FORM
5

Application No. :
Reference No :
(For official use)

FORM 5
ENVIRONMENTAL IMPACT ASSESSMENT ORDINANCE
(CHAPTER 499)
SECTION 13(1)

Application for Variation of an Environmental Permit

PART A PREVIOUS APPLICATIONS

☑ No previous application for variation of an environmental permit.

☐ The environmental permit was previously amended.

Application No. : .....

PART B DETAILS OF APPLICANT

B1. Name : (person or company)
TELSTRA INTERNATIONAL LIMITED

[Note : In accordance with section 13(1) of the Ordinance, the person holding an environmental permit or a person who assumes responsibility for the designated project may apply for variation of the environmental permit.]

B2. Business Registration No. : (if applicable) [redacted]

B3. Correspondence Address : [redacted]

B4. Name of Contact Person : [redacted]

B5. Position of Contact Person : [redacted]

B6. Telephone No. : [redacted]

B7. Fax No. : [redacted]

B8. E-mail Address : (if any) [redacted]

PART C DETAILS OF CURRENT ENVIRONMENTAL PERMIT

C1. Name of the Current Environmental Permit Holder :
Asia Global Crossing Limited (now acquired by Telstra)

C2. Application No. of the Current Environmental Permit : AEP-081/2000

C3. The Current Environmental Permit was Issued in : month / year
10 2000

Important Notes : Please submit the application together with

(a) 3 copies of this completed form; and

(b) appropriate fee as stipulated in the Environmental Impact Assessment (Fees) Regulation

to the Environmental Protection Department at the following address :

The EIA Ordinance Register Office,
27th floor, Southorn Centre,130 Hennessy Road,
Wan Chai, Hong Kong.

RECEIVED
14 OCT 2013
EIAO Register Office, E.P.D.

☐ Tick (✓) the appropriate box

PART D PROPOSED VARIATIONS TO THE CONDITIONS IN CURRENT ENVIRONMENTAL PERMIT

D1. Condition(s) in the Current Environmental Permit :	D2. Proposed Variation(s) :	D3. Reason for Variation(s) :	D4. Describe the environmental changes arising from the proposed variation(s) :	D5. Describe how the environment and the community might be affected by the proposed variation(s) :	D6. Describe how and to what extent the environmental performance requirements set out in the EIA report previously approved or project profile previously submitted for this project may be affected :	D7. Describe any additional measures proposed to eliminate, reduce or control any adverse environmental impact arising from the proposed variation(s) and to meet the requirements in the Technical Memorandum on Environmental Impact Assessment Process :
Part B- Nature of Designated Project: A dredging operation which is less than 500 metres from the nearest boundary of an existing site of culture heritage, the Old Chinese Customs Station at Fat Tong Chau.	**Part B - Nature of Designated Project:** (i) A dredging operation which is less than 500 metres from the nearest boundary of an existing site of culture heritage, the Old Chinese Customs Station at Fat Tong Chau. (ii) A dredging operation which is less than 500 m from the nearest boundary of an existing coastal protection area (Coastline of Shek O Headland, Tai Tau Chau and Ng Fan Chau and Coastline from Cape Collinson to Big Wave Bay). **Part C . Measures during the Operation of the Project** For cable repair works of the Project which involves dredging operation, the Permit Holder shall deposit the work plan with the DEP providing information on the location(s) and cable alignment of repair works, the installation method and duration, work schedule, burial depth and trench width; a review to confirm any coral communities and water sensitive receivers less than 500m from repair works; and precautionary measures to avoid and minimize potential impact on identified coral communities and water sensitive receivers and to minimize potential disturbance to marine mammals.	During operation (after cable installation) there may be a potential requirement for maintenance work (i.e., cable repair works at particular fault location along the EAC routing due to unexpected damage) to be carried out and a work plan will be submitted on the details.	Key potential environmental impacts associated with the proposed cable repair works included water quality and ecological impacts and they have been reviewed. No adverse environmental impacts are anticipated. For details, please refer to the supporting document attached to the Application of Variation of Environmental Permit No. EP-081/2000.	To verify that no adverse environmental impacts on the environment and the community, the key environmental impacts due to the proposed cable repair works (including water quality and ecological impacts) have been reviewed and are concluded to meet the requirements in the EIAO-TM as shown iin the supporting document attached to the Application of Variation of Environmental Permit No. EP-081/2000.	The environmental performance requirements set out in the project profile previously submitted for this project will not be exceeded or violated. For details refer to the supporting document attached to the Application of Variation of Environmental Permit No. EP-081/2000.	Additional mitigation measures include the implementation of a Marine Mammal exclusion Zone, limiting the speed of cable repair vessel to no more than 1,000 m per hour and near Fat Tong Chau and Tai Long Pai, further restricting the cable repair vessel to a maximum of no more than 500 m per hour; and mobile silt curtains located 60 m away from cable alignment (repair area) shall be deployed and maintained during cable reparation works near Fat Tong Chau and Tai Long Pai. For more details refer to the supporting document attached to the Application of Variation of Environmental Permit No. EP-**081/2000.**

PART E DECLARATION BY APPLICANT

E1. I hereby certify that the particulars given above are correct and true to the best of my knowledge and belief. I understand the environmental permit may be suspended, varied or cancelled if any information given above is false, misleading, wrong or incomplete.

[redacted] [redacted] [redacted]

Signature of Applicant | Full Name in Block Letters | Position

on behalf of TELSTRA INTERNANTIONAL LIMITED 14 OCT 2019

Company Name and Chop (as appropriate) | Date

NOTES :

1. A person who constructs or operates a designated project in Part I of Schedule 2 of the Ordinance or decommissions a designated project listed in Part II of Schedule 2 of the Ordinance without an environmental permit or contrary to the permit conditions commits an offence under the Ordinance and is liable to a maximum fine of $5,000,000 and to a maximum imprisonment for 2 years.

2. A person for whom a designated project is constructed, operated or decommissioned and who permits the carrying out of the designated project in contravention of the Ordinance commits an offence and is liable to a maximum fine of $5,000,000 and to a maximum imprisonment for 2 years.

1 INTRODUCTION

1.1 BACKGROUND

The Project Profile (PP) for East Asian Crossing (EAC) Cable System (TKO) was submitted under *Environmental Impact Assessment Ordinance* (EIAO) in July 2000 (*PP-101/2000*). The EAC PP concluded that there would be no adverse long term or cumulative effects/impacts on the environment and there are also no environmental impacts that are expected to occur during the operation of the submarine cable. An Environmental Permit (EP) was granted on 4 October 2000 (*EP-081/2000*). The EAC cable alignment is shown in *Figure 1.1*. The EAC cable installation works were completed in year 2001.

Further to the review of the project details, it is considered that the potential cable repair work during operation at particular fault location due to unexpected damage, did not mention clearly in the approved EAC PP and EP. And therefore further information on potential cable repair work during operation was supplemented.

With reference to the latest Outline Zoning Plans (Approved Chai Wan OZP No. S/H20/23 [issued in September 2017], Approved Tai Tam & Shek O OZP No. S/H18/10 [approved in May 2008]), the coastlines along eastern side of Hong Kong Island (coastline of Shek O Headland, Tai Tau Chau and Ng Fan Chau and Coastline from Cape Collinson to Big Wave Bay) are designated as Coastal Protection Area (CPA) but those areas were previously generally designated as "Green Belt" (refer to Section 3.7 of the approved EAC PP). The existing surrounding environment along the EAC cable system is presented in *Figure 1.2*. Additional Designated Project item as specified in the EIAO Schedule 2 (Part I), C.12 (in addition to *a dredging operation which is less than 500 metres from the nearest boundary of an existing site of culture heritage, the Old Chinese Customs Station at Fat Tong Chau*) was identified (which did not include in the Environmental Permit (*EP-081/2000*) granted on 4 October 2000):

> A dredging operation which is less than 500 m from the nearest boundary of an existing coastal protection area (Coastline of Shek O Headland, Tai Tau Chau and Ng Fan Chau and Coastline from Cape Collinson to Big Wave Bay)

This supplementary information on potential cable repair work during operation therefore require an update of Part B (Description of Designated Project) and a variation to the following conditions of the current EP (*EP-081/2000*), as presented below:

Part B

Nature of Designated Project:

A dredging operation which is less than 500 metres from the nearest boundary of an existing site of culture heritage, the Old Chinese Customs Station at Fat Tong Chau.

Location of Designated Project:

The Project involves laying of two international fibre optic telecommunication cables in Hong Kong Special Administrative Region (HKSAR) waters to a single landing site and manhole location in the Tseung Kwan O (TKO) Industrial Estate.

Part C

2. Measures during the Construction of the Project

2.1 The project shall be constructed in accordance with the details described in Appendix 1 of this Permit. The Permit Holder shall obtain prior approval from the Director of any changes in the Project details, including cable alignments, burial depth, trench width and installation methods.

To support the application for this VEP, supplementary information has been provided in this *Environmental Review Report* (ERR) to demonstrate there is no material change to the environmental impact of the Project with the mitigation measures in place and the Project complies with the requirements described in the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM).

1.2 PURPOSE OF THIS DOCUMENT

This ERR presents the findings of a review of the potential environmental impacts that may arise from the supplementary information on potential cable repair work during operation.

1.3 DOCUMENT STRUCTURE

The remainder of this document is set out as follows:

- *Section 2* describes the relevant condition(s) in the current EP, the proposed variations and reason for the variations **(related to Part D1, D2 and D3 of Form 5 – Application for VEP)**;
- *Section 3* describes the environmental changes associated with the proposed variation(s) and their potential impacts. It provides the results of the environmental review **(related to Part D4, D5, D6 and D7 of Form 5 – Application for VEP)**; and
- *Section 4* provides the conclusion.

Figure 1.1 EAC Cable Alignment as shown in the Environmental Permit No. EP-081/2000

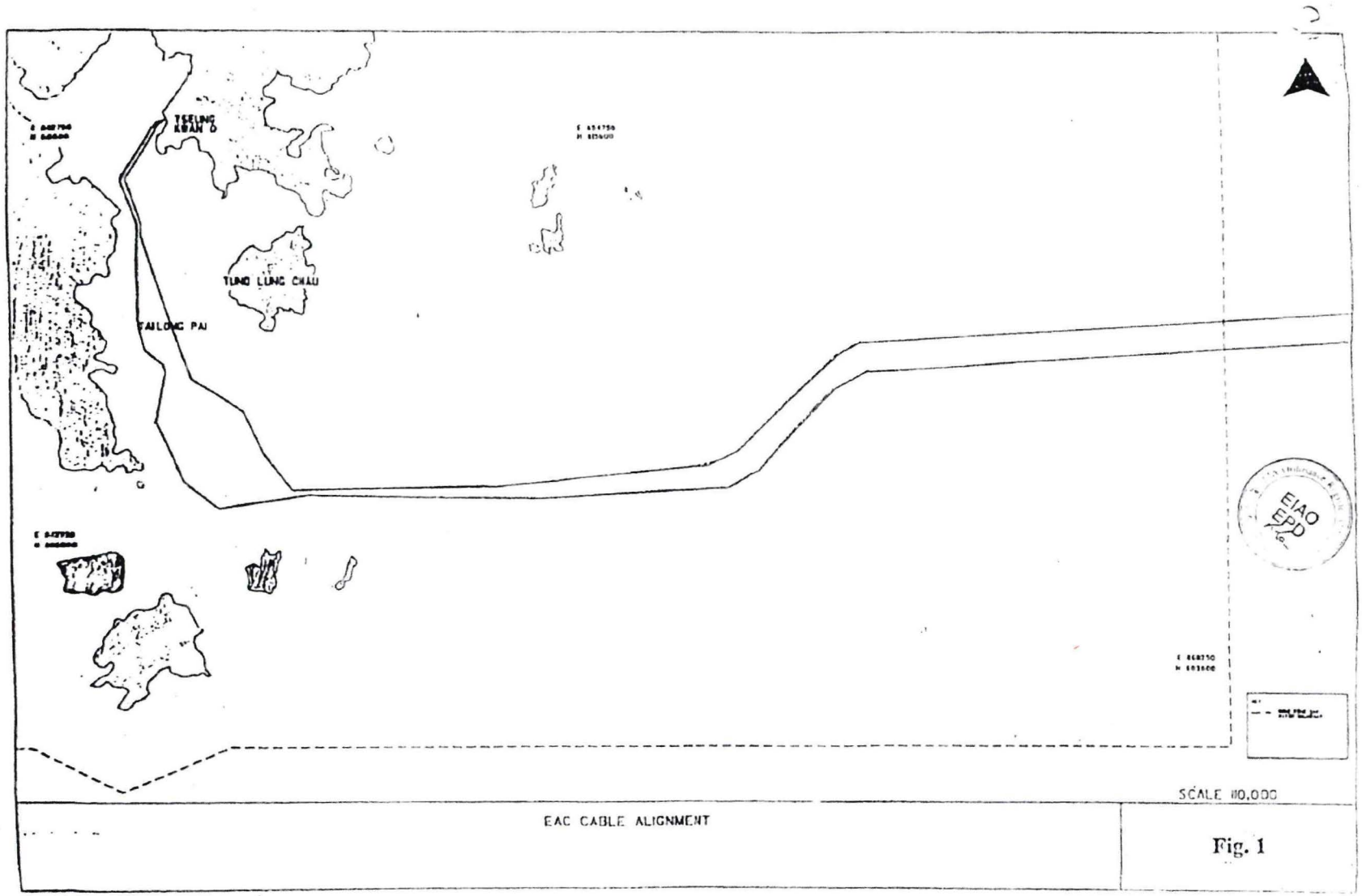

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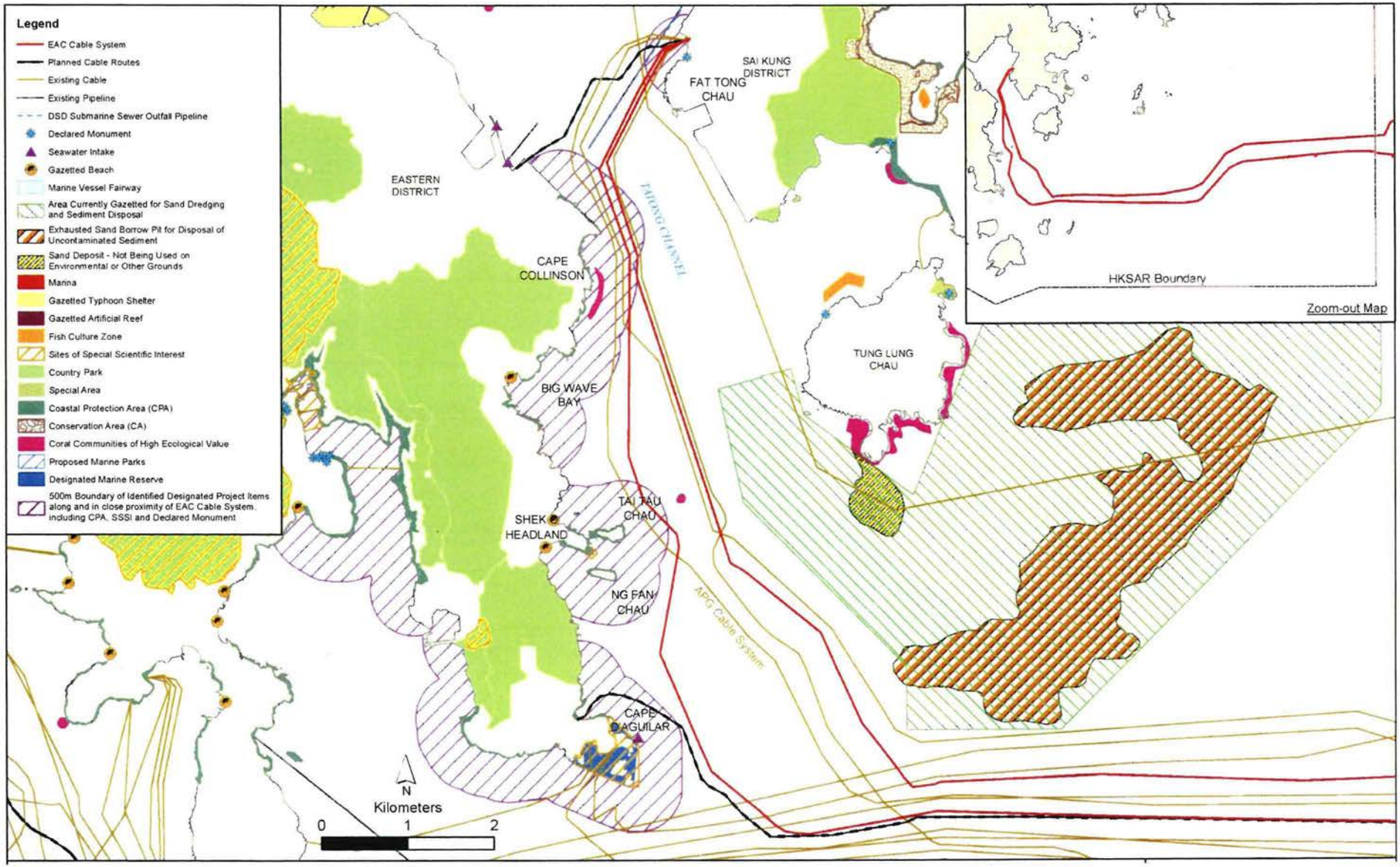
Figure 1.2 The Current Existing Surrounding Environment along the EAC Cable System



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2 *PROPOSED VARIATION & ASSOCIATED ENVIRONMENTAL ISSUES* *(RELATED TO PART D1, D2 AND D3 OF FORM 5)*

2.1 *RELEVANT CONDITION IN THE CURRENT ENVIRONMENTAL PERMIT (RELATED TO PART D1 OF FORM 5)*

The relevant description of Designated Project and conditions in the current EP reads:

Part B

Nature of Designated Project:

A dredging operation which is less than 500 metres from the nearest boundary of an existing site of culture heritage, the Old Chinese Customs Station at Fat Tong Chau.

Location of Designated Project:

The Project involves laying of two international fibre optic telecommunication cables in Hong Kong Special Administrative Region (HKSAR) waters to a single landing site and manhole location in the Tseung Kwan O (TKO) Industrial Estate.

Part C

2. Measures during the Construction of the Project

2.1 The project shall be constructed in accordance with the details described in Appendix 1 of this Permit. The Permit Holder shall obtain prior approval from the Director of any changes in the Project details, including cable alignments, burial depth, trench width and installation methods.

2.2 *PROPOSED VARIATION (RELATED TO PART D2 OF FORM 5)*

It is proposed to amend Conditions 2 and 2.1 and the changes (***bolded***) are indicated below.

Details of Variation(s)

Part B

Nature of Designated Project:

(i) *A dredging operation which is less than 500 metres from the nearest boundary of an existing site of culture heritage, the Old Chinese Customs Station at Fat Tong Chau.*

(ii) A dredging operation which is less than 500 m from the nearest boundary of an existing coastal protection area (Coastline of Shek O Headland, Tai Tau Chau and Ng Fan Chau and Coastline from Cape Collinson to Big Wave Bay).

Location of Designated Project:

The Project involves laying ***and operation including cable repair works*** *of two international fibre optic telecommunication cables in Hong Kong Special Administrative Region (HKSAR) waters to a single landing site and manhole location in the Tseung Kwan O (TKO) Industrial Estate.*

Part C

2. Measures during the Construction ***and Operation*** *of the Project*

2.1 The project shall be constructed in accordance with the details described in Appendix 1 of this Permit. The Permit Holder shall obtain prior approval from the Director of any changes in the Project details, including cable alignments, burial depth, trench width, and installation ***and cable repair*** *methods.*

2.3 REASON FOR VARIATION (RELATED TO PART D3 OF FORM 5)

With reference to the latest approved Outline Zoning Plan (Approved Chai Wan OZP No. S/H20/23 [issued in September 2017), Approved Tai Tam & Shek O OZP No. S/H18/10 [approved in May 2008]), additional Designated Project item as specified in the EIAO Schedule 2 (Part I), C.12 (which did not include in the Environmental Permit (*EP-081/2000*) granted on 4 October 2000) was identified:

> A dredging operation which is less than 500 m from the nearest boundary of an existing coastal protection area (Coastline of Shek O Headland, Tai Tau Chau and Ng Fan Chau and Coastline from Cape Collinson to Big Wave Bay)

During operation (after cable installation) there may be a potential requirement for maintenance work (i.e., cable repair works at particular fault location along the EAC routing due to unexpected damage) to be carried out. These works will be similar in nature to cable installation works using jetting technology described in *Section 2.1* of the approved EAC Project Profile but of smaller scale, with the potential to use smaller equipment such as Remotely Operated Vehicles (ROVs) equipped with injector tool (*Figure 2.1*). Duration of any cable repair work during operation is anticipated to be of shorter duration than cable installation during construction.

Figure 2.1 Typical Remotely Operated Vehicle

The repair works process is outlined below:

- **Terminal Testing:** Testing from cable station terminal, to try and determine fault location as precisely as possible using optical or electrical characteristics of the submarine cable;

- **Initial Inspection:** Cable will be inspected using ROV or divers where appropriate to determine the precise fault location and nature if unknown. If the cable is buried, tracking equipment will be used;

- **Cut Faulty cable, Buoy off, Recover to vessel:** If necessary to cut the cable at the fault area, either an ROV or grapnels will be used, or if feasible, divers. Divers use hand-jetting and ROVs use jetting technique to uncover buried cable. Grapnels penetrate the seabed without jetting to pick up the cable and *Figure 2.2* shows typical grapnels used to penetrate the seabed, and grip, cut and recover cables. The cable ends will be recovered to the vessel, using diver, ROV or gripper grapnels. While one cable end is repaired on the vessel, the other cable end will be attached a rope that is lowered to seabed and this rope will be attached to a buoy to mark its location. Typical buoys are shown in *Figure 2.3.*

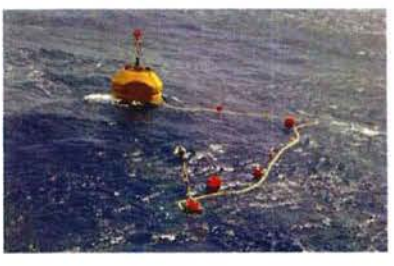
- **Cable Splice and Repair:** Damaged cable section will be cut out. First one end will be spliced to the spare repair cable section and electrical and optical testing conducted to ensure the integrity of the splice and cables. Then the second cable end will be picked up and spliced back to the repair cable section. Upon completion, the cable integrity will be confirmed through end-to-end electrical and optical testing.

- **Replacement of Repaired Cable:** Once the cable has been fully repaired and connected, it will be lowered onto the seabed, along the 'as-laid' cable route. Any protective measures, such as articulated piping, URADUCT® or other means would be added to the cable prior to re-laying. Once the repaired cable is in the 'as-laid' cable route alignment, a diver or ROV will perform an inspection of the repair area, including determining the beginning and ending of unburied cable.

- **Post Repair Inspection and Burial (PRIB):** Should burial at the repair area be necessary, it will be carried out to best endeavour or pre-determined target depth, using diver or ROV jetting up to 3 m or burial tool if deeper. . If burial is not possible, other means of protection may be considered such as articulated piping, URADUCT® or other means. Once completed one final diver or ROV inspection will be carried out before repair works are completed.

Figure 2.2 *Typical grapnels used to penetrate seabed, grip, cut and recover cable*

Figure 2.3 *Typical buoy types used for connecting to cable end by rope*



3 *ENVIRONMENTAL REVIEW (RELATED TO PART D4, D5, D6 AND D7 OF FORM 5)*

3.1 *ENVIRONMENTAL CHANGES ARISING FROM THE PROPOSED VARIATIONS (RELATED TO PART D4 OF FORM 5)*

The checklist presented in *Table 3.1* identifies the potential sources of impacts associated with the proposed variations.

Table 3.1 Potential Sources of Environmental Impacts

Potential Impact	Construction (1)	Normal Operation (2)	Potential Repair during Operation (3)
• Dust	×	×	×
• Noise	×	×	×
• Liquid Effluents, Discharges, or Contaminated Runoff	✓	×	×
• Generation of Waste or By-products	×	×	×
• Disruption of Water Movement or Bottom Sediment	✓	×	✓
• Unsightly Visual Appearance	×	×	×
• Cultural Heritage	×	×	×
• Ecological Impacts:			
- Terrestrial	×	×	×
- Marine	✓	×	✓
- Fisheries	✓	×	✓
• Gaseous Emissions	×	×	×
• Odour	×	×	×
• Night-time Operations	×	×	×
• Traffic Generation	×	×	×
• Manufacturing, Storage, Use, Handling, Transport, or Disposal of Dangerous Goods	×	×	×
• Hazardous Materials or Wastes	×	×	×
• Risk of Accidents Which Result in Pollution or Hazard	×	×	×
• Disposal of Spoil Material, Including Potentially Contaminated Materials	×	×	×

Notes: ✓ = Potential to result in adverse impacts

× = Not expected to result in adverse impacts

(1) = Approved Project Profile assessed and evaluated

(2) = Approved Project Profile assessed and evaluated, and concluded no environmental impacts that are expected to occur during the operation of the submarine cable

(3) = Potential adverse impacts are expected to be less than during construction

A description and evaluation, where appropriate, of these potential impacts associated with cable repair work (including water quality, marine ecology, and fisheries) are provided in the following sections.

3.1.1 *Review of the Overall Baseline Conditions*

The locations of the various major elements of the area surrounding the EAC cable system presented in the approved EAC Project Profile, including areas identified as supporting coral assemblages of ecological interest, are shown in *Figure 3.0a* (extracted from the approved EAC PP (PP-101/2000)). With reference to the approved Project Profile of Asia Pacific Gateway (APG) - Tseung Kwun O (PP-496/2013), the APG generally has similar alignment as the EAC Cable System but closer to the coastlines of eastern Hong Kong Island, the distribution and locations of the coral communities of conservation interest are generally similar to the findings as presented in the EAC PP (refer to *Figure 3.1*, extracted from the approved APG PP (PP-496/2013)). The recent completed Post Project Coral Survey for the APG Cable System (conducted in June 2016) (1) also confirmed that the status of the identified coral communities of conservation interest were similar to those recorded in the approved APG PP.

3.1.2 *Water Quality*

Key Information from the Approved PP

The marine based construction activities relate to burying the cables below the existing sea bed. From the cable landing point to the -20 m CD sea bed contour, which is approximately 6.5 km along the cable route, the cable will be buried up to 5 m below the existing sea bed using a barge mounted injection tool. This burial depth is to be provided for navigational requirements in the Tathong Channel and to provide protection to the cables. The injection jetting tool utilises water injector technology to fluidise the sea bed sediments, which enables the injection tool to penetrate the sea bed to the desired depth and lay the cable. The cable segments will be laid sequentially (i.e., one segment will be completed prior to laying the second). The shortest period of time that the cables could be installed in this area would be one working day. The maximum speed of laying of each segment will be approximately 1.1 km $hour^{-1}$. The maximum width of disturbance of the sea bed surface will be 0.25 m.

(1) https://www.epd.gov.hk/eia/english/register/aep/ep4852014_content.html

Figure 3.0a *Location of the Cable Routes and Sensitive Receivers (EIAO), extracted from the Approved EAC Project Profile (PP-101/2000)*

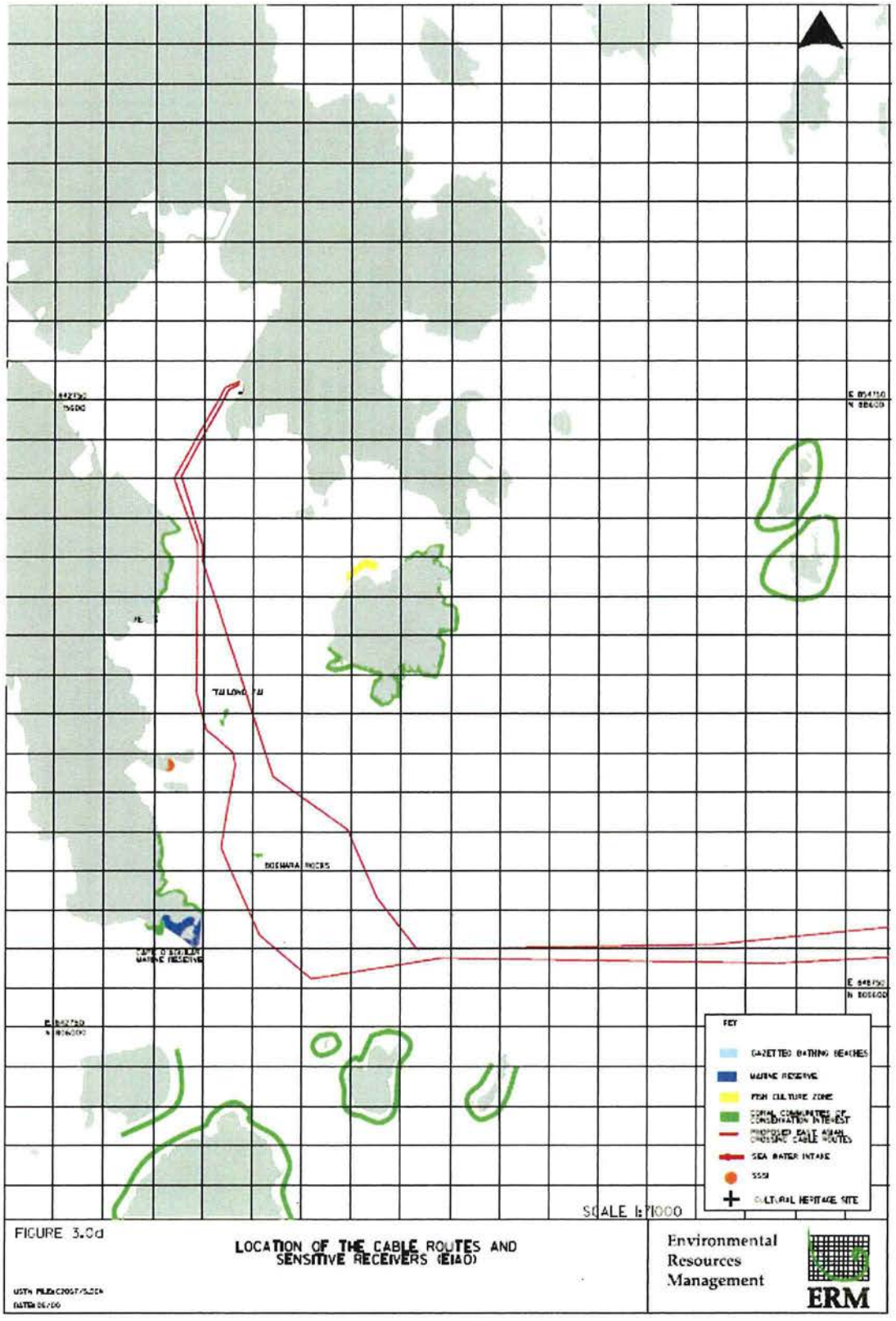


Figure 3.1 Major Environmental Elements of the Areas in Vicinity of the APG Cable System, extracted from Approved Project Profile (PP-496/2013)

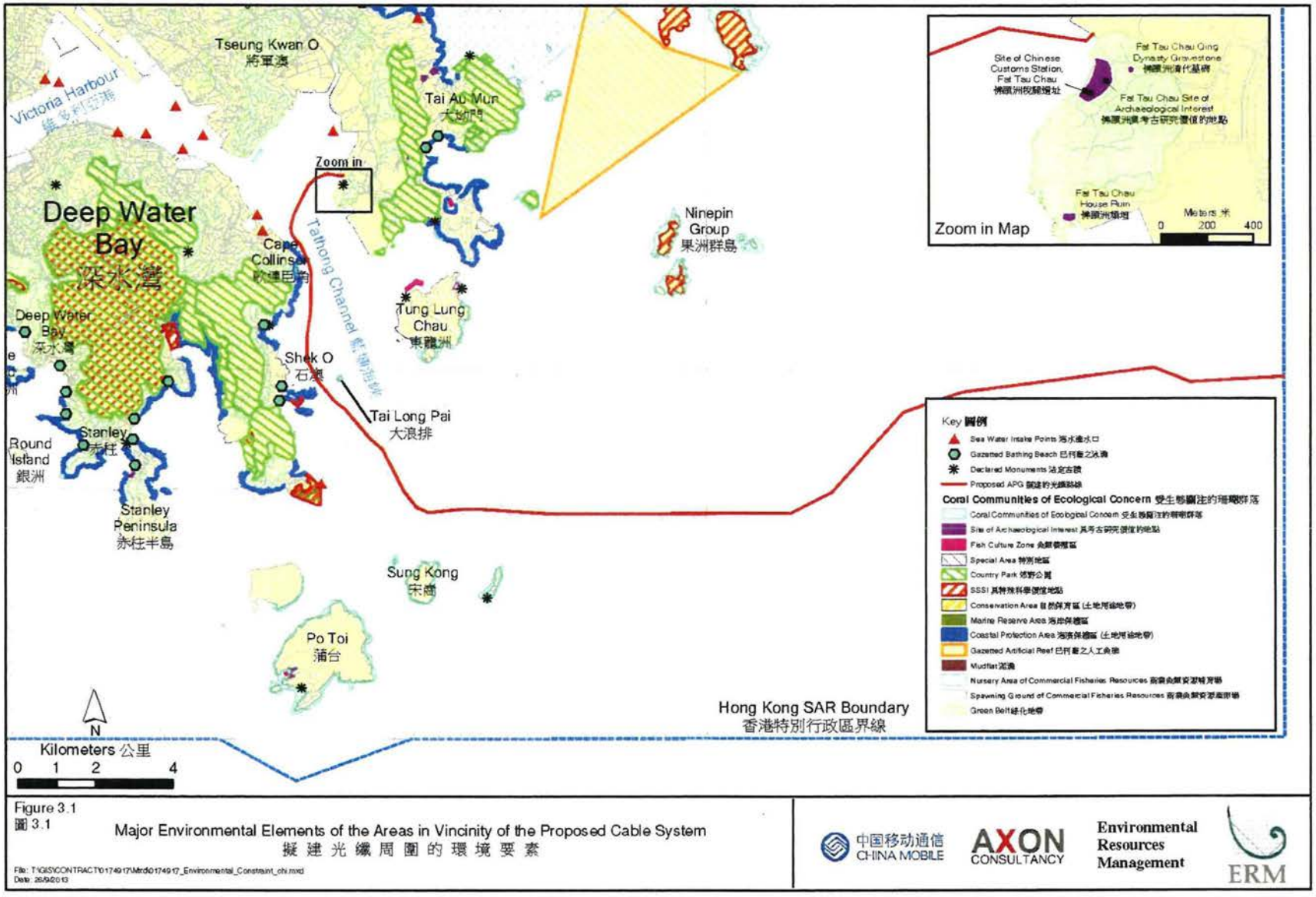


Figure 3.1
圖 3.1

Major Environmental Elements of the Areas in Vincinity of the Proposed Cable System
擬建光纖周圍的環境要素

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Date: 26/9/2013

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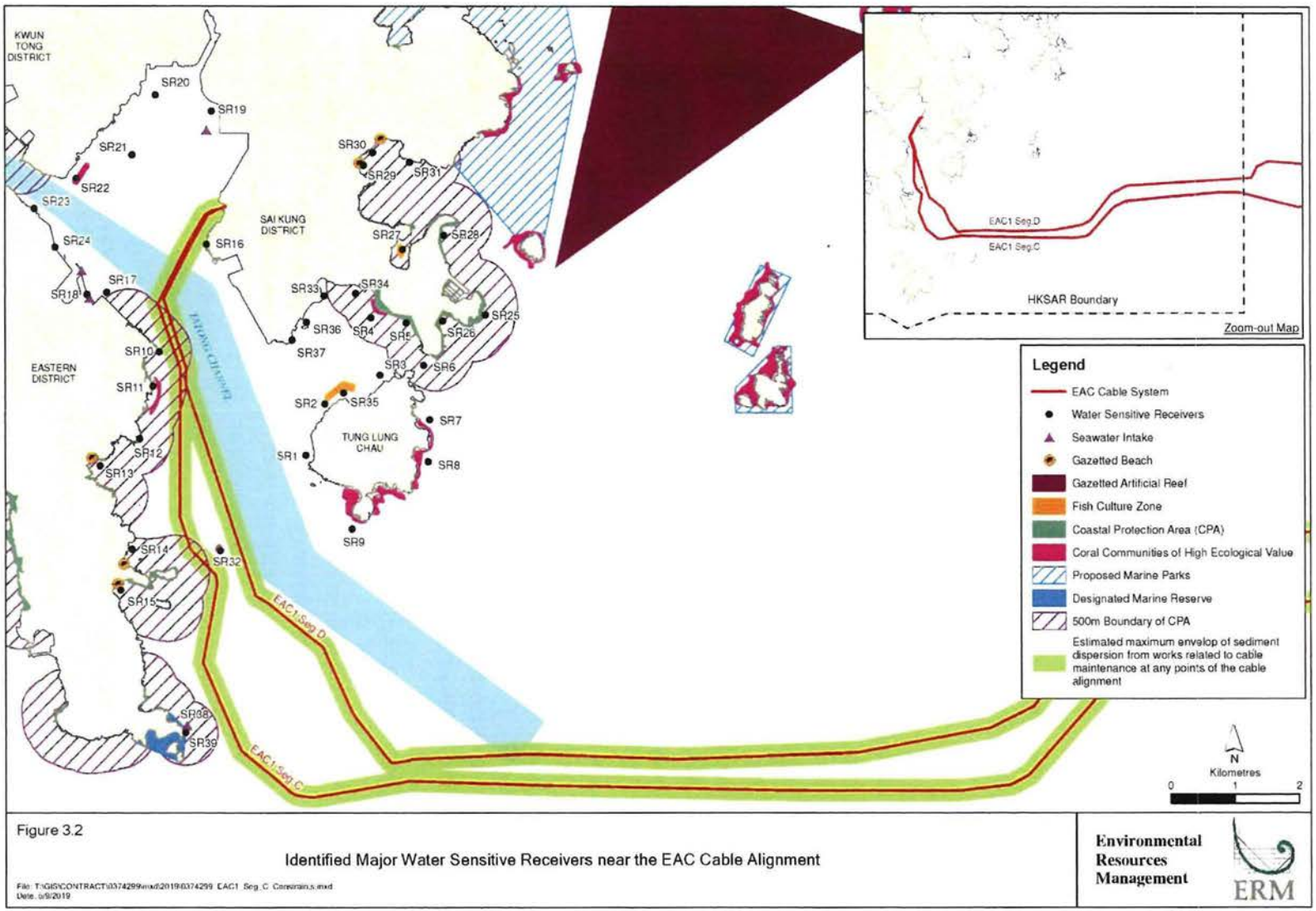
Figure 3.2 *Identified Nearby Water Sensitive Receivers*



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From the -20 m CD sea bed contour to the marine boundary of the HKSAR the cable will be buried to a depth of 1.5 m using the ploughing method, deployed from the main lay vessel. The plough is a simple mechanical device which opens up a v-shaped notch in the sea bed in front of the cable, into which the cable is laid. After placement of the cable the sides of the notch collapse, burying the cable below the sea bed. The speed of the plough vessel is expected to be approximately 2.5 km hour^{-1}. The maximum width of disturbance of the surface of the sea bed will be 0.3 m. The ploughing method of cable laying is considered to be less disruptive to sea bed sediments than the use of an injection tool.

Cable laying will result in the formation of an area of high suspended sediment concentrations around both the injection tool and the plough, which will remain close to the seabed and will settle out quickly. However, as the sediment disturbed during cable laying will remain in suspension for a very short period of time the potential for release of contaminants from seabed sediments and exertion of the oxygen demand on the receiving waters will be limited and is not expected to cause adverse impacts to the water column.

Analysis of the potential transport of fine sediments suspended in the water column for cable laying with the injection tool was undertaken and determined that the sediments would settle onto the sea bed in less than 3 minutes and that the maximum distance of transport for the suspended sediments would be less than 90 m. For cable laying using the ploughing method of construction, the sediments were predicted to remain in suspension for less than 1 minute and would be transported less than 60 m from the cable route. As nearby sensitive receivers (including Gazetted Beaches, SSSI, Marine Reserve, the Fish Culture Zone at Tung Lung Chau, and the WSD seawater intake at Junk Bay) are more than 500 m away from the cable routes, the sites will not be impacted by the cable installation work. No long term disruption of bottom sediment will occur and no disruptions to water movement will result from this project. Therefore, no adverse impacts to water quality will occur during the marine works.

No environmental impacts that are expected to occur during the operation of the submarine cable.

Baseline Condition

The existing marine environment and the identified WSRs are generally similar to the conditions as described in the approved EAC PP, except the coastlines along eastern side of Hong Kong Island within 500 m of the cable alignment previously designated as "Green Belt" (Section 3.7 of the approved PP) but currently amended as Coastal Protection Area (CPA) (Approved Chai Wan OZP No. S/H20/23 (issued in September 2016), Approved Tai Tam & Shek O OZP No. S/H18/10 (approved in May 2008)). Other WSRs, including fish culture zones, gazetted beaches, seawater intakes and coral communities

are also identified and are shown in *Figure 3.2*. The distance from these identified sensitive receivers from the two EAC cable alignments are provided in *Table 3.2*.

Table 3.2 ***Closest Approach of the Cable Alignments to Water Sensitive Receivers***

ID	Water Sensitive Receivers	Approximate Geodesic Distance ^ to Cable Alignment (m)	
		EAC1 Seg.D	EAC1 Seg.C
SR1	Tung Lung Chau (Coral Community)	1440	1970
SR2	Tung Lung Chau (Fish Culture Zone)	1970	2260
SR3	Tung Lung Chau (Coral Community)	2930	3120
SR4	Tai Miu Wan (Coral Community & Coastal Protection Area)	2850	2850
SR5	Tai Miu Wan (Coastal Protection Area)	3350	3350
SR6	Tung Lung Chau (Coral Community)	3630	3810
SR7	Tung Lung Chau (Coral Community)	3450	3900
SR8	Tung Lung Chau (Coral Community)	3220	3760
SR9	Tung Lung Chau (Coral Community)	1730	2250
SR10	Cape Collinson (Coastal Protection Area)	320	230
SR11	Cape Collinson (Coastal Protection Area)	520	430
SR12	Cape Collinson (Coral Community)	950	630
SR13	Big Wave Bay (Gazetted Bathing Beach & Coastal Protection Area)	1670	1240
SR14	Rocky Bay (Gazetted Bathing Beach)	1600	870
SR15	Shek O (Gazetted Bathing Beach)	1980	1270
SR16	Fat Tong Chau (Coral Community)	210	250
SR17	Siu Sai Wan (WSD Flushing Intake)	890	810
SR18	Chai Wan Godown (Cooling Water Intake)	1200	1110
SR19	Tseung Kwan O New Town (Seawater Intakes)	1490	1490
SR20	Junk Bay (Coral Community)	2020	2000
SR21	Junk Bay (Coral Community)	1500	1470
SR22	Junk Bay (Coral Community)	2060	2020
SR23	Heng Fa Chuen (Seawater Intakes)	2440	2390
SR24	Heng Fa Chuen (Seawater Intakes)	1880	1830
SR25	Tai Tam (Coastal Protection Area)	4390	4390
SR26	Tai Tam (Coastal Protection Area)	3830	3830
SR27	Po Toi O (Fish Culture Zone & Coastal Protection Area)	2850	2850
SR28	Clear Water Bay (Coastal Protection Area)	3440	3440
SR29	Clear Water Bay (Coastal Protection Area& Gazetted Bathing Beach)	2250	2250
SR30	Clear Water Bay (Coastal Protection Area& Gazetted Bathing Beach)	2440	2440
SR31	Clear Water Bay (Coastal Protection Area)	2960	2960
SR32	Tai Long Pai (Coral Community)	300	320
SR33	Joss House Bay (Coral Community)	2080	2080
SR34	Joss House Bay (Coral Community)	2440	2440
SR35	Joss House Bay (Coral Community)	2300	2550
SR36	Kwun Tsai (Coral Community)	2010	2100
SR37	Tit Cham Chau (Coral Community)	1720	1810
SR38	Swire Institute of Marine Science (Seawater Intake)	2440	620
SR39	Cape d'Aguilar (Marine Reserve)	2506	682

Note: ^ Geodesic distance refers to the shortest straight-line distance between two locations, without regard on the physical obstacles in between.

Evaluation of Impact ***(Related to Part D5& D6 of Form 5)*** *- Cable Repair Work*

It is considered unlikely that the submarine cable will require cable repair works during operation, however should an occasion of cable fault arise that necessitates this, emergency repair operation will be required. Methods used for cable repair at any location is described in *Section 2.3*, which involve the use of Remotely Operated Vehicles (ROVs) equipped with injector tool. This kind of ROVs operation is often adopted in similar cable installation and repair works, such as in the recently approved projects of DIR-233/2013 HKA Submarine Cable - Chung Hom Kok and DIR-254/2017 Pacific Light Cable Network (PLCN) - Deep Water Bay. During the jetting process for cable uncovering (before repair) and reburial (after repair), the seabed sediments will be disturbed and a small percentage will be lost to suspension in the lower part of the water column in the immediate vicinity of the injector. The analysis of the potential transport of fine sediments suspended into the water column during the jetting process has been conducted and is presented in the following paragraphs.

Calculation of Sediment Transport

The rate of sediment lost to suspension is calculated as follows:

Release rate =	=	cross-sectional area of disturbed sediment × speed of cable laying machine × sediment dry density × percentage loss
depth of disturbance	=	1.5 m (target burial depth of cable)
width of disturbance	=	0.25 m (width of seabed disturbance as cable buried)
maximum cross sectional area	=	0.375 m^2
loss rate	=	20% (majority of sediment not disturbed) (1)
speed of machine	=	0.25 m s^{-1} (900 m hr^{-1}, maximum speed of ROV based on specifications for conservative estimation of SS release rate; normal works speed generally will not exceed 300 m hr^{-1})
in-situ dry density	=	600 kg m^{-3} (typical of Hong Kong sediment) (1)
Release Rate	=	**11.25 kg s^{-1}**

(1) Review conducted under DIR-266/2019 summarized typical parameters adopted under this kinds of sediment loss assessment. The parameters adopted for this assessment, including percentage of sediment loss, *in-situ* dry density of sediment, current velocity as well as height and width of sediment plume, make reference to that review summary.

During jetting for uncovering (before repair) and reburial (after repair) of cable, the seabed sediment will be released at the bottom of the water column which will result in high localised suspended sediment concentrations and high settling velocities. This is because at high concentrations within a much localised area, suspended sediments will tend to form large aggregations of sediment particles (the process of flocculation) which have a higher settling velocity than the individual sediment particles.

It is expected that the suspended sediments will remain within 1 m of the seabed, which is independent of the water depth, although the current velocities at the seabed are lower than those near the water surface, due to such effects as bottom friction. For the purposes of the assessment it is assumed that the current velocity is 0.9 m s^{-1}, which is an upper bound estimate of bottom current velocities in the vicinity of the cable works area and conservative.

Similar impact assessment projects, including those listed at the start of this Section on *' Evaluation of Impact (Related to Part D5& D6 of Form 5) - Cable Repair Work'*, have been reviewed and a current velocity of 0.9 m s^{-1} is chosen based on estimated velocity values of currents from projects closest to the project area. It is expected that the sediment will initially spread to a maximum of 6 m along the centre-line of the cable alignment, which represents the longitudinal dimension of the injector. The suspended solids will tend to form around the ROV conducting the jetting process, however the potential impacts have been addressed using a conservative assumption that a cross-current carries the sediment towards the sensitive receivers.

Based on the above, and given the worst case scenario that the sediment initially mixes evenly over the lower 1 m of the water column and over the initial length of spread of the sediment, the initial concentration of the suspended sediment is as follows:

Initial Concentration	=	release rate/(current speed × height of sediment × width of sediment)
release rate	=	11.25 kg s^{-1}
current velocity	=	0.9 m s^{-1}
height of sediment	=	1 m
width of sediment	=	6 m
Initial Concentration	=	**2.0833 kg m^{-3}**

Typically the settling velocity of SS is determined by examining the relationship between SS initial concentrations and the cohesive nature of the sediment being disturbed. This applies in HKSAR and typically, as SS

concentration increases, so will settling velocity, as sediment particles flocculate, gain mass and settle faster. However, this relationship does not hold true when initial concentrations exceed values such as 1 kg m^{-3} (1). As the predicted initial concentration exceeds this value for this project, a more conservative settling velocity of 10 mm s^{-1} has been adopted.

As the sediment progressively settles onto the seabed, however, suspended sediment concentrations will gradually reduce. In order to account for the gradually reducing concentrations, the above settling velocity is halved, which gives a value of **5.0 mm s^{-1}**.

The time taken for the sediment to settle onto the seabed will thus be the maximum height of the sediment divided by the average settling velocity.

Settling Time = 1 m /0.005 m s^{-1} = **200 s**

The distance travelled by the sediment will thus be the settling time multiplied by the current velocity.

Distance Travelled = 200 s x 0.9 m s^{-1} = **180 m**

The above calculation indicates that the sediments disturbed during cable laying works will settle onto the seabed within approximately **180 m** of the cable alignment.

Table 3.2 shows that all WSRs are located beyond the above this predicted distance. It is hence expected that the suspended solid in the water column will be back to background level before reaching these WSRs. No significant elevation is therefore expected at these WSRs and hence no unacceptable change in water quality is expected at these WSRs, or would be expected from the jetting associated with the uncovering and reburial of cable during cable repair works.

Other underwater works for cable repair works as described in *Section 2.3* above will have limited or no contact / disturbance to the seabed. It is expected such works would not result in potential sediment loss exceeding that of the jetting for recovering and reburial of cable. No unacceptable water quality impact from these other underwater works is expected.

In summary, the water quality impact during the construction phase is considered to remain acceptable while the potential water quality impact during operation phase will remain with no impact, as per the assessment in the approved PP.

(1) Hydraulics Research (1988) Estuarine Muds Manual.

3.1.3 *Marine Ecology*

Key Information from the Approved PP

The cable laying process will only result in short term direct impacts to the subtidal soft bottom habitats and assemblages present on the artificial seawall at the landing point. However, these assemblages are commonly recorded elsewhere in Hong Kong waters, and no species that are either of ecological importance, or that are considered rare, would be impacted, the short term loss of benthic organisms directly along the cable routes is not considered to represent an unacceptable ecological impact. The rapid natural reinstatement of the seabed will result in the area being available for prompt recolonisation, and hence, no permanent impacts would occur.

A number of areas in the vicinity of the proposed cables route have been identified as supporting coral assemblages of ecological interest. However, the coral assemblages are located at sufficient distance (at least 210 m) from the alignment of the cables to indicate that impacts will not occur. Similarly, no adverse impacts to the Cape d'Aguilar Marine Reserve (SR39) are expected to occur as any dispersing plumes of suspended sediments from the proposed injection and plough methods used in the deployment of the cables are predicted to be localised (settling out within 90 m from the cable alignment) and short term in nature - Cape d'Aguilar is located 2506 m from EAC1 Seg. D and 682 m from EAC1 Seg. C. As such, no impacts would occur.

No environmental impacts are expected to occur during the operation of the submarine cable.

Baseline Condition

The existing marine environment and the identified species of conservation interest are generally similar to the conditions as described in the approved EAC PP, except the coastlines along eastern side of Hong Kong Island within 500 m of the cable alignment previously designated as "Green Belt" (Section 3.7 of the approved PP) but currently amended as Coastal Protection Area (CPA) (Draft Chai Wan OZP No. S/H20/22 (issued in November 2016), Approved Tai Tam & Shek O OZP No. S/H18/10 (approved in May 2008)). Overall the conditions described in the approved PP are still relevant.

Evaluation of Impact ***(Related to Part D5& D6 of Form 5)*** *- Cable Repair Work*

It is considered unlikely that the submarine cable will require cable repair works during operation, however should an occasion of cable fault arise that necessitates this, emergency repair operation will be required. Methods used for cable repair works at any location along the submarine cable route are anticipated to be as per those used for cable installation during construction, with the potential to use smaller equipment such as Remotely Operated Vehicles (ROVs) equipped with injector tool. Duration of any cable repair work is anticipated to be of shorter duration than cable installation during

construction and along the same proposed alignment. As discussed in *Section 3.1.3*, level of sediment elevation would return to normal within 180 m away from the cable alignments, and there is no identified major marine ecological resources located within 180 m from the cable alignments. Therefore overall, any potential marine ecological impacts would be less than those for cable installation during construction as predicted in the approved PP. Since cable installation during construction is not considered to cause adverse environmental impacts, therefore no adverse marine ecological impacts are considered likely should cable repair works be required.

In summary, the marine ecological impact during the construction phase is considered to remain acceptable while the potential marine ecological impact during operation phase will remain with no impact, as per the assessment in the approved PP.

3.1.4 *Fisheries Impact*

Key information from the Approved PP

Minor interruptions to fishing operations are expected to occur only during the cables deployment phase. However, these disruptions will be minimal as the time required for the cable deployment is predicted to be only a few days. As a result, increases in marine traffic, and hence, disturbance to fishing activities in the area, are small scale, and thus, are not expected to be of concern.

Indirect impacts may occur through elevation in suspended solids resulting from the disturbance of the seabed during deployment. However, as any potential disturbance to the seabed is likely to be minimal, localised and of a short duration, no unacceptable impacts have been predicted to occur to fisheries resources, including spawning grounds, or fishing operations, including aquaculture activity at Tung Lung Chau Fish Culture Zone, as a result of the proposed cable deployment and installation.

Baseline Condition

Overall the conditions described in the approved EAC PP are still relevant.

Evaluation of Impact ***(Related to Part D5& D6 of Form 5) -*** *Cable Repair Work*

It is considered unlikely that the submarine cable will require repair works during operation, however should an occasion of cable fault arise that necessitates this, emergency repair operation will be required. Methods used for cable repair works at any location along the submarine cable route are anticipated to be as per those used for cable installation during construction, with the potential to use smaller equipment such as Remotely Operated Vehicles (ROVs) equipped with injector tool. Duration of any cable repair work is anticipated to be of shorter duration than cable installation during construction and along the same proposed alignment. Also as discussed in

Section 3.1.3, level of sediment elevation would return to normal within 180 m away from the cable alignments. Therefore no adverse fisheries impacts are considered likely should repair works be required.

In summary, the changes to the Project are not considered to affect the fisheries impact assessment conclusion in the approved EAC PP.

3.2 *MITIGATION MEASURES (RELATED TO PART D7 OF FORM 5)*

Potential water quality, ecological and fisheries impacts associated with the operational cable repair works of the EAC cable system will likely be disturbance of the marine sediment from the uncovering of faulty section of the cable and reburial of the repaired cable, as well as the associated elevation of suspended solids in the water column. It is expected that potential SS elevation due to the uncovering of faulty cable and reburial of repaired cable would be settled within 180 m from the cable alignment and would not encroach into identified nearby sensitive receivers Given the nature of cable repair works, the required extent of cable which requires uncovering and reburial for a typical cable repair event would be highly localized and would not requires work along the entire cable alignment. It is considered mitigation measures suggested for water quality, ecology and fisheries in the approved EAC PP are therefore considered to remain relevant and to be adequate. The precautionary measure for the cable repair works within 500 m from the Coastal Protection Area (Coastline of Shek O Headland, Tai Tau Chau and Ng Fan Chau and Coastline from Cape Collinson to Big Wave Bay) and site of culture heritage, the Old Chinese Customs Station at Fat Tong Chau, is proposed:

- The maximum speed of the cable repair equipment using jetting technology such as Remotely Operated Vehicles (ROVs) equipped with injector tool shall be limited to 300 m hr^{-1}.

3.3 *SUMMARY*

This assessment has critically reviewed the overall acceptability of the environmental impacts likely to arise from the proposed variations to the Project. Overall, no unacceptable environmental impacts are anticipated to arise from the proposed variation.

4 CONCLUSION

4.1 COMPLIANCE WITH WITH ENVIRONMENTAL PERFORMANCE REQUIREMENTS SET OUT IN THE APPROVED EIA REPORT

The same environmental performance requirements set out in the approved EAC PP will apply.

4.2 ADDITIONAL MEASURES PROPOSED TO ELIMINATE, REDUCE OR CONTROL ANY ADVERSE ENVIRONMENTAL IMPACT ARISING FROM THE PROPOSED VARIATIONS AND TO MEET THE REQUIREMENTS IN THE TECHNICAL MEMORANDUM ON ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

Precautionary measure for the cable repair works within 500 m from the Coastal Protection Area (Coastline of Shek O Headland, Tai Tau Chau and Ng Fan Chau and Coastline from Cape Collinson to Big Wave Bay) and site of culture heritage, the Old Chinese Customs Station at Fat Tong Chau, is proposed as :

The maximum speed of the cable repair equipment using jetting technology such as Remotely Operated Vehicles (ROVs) equipped with injector tool shall be limited to 300 m hr-1

To minimize water quality impact arising from cable installation works and to safeguard the coral communities at Fat Tong Chau (SR16) and Tai Long Pai (SR32), the following precautionary measures shall be implemented:

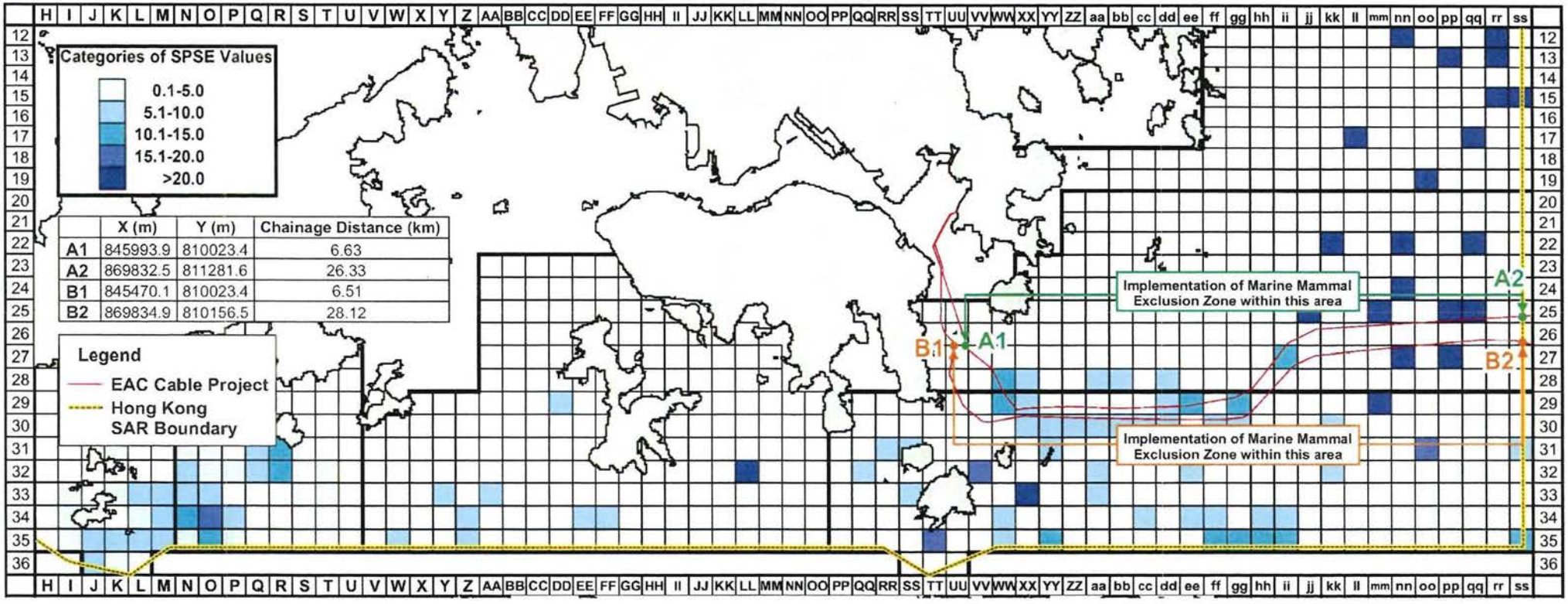
- The speed of the cable repair vessel shall be limited to a maximum of no more than 1,000 meters per hour. In particular, the speed of the vessel for cable repair works near Fat Tong Chau (SR16) and Tai Long Pai (SR32) shall further be restricted to a maximum of no more than 500 meters per hour; and
- Mobile silt curtains located 60 m away from cable alignment (repair area) shall be deployed and maintained during cable reparation works near Fat Tong Chau (SR16) and Tai Long Pai (SR32) (i.e., Ch. 0.6 km to Ch. 0.8 km and Ch. 5.8 km to Ch. 6.2 km on EAC1 Seg. C and Ch. 0.5 km to Ch. 0.8 km and Ch. 5.5 km to Ch. 6.0 km on EAC1 Seg. D).

To minimize potential disturbance to marine mammals, in particular finless porpoise, and based on the Monitoring Of Marine Mammals In Hong Kong Waters Report (2018-19), the following precautionary measures shall be implemented:

- A marine mammal exclusion zone of not less than 250 m radius from the cable repair vessel shall be implemented during cable repair works at area;
- No cable installation works shall be carried out until the marine mammal exclusion zone is confirmed by an experienced marine

mammal observer as clear of marine mammal(s) for a period of 30 minutes continuously.

Details of the project marine mammal exclusion zone are depicted in *Figure 4.1.*



Source: Monitoring Of Marine Mammals In Hong Kong Waters (2018-19) Final Report

Figure 4.1 Density of finless porpoises with corrected survey effort per km2 in southern and eastern waters of Hong Kong during wet season (June to November), using data collected during 2014-18 (SPSE = no. of on-effort porpoise sightings per 100 units of survey effort)

Additional commitment during operation

For cable repair works of the Project, the Permit Holder shall, no later than one month before the commencement of repair works, deposit with DEP a work plan including the following information:

(i) the location(s) and cable alignment of the repair works, the installation method and duration, work schedule, burial depth and trench width;

(ii) a review to confirm any coral communities and water sensitive receivers (WSRs) less than 500m from the repair works; and

(iii) precautionary measures (e.g. speed limit for cable repair vessel, implementation of mobile silt curtain and marine exclusion zone as detailed in *Section 4.2* of this document) to avoid or minimize potential impact on the identified coral communities and WSRs.

The Permit Holder shall fully and properly implemented all precautionary measures set out in the work plan.