-10% in both shallow and deep water regions with a total of 13 octocoral species and one (1) black coral species recorded (*Table 3.1*).

Similar abiotic composition was found along the entire Zone A. At the south of Cape Collinson and northern part of Ngan Wan, more hard coral species and larger hard coral colonies were found although the estimated coral cover and number of octocoral species recorded was similar to other areas in Zone A. As such, the northern part of Ngan Wan was considered as significant coral habitats and was selected as the area for the REA survey and coral colony monitoring (*Figure 3.1*).

#### 3.1.2 Zone B - Tai Long Pai

Results of qualitative spot dive survey at Tai Long Pai (Zone B; *Figure 3.1*) confirmed that the seabed was composed of hard bottom substrates which were mainly bedrocks. Coverage and abundance of hard corals was very low (less than 5%) with three (3) hermatypic hard coral species and one (1) ahermatypic coral species being recorded. Hermatypic hard coral was only found in the southwestern part of Tai Long Pai. A total of twelve (12) octocoral species and two (2) black coral species were recorded along the shoreline of Tai Long Pai with an estimated cover of 5-10% in shallow water and 11 to 30% in deep water.

The cover and diversity of octocoral were similar within the shoreline of Zone B while hard corals were only recorded at the southwestern part of Tai Long Pai. REA survey and coral colony monitoring were undertaken at the northwestern and southwestern region which is considered as significant coral habitat and closer to the proposed cable route (*Figure 3.1*).

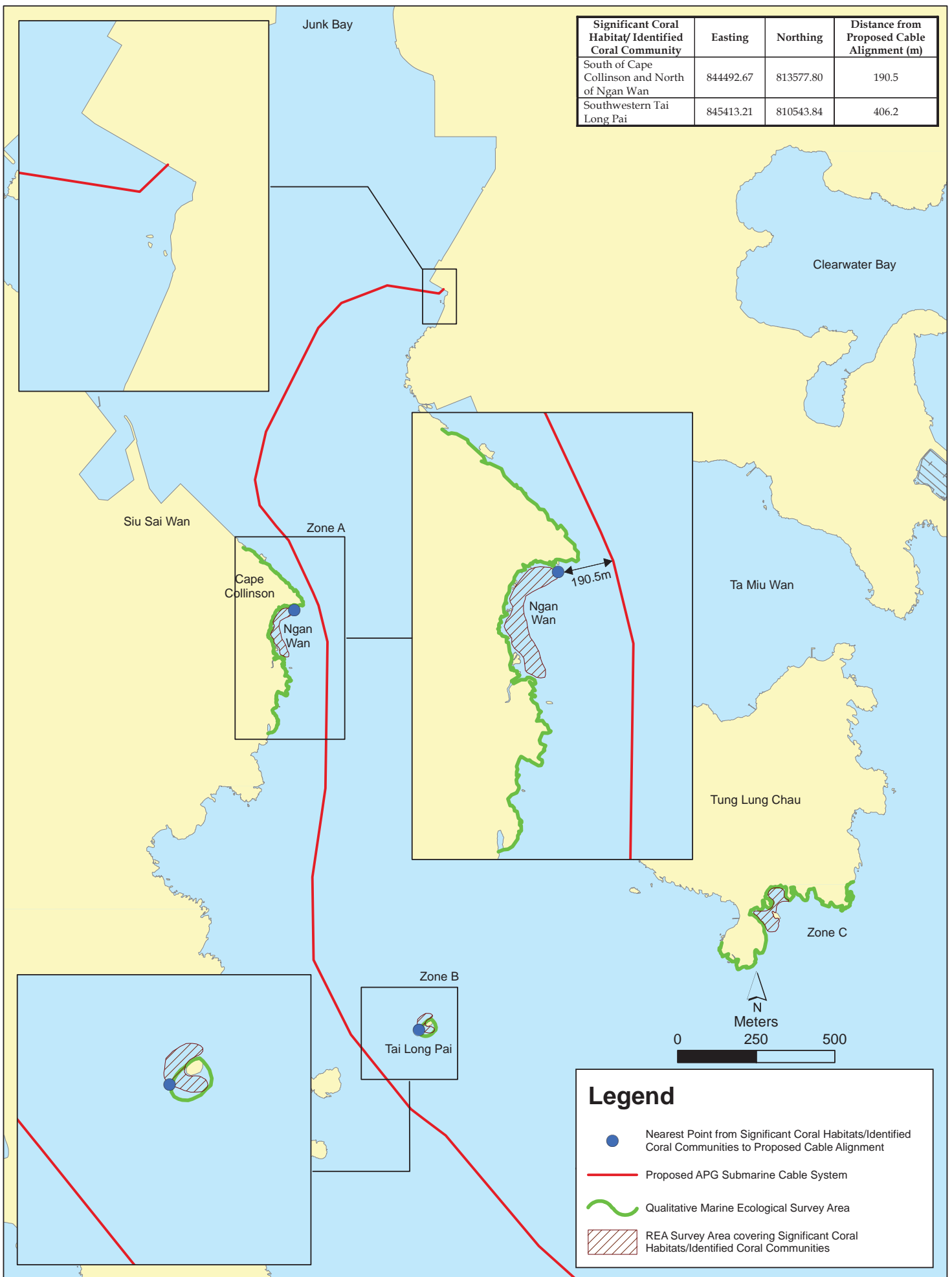


Figure 3.1  
An Enlarged Plan Showing the Coordinates and Location of the Identified Coral Communities and Cable Alignment

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Date: 9/5/2016



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## 3.1.3

*Zone C - Tung Lung Chau*

Results of qualitative spot dive survey at Tung Lung Chau (Zone C; Figure 3.1) confirmed that the seabed was composed mainly of bedrock and large boulders. Twenty-six (26) hermatypic hard coral species, one (1) ahermatypic hard coral species and six (6) octocorals species were recorded at the sheltered area east of the Tung Lung Chau headland. The estimated covers of hard coral and octocoral were lower than 10%. The coral assemblage in this area is considered similar and being comparable to the biotic assemblages in Impact Monitoring stations at Zone A and Zone B and were thus selected as the Control station for the REA survey and coral colony monitoring.

**Table 3.1** *Coral Species Recorded at the Qualitative Spot Dive Survey Zone A, B & C*

<b>Taxon</b>	<b>Family</b>	<b>Species</b>		
<b>Zone A - Cape Collinson (Impact Monitoring Station)</b>				
Hard Coral	Acroporidae	<i>Montipora venosa</i>		
	Coscinaraeidae	<i>Coscinaraea</i> sp.		
	Dendrophylliidae	<i>Turbinaria peltata</i>		
	Incertae sedis		<i>Leptastrea pruinosa</i>	
			<i>Plesiastrea versipora</i>	
			<i>Cyphastrea chalcidicum</i>	
			<i>Cyphastrea serailia</i>	
			<i>Dipsastraea lizardensis</i>	
	Merulinidae		<i>Dipsastraea speciosa</i>	
			<i>Dipsastraea rutumana</i>	
			<i>Favites abdita</i>	
			<i>Favites pentagona</i>	
		Poritidae		<i>Goniopora columna</i>
				<i>Goniopora stutchburyi</i>
				<i>Porites</i> sp.
Psammocoridae		<i>Psammocora superficialis</i>		
	Dendrophylliidae	<i>Tubastrea/Dendrophyllia</i> sp.		
Ahermatypic Coral Species				
Octocoral	Acanthogorgiidae	<i>Anthogorgia</i> sp.		
	Alcyoniidae	<i>Sinularia</i> sp.		
	Gorgoniidae	<i>Leptogorgia</i> sp.		
	Nidaliidae	<i>Nephthyigorgia</i> sp.		
	Nephtheidae		<i>Dendronephthya</i> sp.	
			<i>Scleronephythya gracillicum</i>	
			<i>Echinogorgia</i> sp.	
	Plexauridae		<i>Echinomuricea</i> sp.	
			<i>Euplexaura</i> sp.	
			<i>Menella</i> sp.	
		<i>Paraplexaura</i> sp.		
		<i>Ellisella</i> sp.		
Ellisellidae		<i>Dichotella gemmacea</i>		
		<i>Cirrhopathes</i> sp.		
Black Coral	<i>Antipathidae</i>			
<b>Zone B - Tai Long Pai (Impact Monitoring Station)</b>				
Hard Coral	Incertae sedis	<i>Leptastrea pruinosa</i>		
		<i>Plesiastrea versipora</i>		
Ahermatypic Coral Species	Poritidae	<i>Porites</i> sp.		
		<i>Tubastrea/Dendrophyllia</i> sp.		
Octocoral	Dendrophylliidae	<i>Anthogorgia</i> sp.		
	Acanthogorgiidae	<i>Cladiella</i> sp.		
	Alcyoniidae	<i>Nephthyigorgia</i> sp.		
	Nidaliidae	<i>Dendronephthya</i> sp.		
	Nephtheidae			

Taxon	Family	Species		
Black Coral	Plexauridae	<i>Scleronephythya gracillicum</i>		
		<i>Astrogorgia</i> sp.		
		<i>Bebryce</i> sp.		
		<i>Echinogorgia</i> sp.		
		<i>Echinomuricea</i> sp.		
		<i>Euplexaura</i> sp.		
		<i>Menella</i> sp.		
		<i>Paraplexaura</i> sp.		
		<i>Antipathes</i> sp.		
		<i>Cirrhopathes</i> sp.		
<b>Zone C - Tung Lung Chau (Control Station)</b>				
Hard Coral	Acroporidae	<i>Acropora digitifera</i>		
		<i>Acropora valida</i>		
		<i>Acropora solitaryensis</i>		
		<i>Montipora venosa</i>		
		Agariciidae	<i>Pavona decussata</i>	
			Dendrophylliidae	<i>Turbinaria peltata</i>
				Incertae sedis
		<i>Plesiastrea versipora</i>		
		Lobophylliidae	<i>Acanthastrea echinata</i>	
			<i>Echinophyllia aspera</i>	
		Merulinidae	<i>Cyphastrea chalcidicum</i>	
			<i>Cyphastrea serailia</i>	
			<i>Dipsastraea speciosa</i>	
			<i>Dipsastraea rutumana</i>	
			<i>Favites abdita</i>	
			<i>Favites chinensis</i>	
			<i>Favites flexuosa</i>	
			<i>Favites pentagona</i>	
			<i>Hydnophora exesa</i>	
			<i>Platygyra acuta</i>	
			<i>Platygyra carnosus</i>	
			<i>Goniopora columna</i>	
			<i>Goniopora stutchburyi</i>	
			<i>Goniopora planulata</i>	
		<i>Porites</i> sp.		
		Ahermatypic Coral Species	Psammocoridae	<i>Psammocora superficialis</i>
			Dendrophylliidae	<i>Tubastrea/Dendrophyllia</i> sp.
Octocoral	Alcyoniidae	<i>Cladiella</i> sp.		
		<i>Lobophytum</i> sp.		
	Gorgoniidae	<i>Sinularia</i> sp.		
	Nephtheidae	<i>Dendronephthya</i> sp.		
	Plexauridae	<i>Echinomuricea</i> sp.		
	Ellisellidae	<i>Paraplexaura</i> sp.		

### 3.2

#### *DISTANCE OF CORAL HABITAT FROM CABLE ALIGNMENT*

To protect the coral communities at Cape Collinson (Zone A) and Tai Long Pai (Zone B), identified coral communities should be more than 180m away from the cable alignment according to the requirement of *Environmental Permit (EP-485/2014)* Condition 2.4. The coordinates of the significant coral habitats/ identified coral communities at the south of Cape Collinson and northern part of Ngan Wan (Zone A) and at the southwestern part of Tai Long Pai (Zone B), and the distance from the nearest point to the proposed cable alignment is presented in *Table 3.2*. Moreover, an enlarge plan is presented in *Figure 3.1*.

Overall, the result indicated that the cable alignment is more than 190m away from significant coral habitats/ identified coral communities at Cape Collinson (Zone A) and Tai Long Pai (Zone B) and it complied with the requirement of *Environmental Permit (EP- 485/2014)*.

**Table 3.2** *Coordinates of the Significant Coral Habitats/ Identified Coral Communities and the Distances from their Nearest Points to the Proposed Cable Alignment*

Significant Coral Habitat/ Identified Coral Community	Easting	Northing	Distance from Proposed Cable Alignment (m)
South of Cape Collinson and North of Ngan Wan	844492.67	813577.80	190.5
Southwestern Tai Long Pai	845413.21	810543.84	406.2

### 3.3 RESULTS OF REA SURVEY

The seabed compositions along each transect of Zone A to C are shown in *Tables 3.3 - 3.5*. Locations of REA survey are presented in *Figure 3.1*.

#### 3.3.1 Zone A – Cape Collinson

The seabed at the REA survey area of Zone A was predominately composed of bedrocks in shallow depth region (-2 to -5 m CD) while at deep depth region (-5 to -15m CD) the seabed was also mainly composed of bedrocks and boulders. However, the deep depth region of Transect 1 was mainly composed of sand and boulders.

Cover of hard corals and octocoral was less than 5% in shallow depth region (-2 to -5 m CD), with 14 hermatypic hard coral species, one ahermatypic hard coral species and six octocoral species being recorded. A relatively more diverse and abundant octocoral community was found at deep depth region beyond -5 m CD. Nine (9) species of octocorals and one (1) species of black corals were recorded during REA survey. *Echinomuricea* sp. was the dominant octocoral species found in the region. All coral species recorded are common and have a widespread distribution throughout Hong Kong’s nearshore waters.

#### 3.3.2 Zone B – Tai Long Pai

Two areas were selected around Tai Long Pai for REA survey (one located on the northwestern side, one on the southwestern side). The seabed was predominately composed of bedrocks in both shallow and deep depth zones.

Two (2) hermatypic hard coral species were recorded in shallow depth zone along the transects located on the southwestern side of Tai Long Pai. One (1) ahermatypic hard coral species was recorded in both shallow and deep depth zone of the whole Zone B. A relatively more diverse and abundant octocoral community was recorded in deep depth zone in the entire Zone B. Ten (10) species of octocorals were recorded in relatively higher abundance while *Echinomuricea* sp. and *Dendronephthya* sp. were the dominant species. Two (2)

species of black corals were recorded with higher abundance of *Cirrhopathes* sp. observed. Crinoids and starfish were commonly found.

### 3.3.3 Zone C - Tung Lung Chau

The seabed in both shallow and deep depth zones of Zone C were predominately composed of bedrocks and large boulders.

Hard coral community was recorded in shallow depth zone (- 2 to -5 mCD) with 18 hermatypic hard coral species and one (1) species of ahermatypic hard coral species and four species of octocoral recorded. Relatively high diversity and abundance of hard coral and octocorals were observed in deep depth zone (beyond -5 m CD) of Transect 2 compared to other transects. Hard coral including, *Montipora venosa*, *Pavona decussata*, *Plesiastrea versipora* and *Porites* sp. and octocoral, including *Cladiella* sp., *Lobophytum* sp. and *Sinularia* sp., and *Dendronephthya* sp. were commonly observed in this area. All coral species recorded are common and have a widespread distribution throughout Hong Kong's nearshore waters.

**Table 3.3 Description of the Seabed Recorded along Each Transect in REA**

Transect	Depth (-m CD)	Description
<b>Zone A - Cape Collinson (Impact Monitoring Station)</b>		
<b>Transect 1</b>		
Shallow	~3-5	The seabed was composed of rubbles and boulders. The hard coral cover was low (< 5%) with nine (9) hermatypic hard coral species recorded and the abundant species were <i>Porites</i> sp.. The octocoral cover was low (< 5%) with three (3) species ( <i>Sinularia</i> sp., <i>Dendronephthya</i> sp. and <i>Menella</i> sp.) recorded.
Deep	~10	The seabed was mainly composed of sand and boulders. The hard coral and black coral cover was low (< 5%) with six (6) hermatypic and one (1) ahermatypic hard coral species recorded and one (1) species of black coral. <i>Tubastrea/Dendrophyllia</i> sp., <i>Goniopora stutchburyi</i> and <i>Porites</i> sp. were commonly identified. The octocoral was low (< 6-10%) with eight (8) species of octocorals and o recorded. Gorgonians, <i>Echinomuricea</i> sp., were recorded to be dominant and growing on sand.
<b>Transect 2</b>		
Shallow	~3-5	The seabed was mainly composed of bedrocks (~60%) with some boulders (~30%). The hard coral cover was about 5% with nine hard coral species and colonies of <i>Porites</i> sp. were commonly recorded. The octocoral cover was low (< 5%) with only <i>Euplexaura</i> sp. recorded.
Deep	~8-9	The seabed was mainly composed of bedrocks (~50%). Sparse hard coral colonies of <i>Porites</i> sp., <i>Leptastrea pruinosa</i> and <i>Goniopora stutchburyi</i> and black coral, <i>Cirrhopathes</i> sp., were found with low coverage (< 5%). The octocoral cover was low (< 6-10%) with five (5) species recorded and the transect was dominant by gorgonians, <i>Echinomuricea</i> sp..
<b>Transect 3</b>		
Shallow	~3-5	The seabed was mainly composed of bedrocks and boulders. The coverage of hard coral and octocoral cover was low (< 5%) with five species of hard coral and four species of octocoral recorded. Small colonies of <i>Porites</i> sp. were commonly identified.

Transect	Depth (-m CD)	Description
Deep	~12	The seabed was mainly composed of bedrocks (~60%). Limited numbers of hard coral colonies, <i>Leptastrea pruinosa</i> , <i>Goniopora stutchburyi</i> and <i>Porites</i> sp., was found. The octocoral cover was about 6-10% with five (5) species recorded and the transect was dominant by gorgonians, <i>Echinomuricea</i> sp..
<b>Zone B - Tai Long Pai (Impact Monitoring Station)</b>		
Transect 1		
Shallow	~2-5	The seabed was mainly composed of bedrocks (> 80%). Hard coral species was extremely low (< 5%). The octocoral cover was about 5% with three (3) species ( <i>Dendronephthya</i> sp., <i>Scleronephythya</i> sp. and <i>Euplexaura</i> sp.) recorded.
Deep	~5-15	The seabed was mainly composed of bedrocks (> 80%). Only high abundance of ahermatypic hard coral species, <i>Tubastrea/Dendrophyllia</i> sp., was recorded in low coverage (<5%). The octocoral cover was about 11-30% with nine (9) species recorded. <i>Echinomuricea</i> sp. was the dominant soft coral species and <i>Anthogorgia</i> sp., <i>Dendronephthya</i> sp. and <i>Scleronephythya</i> sp. were commonly observed. Black coral colonies, <i>Antipathes curvata</i> and <i>Cirrhopathes</i> sp., were observed in low coverage (<5%).
Transect 2		
Shallow	~2-5	The seabed was mainly composed of bedrocks (> 80%). No hard coral cover was observed. The octocoral cover was about 5% with six (6) species recorded. The transect was dominated by <i>Dendronephthya</i> sp..
Deep	~5-15	The seabed was mainly composed of bedrocks (> 80%). Colonies of ahermatypic hard coral <i>Tubastrea/Dendrophyllia</i> sp. were found in high abundance. The octocoral cover was about 11-30% with eight (8) species recorded. <i>Echinomuricea</i> sp. was the dominant soft coral species and <i>Dendronephthya</i> sp., <i>Scleronephythya</i> sp. and <i>Astrogorgia</i> sp. were commonly found. Black coral colonies, <i>Antipathes curvata</i> and <i>Cirrhopathes</i> sp. were observed in low coverage (<5%).
<b>Zone C - Tung Lung Chau (Control Station)</b>		
Transect 1		
Shallow	~3-5	The seabed was mainly composed of bedrocks (~80%). Both hard coral and octocoral cover was very low (< 5%) with seven (7) hermatypic hard coral species, one (1) ahermatypic hard coral species and two (2) octocoral species recorded. This transect was dominated by ahermatypic hard coral <i>Tubastrea/Dendrophyllia</i> sp..
Deep	~10	The seabed was mainly composed of large boulders (~40%). The hard coral and octocoral cover was low (< 5%) with four (4) species of hermatypic hard coral species, one (1) ahermatypic hard coral species and two (2) species of octocoral recorded. Small colonies of <i>Porites</i> sp. were commonly found in this depth.
Transect 2		
Shallow	~3-5	The seabed was mainly composed of bedrock and boulders. Both hard coral and octocoral cover was low (< 5%) with eight (8) hermatypic hard coral species, one (1) ahermatypic hard coral and three (3) species of octocoral recorded. Hard coral <i>Pavona decussata</i> were commonly recorded and only a few colonies of other hard coral and octocoral species were found.

Transect	Depth (-m CD)	Description
Deep	~6-8	The seabed was mainly composed of bedrocks (~80%). The hard coral and octocoral cover was ~ 10% with higher diversity compared to other transects. The hard coral with 19 species and octocoral with five (5) species were recorded. Commonly identified corals included <i>Montipora venosa</i> , <i>Pavona decussate</i> , <i>Plesiastrea versipora</i> and <i>Porites</i> sp. for hard coral species and <i>Cladiella</i> sp., <i>Lobophytum</i> sp., <i>Simularia</i> sp. and <i>Dendronephthya</i> sp. for octocoral species.
<b>Transect 3</b>		
Shallow	~3-5	The seabed was mainly composed of bedrocks and small boulders. The hard coral cover was low (<5%) with 14 hermatypic hard coral species recorded and most of the colonies identified were from Merulinidae, such as <i>Platygyra acuta</i> and <i>Favites pentagona</i> . The octocoral cover was very low (< 5%) with only small colonies of <i>Cladiella</i> sp. recorded.
Deep	~9-10	The seabed was mainly composed of small boulders (~50%). The hard coral cover was low (< 5%) with 15 hermatypic hard coral species recorded, including <i>Montipora venosa</i> , <i>Plesiastrea versipora</i> , <i>Platygyra acuta</i> and <i>Porites</i> sp. The octocoral cover was low (< 10%) with only <i>Dendronephthya</i> sp. recorded.

**Table 3.4 Seabed Attributes along the REA Survey Transects**

Zone	A						B				C					
Depth (a)	S1	S2	S3	D1	D2	D3	S1	S2	D1	D2	S1	S2	S3	D1	D2	D3
<b>Seabed attributes (b)</b>																
Bedrock	2	5	3	1	5	5	6	6	6	6	6	4	4	3	6	1
Boulders - large	4	2	3	3	3	3	1	1	3	3	0	3	3	4	2	2
Boulders - small	2	2	3	3	2	2	1	1	2	2	0	3	3	2	0	4
Rock	1	1	1	1	1	1	0	0	0	0	1	2	1	1	0	1
Rubble	3	2	1	2	1	1	1	1	1	1	1	2	1	1	0	2
Sand	2	1	2	3	2	1	1	1	1	1	1	1	1	1	1	1
Silt	0	0	0	1	2	2	0	0	1	1	0	0	0	1	1	1
<b>Ecological attributes (b)</b>																
Hard coral	1	1	1	1	1	1	1	1	0	1	1	1	1	1	2	1
Dead standing coral	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Octocoral	1	1	1	2	2	2	1	1	3	3	1	1	1	1	2	2
Black coral	0	0	0	1	1	0	0	0	2	2	0	0	0	0	0	0
Turf algae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Macroalgae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coralline algae	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Notes:

(a) s = shallow water; m = mid water; d=deep water

(b) 1=<5% Cover, 2= 6-10% Cover, 3 = 11-30% Cover, 4 = 31-50% Cover, 5 = 51-75% Cover, 6 = 76-100% Cover.

Table 3.5 Seabed Attributes along the REA Survey Transects

Type	Taxon/ Family	Species	Zone																
			A	A	A	A	A	A	B	B	B	B	C	C	C	C	C	C	
		<b>Depth <sup>(a)</sup></b>	S1	S2	S3	D1	D2	D3	S1	S2	D1	D2	S1	S2	S3	D1	D2	D3	
Hard Coral	Acroporidae	<i>Acropora digitifera</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
		<i>Acropora valida</i>	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	1
		<i>Acropora solitaryensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1
		<i>Montipora venosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	3	2
	Agariciidae	<i>Pavona decussata</i>	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0
	Coscinaraeidae	<i>Coscinaraea</i> sp.	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dendrophyllidae	<i>Turbinaria peltata</i>	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	2	0
		<i>Tubastrea/ Dendrophyllia</i> sp.	0	0	0	3	0	0	2	2	5	5	5	0	0	2	1	0	
	Incertae sedis	<i>Leptastrea pruinosa</i>	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0
		<i>Plesiastrea versipora</i>	3	2	2	1	0	0	1	0	0	0	0	2	2	1	1	3	2
	Lobophylliidae	<i>Acanthastrea echinata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
		<i>Echinophyllia aspera</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Merulinidae	<i>Cyphastrea chalcidicum</i>	1	1	0	0	0	0	0	0	0	0	0	1	0	1	0	2	1
		<i>Cyphastrea serailia</i>	2	2	0	1	0	0	0	0	0	0	0	1	0	2	0	2	0
		<i>Dipsastraea lizardensis</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		<i>Dipsastraea speciosa</i>	1	2	0	1	0	0	0	0	0	0	0	1	0	1	0	2	0
		<i>Dipsastraea rutumana</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
		<i>Favites abdita</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	1
		<i>Favites chinensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
		<i>Favites flexuosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
<i>Favites pentagona</i>		0	2	0	0	0	0	0	0	0	0	0	0	1	3	0	2	1	
<i>Hydnophora exesa</i>		0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	
<i>Platygyra acuta</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	2	2		

Type	Taxon/ Family	Species	Zone																
			A	A	A	A	A	A	B	B	B	B	C	C	C	C	C	C	
		<b>Depth <sup>(a)</sup></b>	S1	S2	S3	D1	D2	D3	S1	S2	D1	D2	S1	S2	S3	D1	D2	D3	
	Poritidae	<i>Platygyra carnosus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
		<i>Goniopora columna</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		<i>Goniopora stutchburyi</i>	3	0	1	3	1	1	0	0	0	0	1	0	1	0	0	0	
		<i>Goniopora planulata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
		<i>Porites</i> sp.	4	3	3	3	1	1	1	0	0	0	2	0	1	3	3	2	
	Psammocoridae	<i>Psammocora superficialis</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
<b>Octocoral</b>	Acanthogorgiidae	<i>Acanthogorgia</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		<i>Anthogorgia</i> sp.	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	0
		<i>Muricella</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Alcyoniidae	<i>Cladiella</i> sp.	0	0	0	0	0	0	0	0	1	0	0	0	1	3	0	3	0
		<i>Lobophytum</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0
		<i>Sinularia</i> sp.	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
	Gorgoniidae	<i>Leptogorgia</i> sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Nidaliidae	<i>Nephtyigorgia</i> sp.	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Nephtheidae	<i>Dendronephthya</i> sp.	4	0	1	2	2	2	4	4	3	4	1	1	1	2	3	2	
		<i>Scleronephthya gracillicum</i>	0	0	0	1	0	0	3	1	3	2	0	0	0	0	0	0	0
	Plexauridae	<i>Astrogorgia</i> sp.	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
		<i>Bebryce</i> sp.	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
		<i>Echinogorgia</i> sp.	0	0	0	3	0	1	0	0	1	2	0	0	0	0	0	0	0
		<i>Echinomuricea</i> sp.	0	0	0	5	5	5	0	1	5	3	0	0	0	1	0	0	0
		<i>Euplexaura</i> sp.	0	1	2	1	2	1	1	3	3	1	0	0	0	0	0	0	0
		<i>Menella</i> sp.	1	0	0	3	2	0	0	0	1	2	0	0	0	0	0	0	0
		<i>Paraplexaura</i> sp.	0	0	1	1	0	1	0	3	0	0	1	0	0	0	1	0	0
	Ellisellidae	<i>Ellisella</i> sp.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		<i>Dichotella gemmacea</i>	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0



Type	Taxon/ Family	Species	Zone															
			A	A	A	A	A	A	B	B	B	B	C	C	C	C	C	
		<b>Depth <sup>(a)</sup></b>	S1	S2	S3	D1	D2	D3	S1	S2	D1	D2	S1	S2	S3	D1	D2	D3
<b>Black Coral</b>	<i>Antipathidae</i>	<i>Antipathes</i> sp.	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
		<i>Cirrhipathes</i> sp.	0	0	0	1	2	0	0	0	4	1	0	0	0	0	0	0

Notes:

(a) s = shallow water; m = mid water; d=deep water

(b) 1=Rare, 2= Uncommon, 3 = Common, 4 = Abundant, 5 = Dominant.

### 3.3.4

#### *Results of Coral Colony Monitoring*

Coral Colony Monitoring was undertaken at Zone A, Zone B and Zone C. The monitoring area was the same as the REA survey area (Figure 3.1).

The following data were collected for the identified hard coral, soft coral, black coral and gorgonian colonies and summarized in Table 3.6 to 3.8:

- 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 (i.e. pale) and b. bleached (i.e. 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.

Photographic records of the identified coral colonies are shown in Annex A.

Due to the natural high sedimentation rate in the Impact Monitoring stations and Control station, encrusting (i.e. *Leptastrea pruinosa*, *Porites* sp.) and submassive (i.e. *Goniopora stutchburyi*, *Cyphastrea serailia*) hermatypic hard corals were commonly found to be covered by sediments of less than 1 mm thickness during the Baseline Coral Survey. Octocorals, except for *Lobophytum* sp., *Sinularia* sp., *Bebryce* sp., *Dendronephthya* sp., *Scleronephthya gracillicum*, were generally free of sediments. The health conditions of hard corals and octocorals were generally good with no bleaching or partial mortality recorded, except partial mortality of *Echinogorgia* sp. colonies were observed in Cape Collinson.

Coral Colony Monitoring will be undertaken in the Post Project Monitoring in which coral colonies with similar growth forms and size to those monitored during the Baseline Coral Survey will be selected and measured. The comparison of baseline and post Project data would allow for determination of any observable adverse impacts to the health conditions of coral colonies as a result to the cable laying works.

**Table 3.6 Species, Size, Sediment Cover, Bleached Area, Partial Mortality and Physical Damage to the Identified Coral Colonies in Zone A (Cape Collinson)**

Coral No.	Family	Genus	Species	Max. diameter (cm)	Max. height (cm)	Max. width (cm)	Sediment cover (%)	Sediment color	Sediment Texture	Sediment thickness (cm)	Bleached area (%)	Partial mortality (%)	Physical damage to colonies
<b>Hard Corals</b>													
1	Merulinidae	<i>Leptastrea</i>	<i>pruinosa</i>	18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
2	Poritidae	<i>Goniopora</i>	<i>stuchburyi</i>	17	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	Merulinidae	<i>Leptastrea</i>	<i>pruinosa</i>	21	N/A	N/A	1	Light yellow	Fine	<1mm	N/A	N/A	N/A
4	Merulinidae	<i>Plesiastrea</i>	<i>versipora</i>	55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	Merulinidae	<i>Plesiastrea</i>	<i>versipora</i>	60	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
6	Poritidae	<i>Porites</i>	-	64	N/A	N/A	5	N/A	N/A	N/A	N/A	N/A	N/A
7	Merulinidae	<i>Favites</i>	<i>abditata</i>	19	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
8	Merulinidae	<i>Leptastrea</i>	<i>pruinosa</i>	54	N/A	N/A	5	N/A	N/A	N/A	N/A	N/A	N/A
9	Merulinidae	<i>Leptastrea</i>	<i>pruinosa</i>	53	N/A	N/A	5	Light yellow	Fine	<1mm	N/A	N/A	N/A
10	Poritidae	<i>Porites</i>	-	47	N/A	N/A	1	Light yellow	Fine	1mm	N/A	N/A	N/A
11	Poritidae	<i>Porites</i>	-	38	N/A	N/A	1	Light yellow	Fine	1mm	N/A	N/A	N/A
12	Poritidae	<i>Porites</i>	-	33	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
13	Merulinidae	<i>Dipsastraea</i>	<i>speciosa</i>	30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14	Merulinidae	<i>Leptastrea</i>	<i>pruinosa</i>	69	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
15	Dendrophylliidae	<i>Turbinaria</i>	<i>peltata</i>	20	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
<b>Octocorals</b>													
1	Plexauridae	<i>Menella</i>	-	N/A	30	31	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Ellisellidae	<i>Dichotella</i>	<i>gemmacea</i>	N/A	42	11	1	N/A	N/A	N/A	N/A	N/A	N/A
3	Nephtheidae	<i>Dendronephthya</i>	-	33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	Plexauridae	<i>Echinomuricea</i>	-	N/A	20	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	Plexauridae	<i>Menella</i>	-	N/A	50	58	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	Nephtheidae	<i>Dendronephthya</i>	-	36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Coral No.	Family	Genus	Species	Max. diameter (cm)	Max. height (cm)	Max. width (cm)	Sediment cover (%)	Sediment color	Sediment Texture	Sediment thickness (cm)	Bleached area (%)	Partial mortality (%)	Physical damage to colonies
7	Plexauridae	<i>Echinomuricea</i>	-	N/A	41	8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8	Plexauridae	<i>Echinomuricea</i>	-	N/A	37	11	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9	Plexauridae	<i>Echinomuricea</i>	-	N/A	24	13	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10	Plexauridae	<i>Echinogorgia</i>	-	N/A	27	12	N/A	N/A	N/A	N/A	N/A	10	N/A
11	Nephtheidae	<i>Dendronephthya</i>	-	22	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12	Nephtheidae	<i>Dendronephthya</i>	-	16	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
13	Plexauridae	<i>Paraplexaura</i>	-	N/A	10	7	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14	Ellisellidae	<i>Ellisella</i>	-	N/A	18	22	1	N/A	N/A	N/A	N/A	N/A	N/A
15	Plexauridae	<i>Euplexaura</i>	-	N/A	39	8	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**Table 3.7 Species, Size, Sediment Cover, Bleached Area, Partial Mortality and Physical Damage to the Identified Coral Colonies in Zone B (Tai Long Pai)**

Coral No.	Family	Genus	Species	Max. diameter (cm)	Max. height (cm)	Max. width (cm)	Sediment cover (%)	Sediment color	Sediment Texture	Sediment thickness (cm)	Bleached area (%)	Partial mortality	Physical damage to colonies
<b>Hard Corals</b>													
1	Poritidae	<i>Porites</i>	-	29	N/A	N/A	1	Light yellow	Fine	<1mm	N/A	N/A	N/A
2	Poritidae	<i>Porites</i>	-	14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	Merulinidae	<i>Plesiastrea</i>	<i>versipora</i>	9	N/A	N/A	1	Light yellow	Fine	<1mm	N/A	N/A	N/A
4	Dendrophyllidae	<i>Dendrophyllia</i>	-	11	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
5	Dendrophyllidae	<i>Dendrophyllia</i>	-	5	N/A	N/A	1	Light yellow	Fine	<1mm	N/A	N/A	N/A
6	Dendrophyllidae	<i>Dendrophyllia</i>	-	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7	Dendrophyllidae	<i>Dendrophyllia</i>	-	4	N/A	N/A	1	Light yellow	Fine	<1mm	N/A	N/A	N/A
8	Dendrophyllidae	<i>Dendrophyllia</i>	-	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9	Dendrophyllidae	<i>Dendrophyllia</i>	-	8	N/A	N/A	5	N/A	N/A	N/A	N/A	N/A	N/A
10	Dendrophyllidae	<i>Dendrophyllia</i>	-	5	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
11	Dendrophyllidae	<i>Dendrophyllia</i>	-	10	N/A	N/A	5	Light yellow	Fine	1mm	N/A	N/A	N/A
12	Dendrophyllidae	<i>Dendrophyllia</i>	-	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13	Merulinidae	<i>Leptastrea</i>	<i>pruinosa</i>	15	N/A	N/A	N/A	Light yellow	Fine	<1mm	N/A	N/A	N/A
14	Poritidae	<i>Porites</i>	-	8	N/A	N/A	5	Light yellow	Fine	<1mm	N/A	N/A	N/A
15	Merulinidae	<i>Plesiastrea</i>	<i>versipora</i>	43	N/A	N/A	1	Light yellow	Fine	<1mm	N/A	N/A	N/A
<b>Octocorals</b>													
1	Nephtheidae	<i>Dendronephthya</i>	-	11	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
2	Nephtheidae	<i>Dendronephthya</i>	-	14	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
3	Nephtheidae	<i>Dendronephthya</i>	-	13	N/A	N/A	1	Light yellow	Fine	<1mm	N/A	N/A	N/A
4	Nephtheidae	<i>Scleronephthya</i>	<i>gracillicum</i>	11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	Nephtheidae	<i>Scleronephthya</i>	<i>gracillicum</i>	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	Nephtheidae	<i>Scleronephthya</i>	<i>gracillicum</i>	36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7	Plexauridae	<i>Bebryce</i>	-	N/A	26	15	N/A	Light yellow	Fine	<1mm	N/A	N/A	N/A

Coral No.	Family	Genus	Species	Max. diameter (cm)	Max. height (cm)	Max. width (cm)	Sediment cover (%)	Sediment color	Sediment Texture	Sediment thickness (cm)	Bleached area (%)	Partial mortality	Physical damage to colonies
8	Acanthogorgiidae	<i>Anthogorgia</i>	-		9	10	1	N/A	N/A	N/A	N/A	N/A	N/A
9	Nephtheidae	<i>Scleronephthya</i>	<i>gracillicum</i>	35	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
10	Nephtheidae	<i>Scleronephthya</i>	<i>gracillicum</i>	28	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
11	Alcyoniidae	<i>Cladiella</i>	-	7	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
12	Plexauridae	<i>Euplexaura</i>	-	N/A	11	13	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13	Plexauridae	<i>Echinomuricea</i>	-	N/A	31	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14	Nephtheidae	<i>Dendronephthya</i>	-	23	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15	Nephtheidae	<i>Dendronephthya</i>	-	18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**Table 3.8 Species, Size, Sediment Cover, Bleached Area, Partial Mortality and Physical Damage to the Identified Coral Colonies in Zone C (Tung Lung Chau)**

Coral No.	Family	Genus	Species	Max. diameter (cm)	Max. height (cm)	Max. width (cm)	Sediment cover (%)	Sediment color	Sediment Texture	Sediment thickness (cm)	Bleached area (%)	Partial mortality	Physical damage to colonies
<b>Hard Corals</b>													
1	Poritidae	<i>Porites</i>	-	45	N/A	N/A	1	Light yellow	Fine	1mm	N/A	N/A	N/A
2	Poritidae	<i>Porites</i>	-	24	N/A	N/A	1	Light yellow	Fine	1mm	N/A	N/A	N/A
3	Poritidae	<i>Porites</i>	-	16	N/A	N/A	1	Light yellow	Fine	1mm	N/A	N/A	N/A
4	Poritidae	<i>Porites</i>	-	8	N/A	N/A	1	Light yellow	Fine	1mm	N/A	N/A	N/A
5	Dendrophyllidae	<i>Dendrophyllia</i>	-	27	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
6	Merulinidae	<i>Plesiastrea</i>	<i>versipora</i>	40	N/A	N/A	1	Light yellow	Fine	<1mm	N/A	N/A	N/A
7	Poritidae	<i>Goniopora</i>	<i>stuchburyi</i>	18	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
8	Merulinidae	<i>Dipsastraea</i>	<i>speciosa</i>	32	N/A	N/A	5	Light yellow	Fine	1mm	N/A	N/A	N/A
9	Merulinidae	<i>Cyphastrea</i>	<i>chalcidicum</i>	20	N/A	N/A	5	Light yellow	Fine	1mm	N/A	N/A	N/A
10	Merulinidae	<i>Plesiastrea</i>	<i>versipora</i>	45	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
11	Merulinidae	<i>Plesiastrea</i>	<i>versipora</i>	20	N/A	N/A	5	Light yellow	Fine	1mm	N/A	N/A	N/A
12	Merulinidae	<i>Cyphastrea</i>	<i>serailia</i>	9	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
13	Merulinidae	<i>Cyphastrea</i>	<i>serailia</i>	60	N/A	N/A	1	Light yellow	Fine	1mm	N/A	N/A	N/A
14	Acroporidae	<i>Acropora</i>	<i>valida</i>	17	N/A	N/A	5	Light yellow	Fine	<1mm	N/A	N/A	N/A
15	Merulinidae	<i>Platygyra</i>	<i>acuta</i>	17	N/A	N/A	5	N/A	N/A	N/A	N/A	N/A	N/A
<b>Octocorals</b>													
1	Plexauridae	<i>Menella</i>	-	N/A	52	18	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Nephtheidae	<i>Dendronephthya</i>	-	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	Nephtheidae	<i>Dendronephthya</i>	-	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	Alcyoniidae	<i>Cladiella</i>	-	36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	Alcyoniidae	<i>Cladiella</i>	-	26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	Alcyoniidae	<i>Cladiella</i>	-	52	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
7	Plexauridae	<i>Paraplexaura</i>	-	N/A	30	30	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Coral No.	Family	Genus	Species	Max. diameter (cm)	Max. height (cm)	Max. width (cm)	Sediment cover (%)	Sediment color	Sediment Texture	Sediment thickness (cm)	Bleached area (%)	Partial mortality	Physical damage to colonies
8	Nephtheidae	<i>Dendronephthya</i>	-	15	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
9	Alcyoniidae	<i>Lobophytum</i>	-	44	N/A	N/A	N/A	Light yellow	Fine	<1mm	N/A	N/A	N/A
10	Alcyoniidae	<i>Lobophytum</i>	-	34	N/A	N/A	N/A	Light yellow	Fine	<1mm	N/A	N/A	N/A
11	Alcyoniidae	<i>Sinularia</i>	<i>brassica</i>	45	N/A	N/A	1	Light yellow	Fine	<1mm	N/A	N/A	N/A
12	Alcyoniidae	<i>Sinularia</i>	<i>brassica</i>	35	N/A	N/A	N/A	Light yellow	Fine	<1mm	N/A	N/A	N/A
13	Alcyoniidae	<i>Lobophytum</i>	-	40	N/A	N/A	N/A	Light yellow	Fine	<1mm	N/A	N/A	N/A
14	Alcyoniidae	<i>Lobophytum</i>	-	40	N/A	N/A	N/A	Light yellow	Fine	<1mm	N/A	N/A	N/A
15	Nephtheidae	<i>Dendronephthya</i>	-	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A



## CONCLUSION

Baseline Coral Surveys were undertaken on 21 and 27 April 2016 at three designated monitoring zones (including two Impact Monitoring stations at Cape Collinson and Tai Long Pai, and one Control station at Tung Lung Chau) in accordance with the *EM&A Manual*. During the Baseline Survey, qualitative spot dive survey was firstly undertaken to identify significant coral habitats/identified coral communities (defined as locations within relatively higher coral abundance and species/ genus number for the purpose of this coral monitoring programme). The significant coral habitats/identified coral communities were selected for the subsequent REA survey and Coral Colony Monitoring during the Baseline and Post Project Coral Surveys.







Findings of the qualitative spot dive survey revealed the existence of identified coral communities at the south of Cape Collinson and northern part of Ngan Wan (within Zone A) and southwestern part of Tai Long Pai (within Zone B). Significant coral habitats/ identified coral communities are more than 190m away from the cable alignment and, as such, in compliance with the condition 2.4 of the *Environmental Permit (EP- 485/2014)*.

Baseline REA surveys and Coral Colony Monitoring were then undertaken at these communities as well as the Control station at Tung Lung Chau. Data obtained from the baseline surveys will be used to compare with post Project monitoring data in order to determine any observable adverse impacts to corals as a result of the cable installation works.

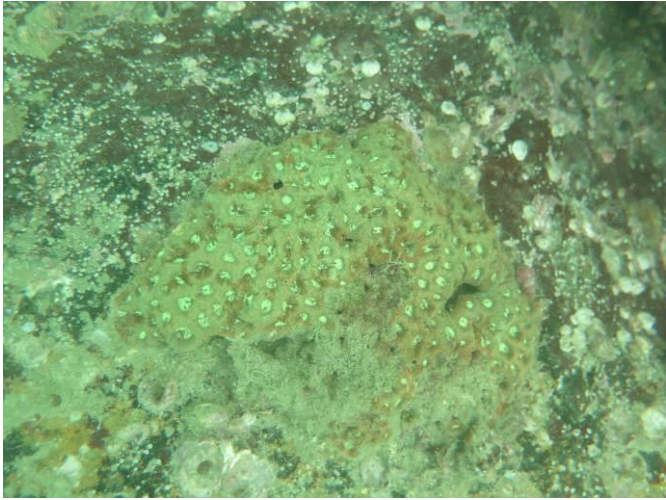
Annex A

Photographic Results of  
Identified Coral Colonies in  
Zone A, B & C

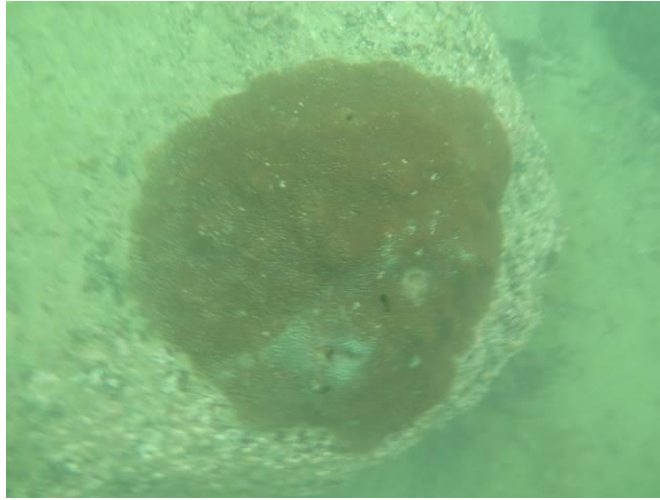
*Annex A1 Photographic Records of Identified Hard Coral Colonies at Impact Monitoring Site (Zone A - Cape Collinson) during the Baseline Coral Monitoring Survey*

Colony No. 1	Colony No. 2	Colony No. 3
		
Colony No. 4	Colony No. 5	Colony No. 6
		

**Colony No. 7**



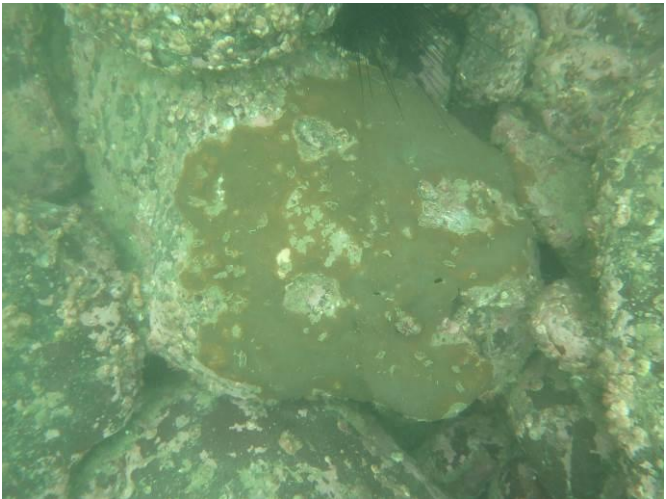
**Colony No. 8**



**Colony No. 9**



**Colony No. 10**



**Colony No. 11**



**Colony No. 12**



**Colony No. 13**



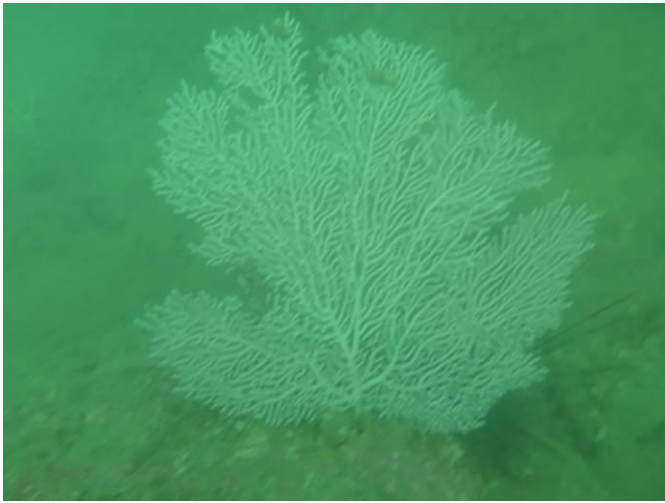





**Colony No. 14**



**Colony No. 15**



*Annex A2 Photographic Records of Identified Octocoral Colonies at Impact Monitoring Site (Zone A - Cape Collinson) during the Baseline Coral Monitoring Survey*

Colony No. 1	Colony No. 2	Colony No. 3
		
Colony No. 4	Colony No. 5	Colony No. 6
		

**Colony No. 7**



**Colony No. 8**



**Colony No. 9**



**Colony No. 10**



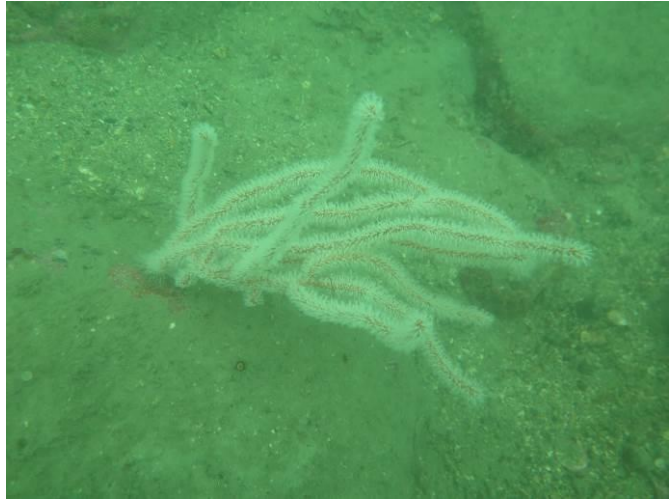
**Colony No. 11**



**Colony No. 12**



**Colony No. 13**



**Colony No. 14**

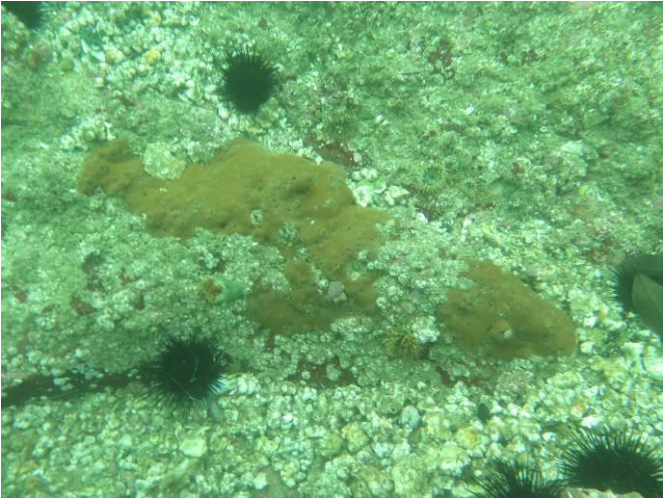







**Colony No. 15**





*Annex A3 Photographic Records of Identified Hard Coral Colonies at Impact Monitoring Site (Zone B - Tai Long Pai) during the Baseline Coral Monitoring Survey*

Colony No. 1	Colony No. 2	Colony No. 3
		
Colony No. 4	Colony No. 5	Colony No. 6
		

**Colony No. 7**



**Colony No. 8**



**Colony No. 9**



**Colony No. 10**



**Colony No. 11**



**Colony No. 12**









**Colony No. 13**

**Colony No. 14**

**Colony No. 15**



*Annex A4 Photographic Records of Identified Octocoral Colonies at Impact Monitoring Site (Zone B – Tai Long Pai) during the Baseline Coral Monitoring Survey*

Colony No. 1	Colony No. 2	Colony No. 3
		
Colony No. 4	Colony No. 5	Colony No. 6
		

**Colony No. 7**



**Colony No. 8**



**Colony No. 9**



**Colony No. 10**



**Colony No. 11**



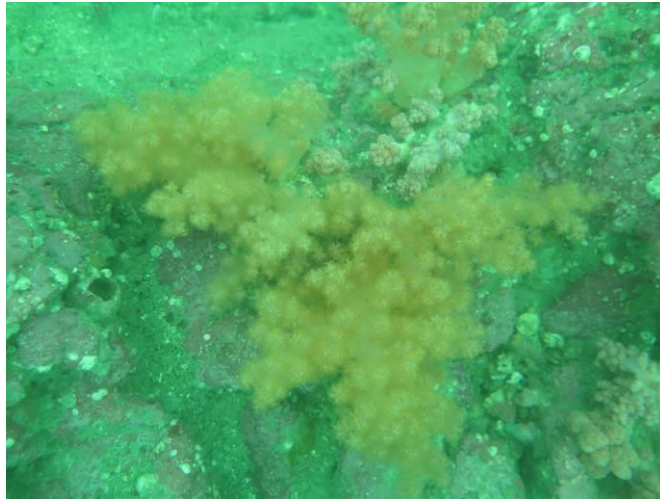
**Colony No. 12**



**Colony No. 13**






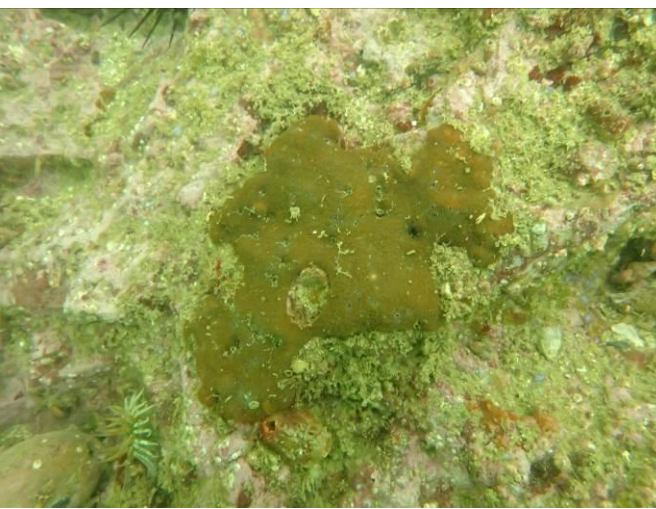


**Colony No. 14**



**Colony No. 15**



*Annex A5 Photographic Records of Identified Hard Coral Colonies at Control Monitoring Site (Zone C -Tung Lung Chau) during the Baseline Coral Monitoring Survey*

Colony No. 1	Colony No. 2	Colony No. 3
		
Colony No. 4	Colony No. 5	Colony No. 6
		

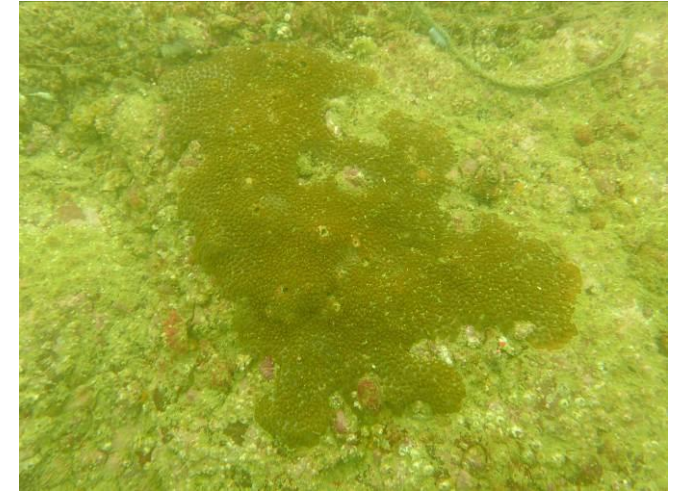
**Colony No. 7**



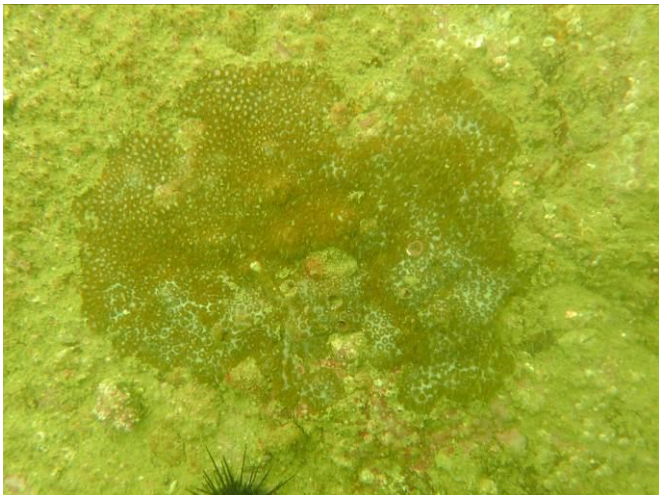
**Colony No. 8**



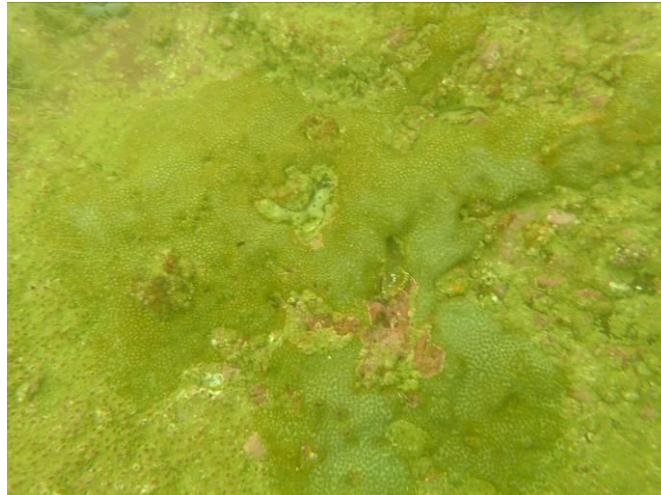
**Colony No. 9**



**Colony No. 10**



**Colony No. 11**

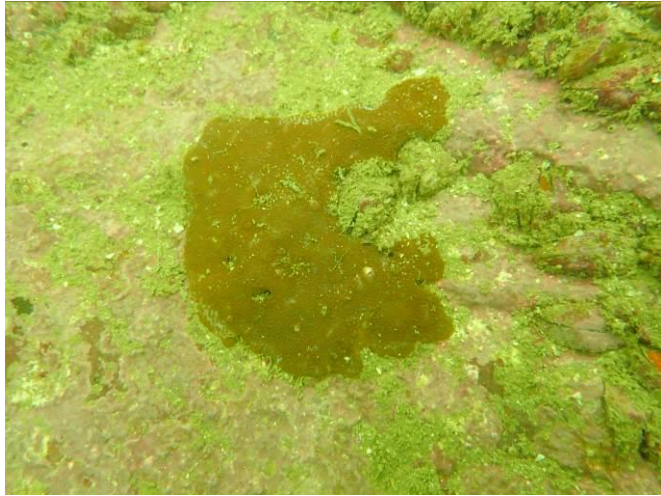


**Colony No. 12**





**Colony No. 13**





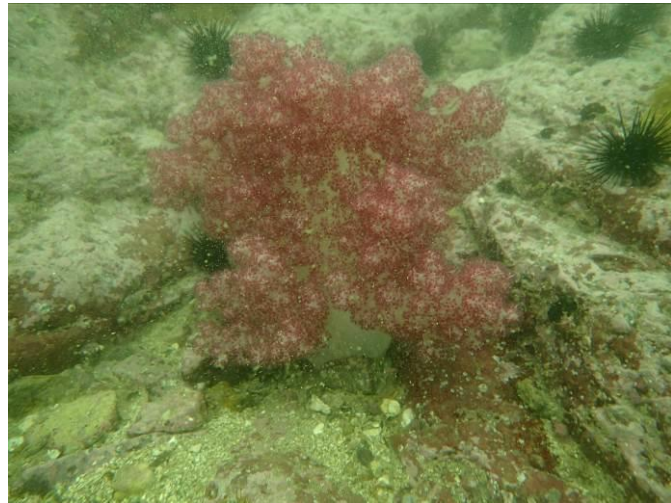



**Colony No. 14**



**Colony No. 15**



*Annex A6 Photographic Records of Identified Octocoral Colonies at Control Monitoring Site (Zone C -Tung Lung Chau) during the Baseline Coral Monitoring Survey*

Colony No. 1	Colony No. 2	Colony No. 3
		
Colony No. 4	Colony No. 5	Colony No. 6
		

**Colony No. 7**



**Colony No. 8**



**Colony No. 9**



**Colony No. 10**



**Colony No. 11**



**Colony No. 12**



**Colony No. 13**



**Colony No. 14**



**Colony No. 15**



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