Sihanoukville-Hong Kong Submarine Cable System

Project Profile

4 December 2024

Project No.: 0619471

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Project Profile

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1. BASIC INFORMATION

1.1 Project Title

The title of the project is “Sihanoukville-Hong Kong Submarine Cable System” (hereafter referred to as the Project).

1.2 Purpose and Nature of the Project

The Ministry of Post and Telecommunications of Cambodia (MPTC) (the cable owner) has decided to build a new optical cable system, linking Sihanoukville, Cambodia and Hong Kong, the Sihanoukville-Hong Kong Submarine Cable System (SHV-HK cable system). The SHV-HK cable system will consist of a trunk cable bundled with two stub cables for future international submarine cable connections. The landing party in Hong Kong is China Unicom (Hong Kong) Operations Limited (CUOL). The new cable system will connect to CUOL’s data centre in Tseung Kwan O Industrial Estate (TKOIE).

HMN Technologies Co., Limited. (“HMN Tech”) is awarded as the main contractor. This cable system will span more than 2,938 km in total and about 35.402 km in Hong Kong waters, and will land at TKOIE within the Hong Kong Special Administrative Region of the People's Republic of China (HKSAR) border.

This Project Profile includes an assessment of the potential environmental impacts associated with the installation and operation of the submarine telecommunications cable system within HKSAR, including the connection to land at TKOIE. The assessment has been based on information compiled by the Project Proponent describing the expected construction and operation activities, as well as potential maintenance work, i.e. maintenance/ repairing.

1.3 Name of Project Proponent

As the landing service provider, CUOL is responsible for the cable landing issue within HKSAR and is therefore the Project proponent. Contact details are:

China Unicom (Hong Kong) Operations Limited (CUOL)

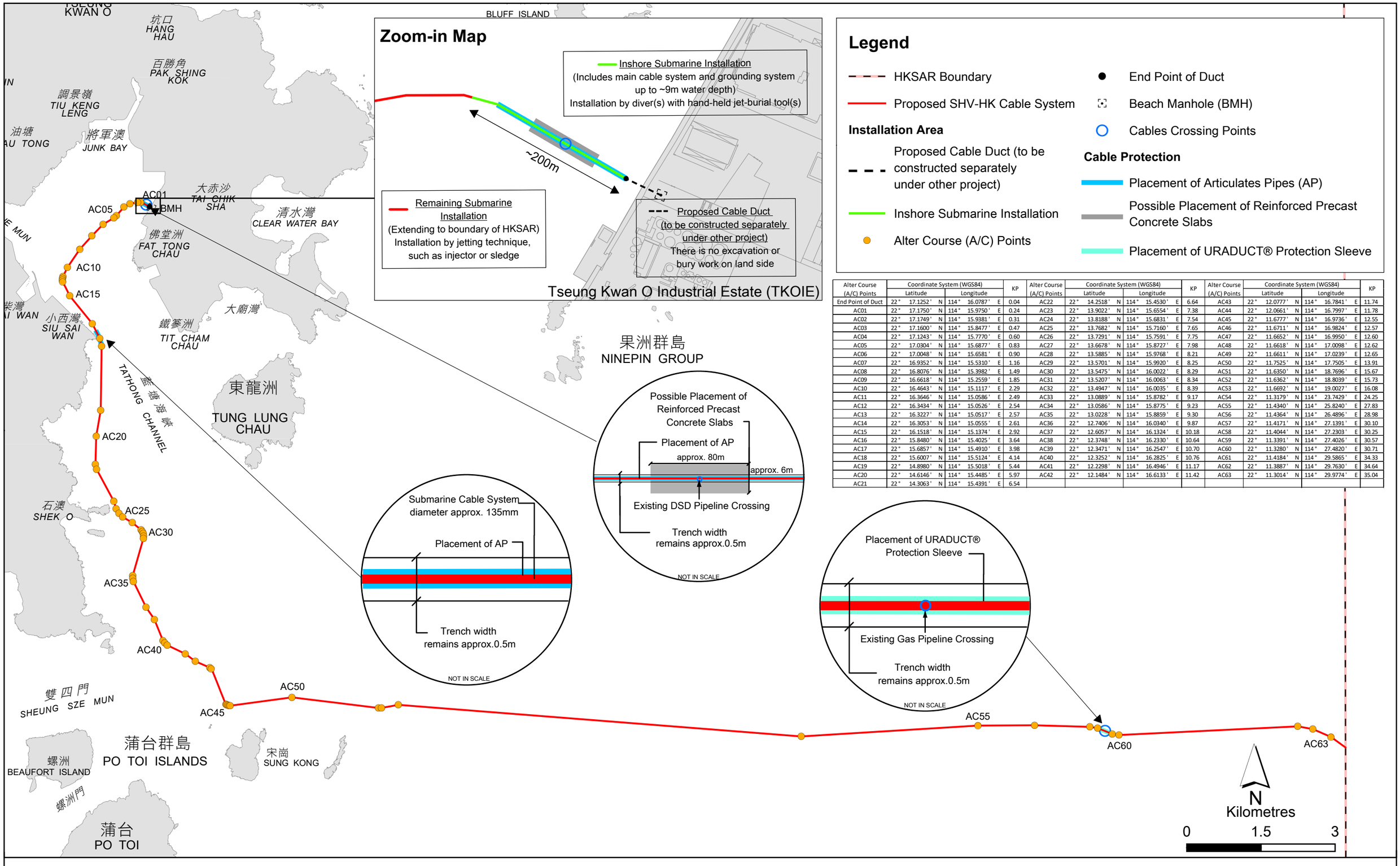
Name:	Jeff Fung
Position:	Senior Project Manager
Email:	jeff@chinaunicom.cn
Telephone:	+852 6550 1238

1.4 Location and Scale of the Project

1.4.1 *Location*

The route of the proposed SHV-HK cable system within HKSAR is depicted in ***Figure 1.1***. The proposed cable system would land at a Beach Manhole (BMH) located at TKOIE. The BMH and the land-based cable ducts connecting to the data centre will be constructed separately under other project by CUOL, which are tentative scheduled to complete in July 2024. The location and photo of the landing site are presented in ***Figure 1.2***.

The proposed SHV-HK cable system will travel from TKOIE southward along Tathong Channel. After crossing Tathong Channel and near Cape Collinson, the cable system 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, entering the South China Sea.



Alter Course (A/C) Points	Coordinate System (WGS84) Latitude	Coordinate System (WGS84) Longitude	KP	Alter Course (A/C) Points	Coordinate System (WGS84) Latitude	Coordinate System (WGS84) Longitude	KP	Alter Course (A/C) Points	Coordinate System (WGS84) Latitude	Coordinate System (WGS84) Longitude	KP
End Point of Duct	22° 17.1252' N	114° 16.0787' E	0.04	AC22	22° 14.2518' N	114° 15.4530' E	6.64	AC43	22° 12.0777' N	114° 16.7841' E	11.74
AC01	22° 17.1750' N	114° 15.9750' E	0.24	AC23	22° 13.9022' N	114° 15.6554' E	7.38	AC44	22° 12.0661' N	114° 16.7997' E	11.78
AC02	22° 17.1749' N	114° 15.9381' E	0.31	AC24	22° 13.8188' N	114° 15.6831' E	7.54	AC45	22° 11.6777' N	114° 16.9736' E	12.55
AC03	22° 17.1600' N	114° 15.8477' E	0.47	AC25	22° 13.7682' N	114° 15.7160' E	7.65	AC46	22° 11.6711' N	114° 16.9824' E	12.57
AC04	22° 17.1243' N	114° 15.7770' E	0.60	AC26	22° 13.7291' N	114° 15.7591' E	7.75	AC47	22° 11.6652' N	114° 16.9950' E	12.60
AC05	22° 17.0304' N	114° 15.6877' E	0.83	AC27	22° 13.6678' N	114° 15.8727' E	7.98	AC48	22° 11.6618' N	114° 17.0098' E	12.62
AC06	22° 17.0048' N	114° 15.6581' E	0.90	AC28	22° 13.5885' N	114° 15.9768' E	8.21	AC49	22° 11.6611' N	114° 17.0239' E	12.65
AC07	22° 16.9352' N	114° 15.5310' E	1.16	AC29	22° 13.5701' N	114° 15.9920' E	8.25	AC50	22° 11.7525' N	114° 17.7505' E	13.91
AC08	22° 16.8076' N	114° 15.3982' E	1.49	AC30	22° 13.5475' N	114° 16.0022' E	8.29	AC51	22° 11.6350' N	114° 18.7696' E	15.67
AC09	22° 16.6618' N	114° 15.2559' E	1.85	AC31	22° 13.5207' N	114° 16.0063' E	8.34	AC52	22° 11.6362' N	114° 18.8039' E	15.73
AC10	22° 16.4643' N	114° 15.1117' E	2.29	AC32	22° 13.4947' N	114° 16.0035' E	8.39	AC53	22° 11.6692' N	114° 19.0027' E	16.08
AC11	22° 16.3646' N	114° 15.0586' E	2.49	AC33	22° 13.0889' N	114° 15.8782' E	9.17	AC54	22° 11.3179' N	114° 23.7429' E	24.25
AC12	22° 16.3434' N	114° 15.0526' E	2.54	AC34	22° 13.0586' N	114° 15.8775' E	9.23	AC55	22° 11.4340' N	114° 25.8240' E	27.83
AC13	22° 16.3227' N	114° 15.0517' E	2.57	AC35	22° 13.0228' N	114° 15.8859' E	9.30	AC56	22° 11.4364' N	114° 26.4896' E	28.98
AC14	22° 16.3053' N	114° 15.0555' E	2.61	AC36	22° 12.7406' N	114° 16.0340' E	9.87	AC57	22° 11.4171' N	114° 27.1391' E	30.10
AC15	22° 16.1518' N	114° 15.1374' E	2.92	AC37	22° 12.6057' N	114° 16.1324' E	10.18	AC58	22° 11.4044' N	114° 27.2303' E	30.25
AC16	22° 15.8480' N	114° 15.4025' E	3.64	AC38	22° 12.3748' N	114° 16.2330' E	10.64	AC59	22° 11.3391' N	114° 27.4026' E	30.57
AC17	22° 15.6857' N	114° 15.4910' E	3.98	AC39	22° 12.3471' N	114° 16.2547' E	10.70	AC60	22° 11.3280' N	114° 27.4820' E	30.71
AC18	22° 15.6007' N	114° 15.5124' E	4.14	AC40	22° 12.3252' N	114° 16.2825' E	10.76	AC61	22° 11.4184' N	114° 29.5865' E	34.33
AC19	22° 14.8980' N	114° 15.5018' E	5.44	AC41	22° 12.2298' N	114° 16.4946' E	11.17	AC62	22° 11.3887' N	114° 29.7630' E	34.64
AC20	22° 14.6146' N	114° 15.4485' E	5.97	AC42	22° 12.1484' N	114° 16.6133' E	11.42	AC63	22° 11.3014' N	114° 29.9774' E	35.04
AC21	22° 14.3063' N	114° 15.4391' E	6.54								

Figure 1.1

Proposed Sihanoukville-Hong Kong (SHV-HK) Submarine Cable System (Hong Kong Section)

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1.4.2 *Scale of the Project*

The SHV-HK cable has a total length of approximately 35.402 km and a diameter of approximately 135 mm within HKSAR waters. The SHV-HK cable system will consist of a trunk cable bundled with two stub cables for future international submarine cable connections.

The submarine cable laying process will involve minor marine works for a relatively short period of time as described in **Sections 2.1** and **2.2**. The burial depth offshore will be up to around 5 m below the seabed in HKSAR waters. The burial depth will be increased to 6 m below the seabed at the submarine cable section that overlaps with the Tathong Channel Traffic Separation Scheme and toward inshore to avoid potential impact to the submarine cable due to the high traffic flow, such as emergency anchoring within the Channel. After the cable system is laid, the seabed will return to its original profile.

The BMH and land-based cable duct connecting to the data centre will be constructed separately by CUOL. The cable duct will be constructed under the rock armour of the artificial seawall, with the duct opening extended from the toe of the seawall. The bundled cables will be pulled and guided into the opening of the cable duct which will be available before the cable installation works. No earthworks will be involved in the cable connection works for the proposed SHV-HK cable system.

During the operation phase, no environmental impacts would arise under operation. Cable maintenance/ repairing works would only be required under emergency conditions. Considering that it is unlikely that the whole section of the cable in HKSAR is damaged and required maintenance/ repairing works, the scale of the maintenance/ repairing works will be way smaller than the submarine cable laying process.

1.5 Landing Site and Cable Route Selection Process

1.5.1 *Landing Site Selection*

The project design team has considered a number of constraints and benefits when selecting the landing site.

The CUOL data centre is in TKOIE, it is reasonable to select the landing site in close proximity to the CUOL data centre.

The proposed landing site of Tseung Kwan O (TKO) is one of the established cable landing sites in Hong Kong with several in-service international, e.g. East Asian Crossing (EAC) Cable Systems, Asia Pacific Gateway (APG) and Asia Submarine-cable Express (ASE), and domestic cable systems, e.g. TKO Connect Cable System, Ultra Express Link, and TKO Express. TKO is a strategically important telecommunications and media hub in Hong Kong. Within TKOIE there are currently a number of cable landing stations (CLSs) and data centres. As such, minimal terrestrial works would be required due to existing facilities being available for this Project.

The viewpoints of the photographs are indicated in ***Figure 1.2a***. The conditions of the proposed landing site at TKOIE are presented in ***Figure 1.2b***. The photographs show that the proposed landing site and its surroundings are developed areas.

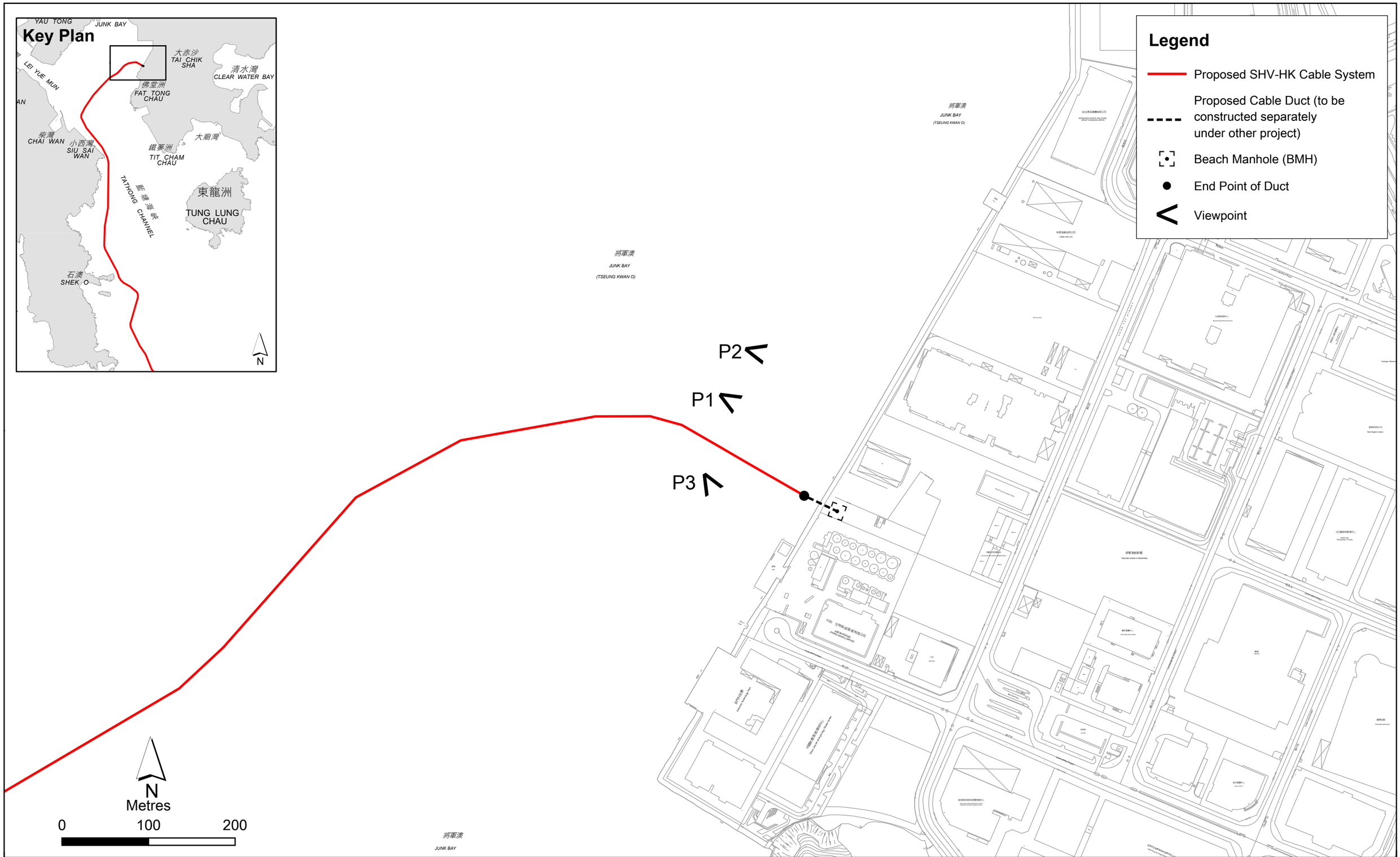

Figure 1.2a

Viewpoints of Photographs of the Landing Site and its Surroundings at TKOIE

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Date: 7/11/2024

Figure 1.2b Photographs of the Landing Site and its Surroundings at TKOIE

P1: The arrow indicates the approximate location of the landing site on the artificial seawall at TKOIE. It should be noted that the BMH and land-based cable duct connecting to the data centre will be constructed separately by CUOL prior to the Project. The cable duct will be constructed under the rock armour of the artificial seawall, with the duct opening extended from the toe of the seawall.

P2: Area to the northeast of the propsoed landing site – the artifical seawall with rock armours continues along the coast

P3: Area to the southwest of the proposed land site – building structures and the deck of Gammon Technology Park

1.5.2 *Marine Route Planning Considerations*

There are several existing environmental and physical constraints to the proposed SHV-HK cable route (***Figure 1.3a*** and ***1.3b***), which have influenced the alignment of the cable system. The following issues have been taken into consideration in finalising the route and prior to installation.

1.5.2.1 Avoid Major Marine Vessel Fairways

Major marine vessel fairways have Traffic Separation Schemes (TSSs) and should be avoided where possible, so as to minimise impacts on marine traffic and maximise the safety of the cable laying operations.

1.5.2.2 Avoid Environmental Sensitive Receivers

The route should preferably avoid all known key environmentally sensitive receivers/ areas, such as Fish Culture Zones (FCZs), coral communities of high ecological value, Marine Reserve and Sites of Special Scientific Interest (SSSI), etc. as shown in ***Figure 1.3a*** and ***1.3b***, and maintain a suitable distance from such receivers/ areas i.e. beyond the maximum dispersion reach of suspended sediment (calculated as 180 m in ***Appendix A***), whenever possible.

With consideration of other physical constraints, including avoidance of the major marine vessel fairways and minimising crossings with other submarine cables, it is inevitable for part of the proposed alignment to be located within 500 m from the Coastal Protection Areas (CPAs) along entire coast from Siu Sai Wan to Big Wave Bay, and along the coastlines of Tai Tau Chau near Shek O. The distances between the alignment and the CPAs have been optimised as much as possible.

It should be noted that several other in-service cable systems share similar alignment and distances to the CPAs, as indicated in ***Figure 1.3***. Examples of in-service and planned submarine cable projects which are within 500 m from CPA(s) include Cheung Chau Submarine Cable System; Peng Chau Cable System; Lamma Cable System; Asia Direct Cable System - Hong Kong Segment (ADC-HK) - Chung Hom Kok; H2H Express Submarine Cable; Bay to Bay Express Cable System - Hong Kong Segment (BtoBE-HK) – Chung Hom Kok; South East Asia - Japan 2 Cable System - Hong Kong Segment (SJC2-HK) - Chung Hom Kok; Hong Kong - Guam Submarine Cable Project (HK-G); and HKA Submarine Cable - Chung Hom Kok.

1.5.2.3 Minimise Disturbance to Heritage Sites

The alignment was selected to avoid impact and minimise disturbance to any known heritage sites around the area, including rock carving at Cape Collinson (declared monument) and Fat Tau Chau Sites of Archaeological Interest (SAI). As the BMH and the land-based cable ducts connecting to the data centre will be constructed separately under other project, no major land-based earthworks will be involved in this Project.

1.5.2.4 Other Submarine Cables and Pipelines

Minimise disturbance to existing submarine cables and pipelines, thereby ensuring that the SHV-HK cable laying works do not compromise the operation or integrity of other submarine cables or pipelines. This includes minimising crossings with other submarine cables and pipeline infrastructure situated along the proposed SHV-HK cable route. Hong Kong waters have a number of existing cables and therefore crossings are unavoidable. Crossings have been minimised to route between existing cables and pipelines but given the congested nature of Hong Kong waters, some are unavoidable.

Other recommendations to maintain existing cable integrity will also be adhered to, with reference to the International Cable Protection Committee (ICPC) (1) in particular aiming to adopt a default minimum separation distance between cables of three times water depth from in service cables.

(1) International Cable Protection Committee website available at https://www.iscpc.org/ [Accessed Aug 2023]

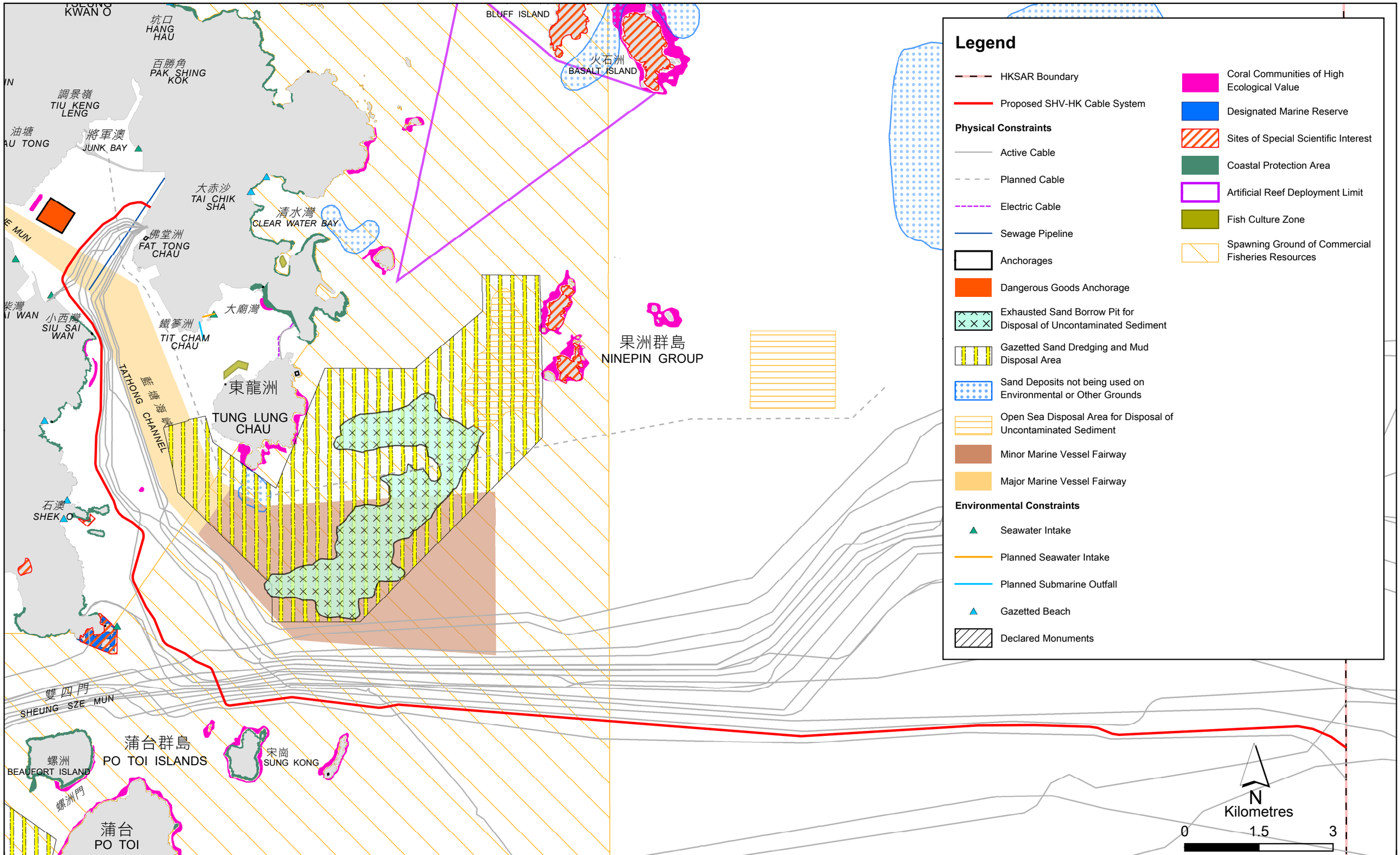

Figure 1.3a

Key Environmental & Physical Constraints

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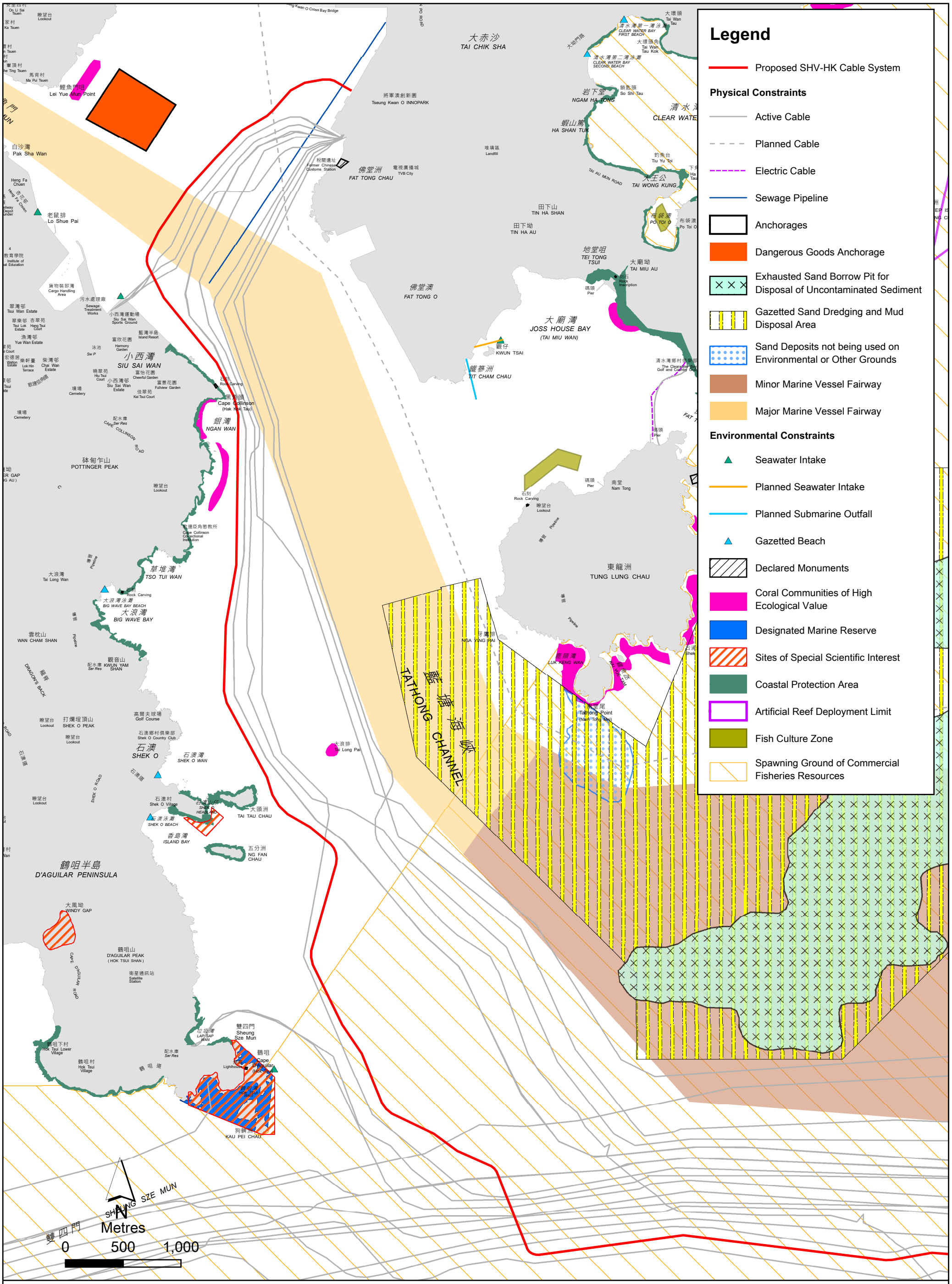

Figure 1.3b

Key Environmental & Physical Constraints
(Part Plan)

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Appropriate separation from existing cables and pipelines is important for successful and efficient maintenance/ repairings if required in the future.

1.5.2.5 Other Physical Constraints

The following physical constraints shall be avoided:

- Open sea disposal area for disposal of uncontaminated sediment at East of Tung Lung Chau;
- Exhausted sand borrow pit for disposal of uncontaminated sediment at East of Tung Lung Chau;
- Sand deposit – not being used on environmental or other grounds at South and Mid-Tathong; and
- The dangerous goods anchorage in Junk Bay.

In addition, the cable system should ideally avoid rocky outcrops on the seabed as cable installation in outcrop areas will require the cable system to be surface laid or shallow burial, increasing the risk of cable damage due to vessel anchors and fishing activity during operation phase.

1.5.2.6 Gazetted Bathing Beaches

Routing within 500m of gazetted bathing beaches should be avoided and the current route is clear of these boundaries.

1.5.2.7 Other Projects

In order to avoid interface and cumulative impacts with other projects, installation program of the SHV-HK cable has considered the prevention of overlapping with the construction works of other projects, as detailed in ***Section 2.3***.

1.6 Designated Project to be Covered by the Project Profile

The project is classified as a Designated Project (DP) under item C.12(1)(b) & (c) of Part I of Schedule 2 of the *Environmental Impact Assessment Ordinance* (EIAO) as specified below and illustrated in ***Figures 1.4a*** and ***1.4b***.

- Schedule 2 (Part I), C.12 –

(1) A dredging operation that is —

(b) less than 500 m from the nearest boundary of an existing or planned specified area that is wholly or partly situated on or over any foreshore and sea-bed; or

(c) less than 200 m from the nearest boundary of an existing or planned specified area that is not wholly or partly situated on or over any foreshore and sea-bed.

(2) In this item—

foreshore and sea-bed (前濱及海床) has the meaning given by section 2 of the Foreshore and Sea-bed (Reclamations) Ordinance (Cap. 127) ;

specified area (指明地區) means—

(a) site of special scientific interest;
(b) site of cultural heritage;
(c) bathing beach;
(d) marine park;
(e) marine reserve;
(f) fish culture zone;
(g) wild animal protection area;
(h) coastal protection area; and
(i) conservation area.

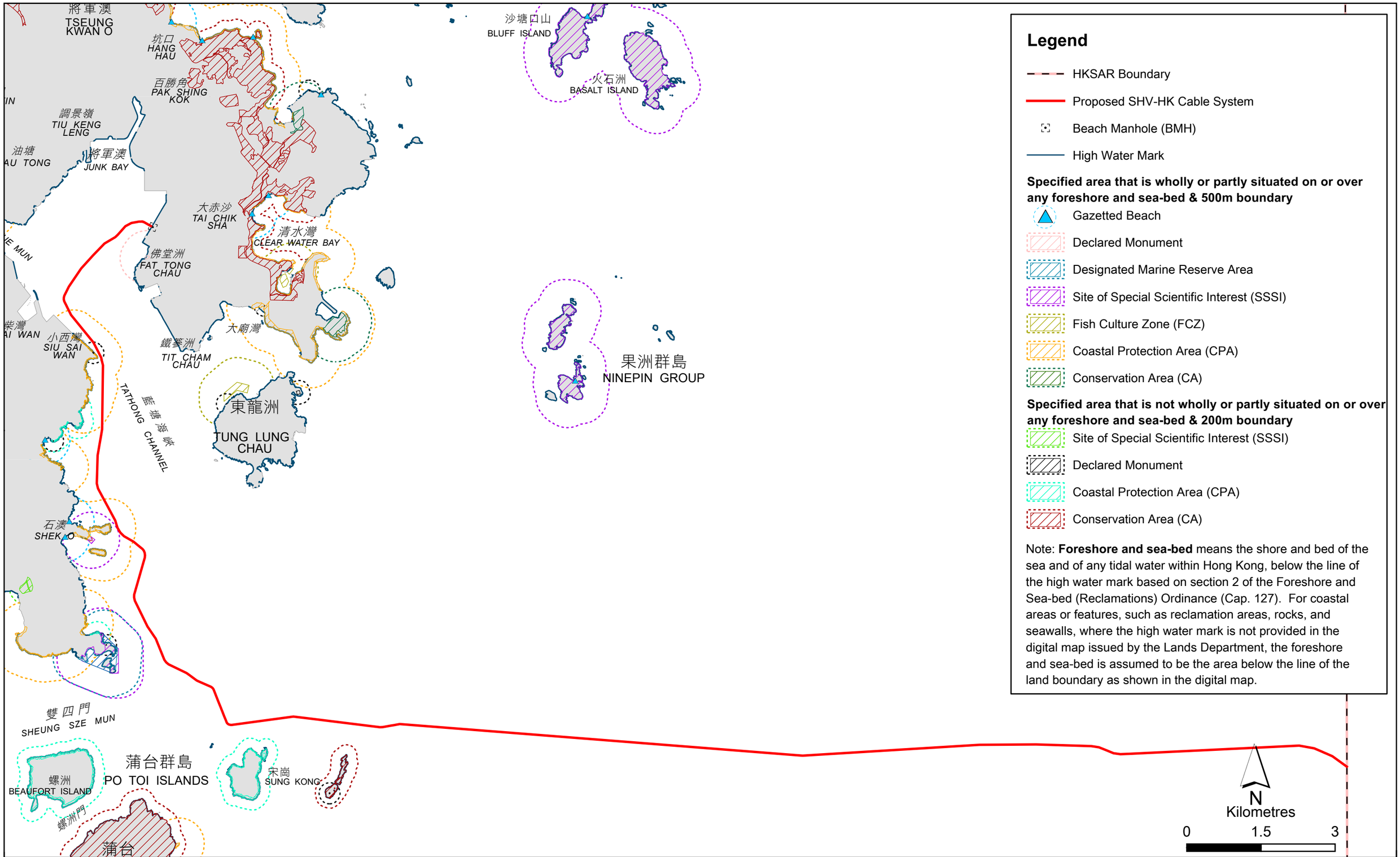

Figure 1.4a

Designated Project Elements

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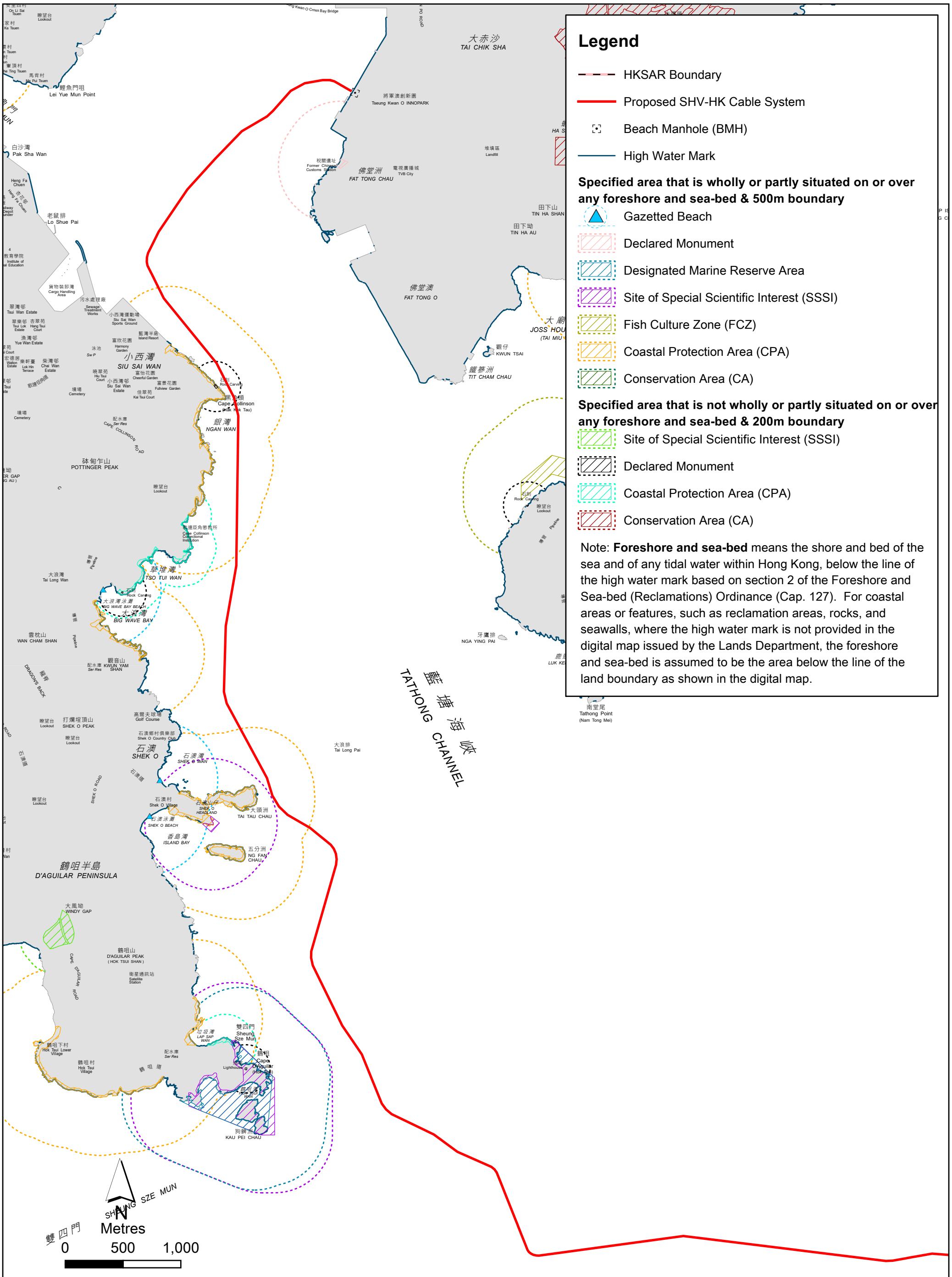

Figure 1.4b

Designated Project Elements
(Part Plan)

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The CPAs along entire coast from Siu Sai Wan to Big Wave Bay, and along the coastlines of Tai Tau Chau near Shek O are partly situated below the highwater mark. A site of cultural heritage (i.e. Rock Carving at Cape Collinson) is not wholly or partly situated on or over any foreshore and sea-bed. The locations of the CPAs, the site of cultural heritage and high water mark are presented in ***Figure 1.5*** for reference.

1.7 Name and Telephone Number of Contact Person

ERM-Hong Kong, Limited (ERM) has been appointed to undertake the environmental permitting for this Project. All queries regarding the Project can be addressed to:

ERM-Hong Kong, Limited (ERM)
2507, 25/F One Harbourfront
18 Tak Fung Street, Hung Hom,
Kowloon, Hong Kong

Attention: Mr Terence Fong, Partner
Telephone: (852) 2271 3000
Fax: (852) 3015 8052

Legend

- Proposed SHV-HK Cable System
- High Water Mark
- Coastal Protection Area
- Site of Cultural Heritage (i.e. Rock Carving at Cape Collinson) that is not wholly or partly situated on or over any foreshore and sea-bed
- 200m from CPA that is not wholly or partly situated on or over any foreshore and sea-bed
- 500m from CPA that is wholly or partly situated on or over any foreshore and sea-bed
- 200m from Site of Cultural Heritage (i.e. Rock Carving at Cape Collinson) that is not wholly or partly situated on or over any foreshore and sea-bed

Note: **Foreshore and sea-bed** means the shore and bed of the sea and of any tidal water within Hong Kong, below the line of the high water mark based on section 2 of the Foreshore and Sea-bed (Reclamations) Ordinance (Cap. 127). For coastal areas or features, such as reclamation areas, rocks, and seawalls, where the high water mark is not provided in the digital map issued by the Lands Department, the foreshore and sea-bed is assumed to be the area below the line of the land boundary as shown in the digital map.

N

Metres

0 250 500

Figure 1.5

Coastal Protection Area and High Water Mark

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2. OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

2.1 Project Planning and Implementation

The Project will be led and managed by the Project Proponent, CUOL. Planning and construction of the submarine cable system will be undertaken by HMN Tech. CUOL will be the contact point for the Project during its operation lifetime.

2.1.1 *Construction Phase*

The Hong Kong section of the SHV-HK cable installation works will be a "Pre-lay Shore End" (PLSE), where the cable system will be landed from Hong Kong landing point, the bundled cables will be pulled through the duct, which will be constructed by CUOL separately prior to this Project, until the bunded cables be pulled and secured in the BMH. After landing, the bundled cables will be laid up to the edge of Hong Kong waters, sealed and dropped onto the seabed. In this way the bundled cables can be picked up and spliced with the main submarine cable running outside Hong Kong, as a separate phase in the future.

Within Hong Kong, a shallow draft barge will be deployed to accomplish the submarine cable installation and protection works, and the bundled cables will be double armoured throughout. The Project is not expected to interact with any other projects and will include the following stages:

2.1.1.1 Pre-lay Grapnel Run (PLGR) and Route Clearance (RC) –

PLGR is designed to clean all seabed debris along the planned cable route, and RC works is designed to remove debris and all out of service (OSS) cables found on the planned route, and this will be done by with purpose-designed grapnels (as shown in ***Figure 2.1a***) towed along the route and penetrating up to 1.5 m or supported by diver hand-jetting (as shown in ***Figure 2.1b***) to ensure the whole cable route is clear.

2.1.1.2 Inshore Works and Connecting Cable System to BMH

Site Preparation

Prior to cable landing, cable landing team will be dispatched to landing point ahead of cable laying barge (as shown in ***Figure 2.1a***) arrival to prepare the site for the cable landing works. The existed from BMH to seaward will be carefully inspected to ensure that all is clear and ready for the cable to enter. Any obstruction will be cleared and cleaned. Pull ropes/wires will be checked and, if necessary, renewed or installed.

A survey will be carried out inside the BMH to ensure the duct for cable pulling is clear. A diver survey will be carried out at the duct end position, to ensure there is no obstacle of the duct end and ensure the pulling wire is inside the duct and ready for pulling.

Pre-Cable Installation

Prior to cable landing works, pre-landing meeting will be conducted between the landing team and cable laying barge to finalise the cable landing procedure.

The cable laying barge will be setup in the pre-determined location for landing the cable. A 5-point mooring system / dynamic positioning (DP) system will be setup to maintain the cable lay barge's position. The burial tool will be lowering to the seabed and ready for perform the burial works after the cable landing.

The bundled cable will be secured with the stoppers / messenger rope / manila rope with shackle and swivel for pulling. Upon securing of the cable ends with the stoppers / messenger rope / manila rope, divers will connect and secure the pulling wire with the shackle/ swivel. Then shore end team will

start to recover the pulling wire using a winch or a suitable pulling machine. Once sufficient cable is pulled ashore, with sufficient slack, the cables will be temporary secured on the shore end.

Cable Installation at the Landing Site

Then the cables will be de-armored, coiled and fixed inside the BMH with anchor plate. An estimated length of 164m articulated pipes (as shown in ***Figure 2.1b***) will be installed from the duct end where positioned at 9m water depth to the direct shore end point/burial tool down point. Once the cables are fixed inside the BMH, the main lay works will be started.

2.1.1.3 Submarine Cable Installation Shore End Laying, Burial and Ocean Ground Bed Installation

After the marine cable shore end landing is successfully completed, the installation barge will use injector/ jet sled for simultaneous lay and burial works (maximum speed up to 1 km hr-1) in a narrow trench approximately 0.5 m wide at a target depth of approximately 5 m below the seabed, out to the boundary of Hong Kong waters.

Cable Lay and Burial

After the completion of landing works, the lay and burial will commence by feeding high pressure water into the burial tool and progressively lowering the injector burial tools / jet sled tools (as shown in ***Figure 2.1a***) to the target burial depth penetration. From Beach Manhole (BMH) to approximately 45 m out from the BMH, the fibre-optic cables will be pulled into the Beach Manhole (BMH) via an as-built duct. From the 45 m to approximately 220 m out from the BMH, the cable system will be laid in a trench approximately 0.5 m wide and with target burial depth from approximately 0.1 to 1.5 m to approximately 5 m below the sea-bed/ mudline at the point where the installation barge can be set up (in approximately 9 m water depth). The burial depth will be increased to 6 m below the seabed at the submarine cable section that overlaps with the Tathong Channel Traffic Separation Scheme and toward inshore to avoid potential impact to the submarine cable due to the high traffic flow, such as emergency anchoring within the Channel. Three electrical earthing cables and anodes (called Ocean Ground Bed (OGB), acting as grounding) will be laid in this section, and generally laid along the bundled cable system and to the same depth as the fibre-optic cables. Divers with hand jet or jetting machine will be used to carry out the installation of OGB and then the grounding cable. The seabed is expected to naturally reinstate to its original condition shortly after burial.

For areas with cable crossings and pipeline crossings, and the areas where water depth is less than 9 m that installation barge cannot reach and burial by injector burial tools / jet sled tools (as shown in ***Figure 2.1b***) is not achievable, hand jetting by divers will be adopted. The practical burial depth for hand jetting will be from around 0.1 to 1.5 m, subject to the seabed conditions. The trenching area would be approximately 0.5 m wide.

Grounding System Installation

Three electrical earthing cables and anodes (called Ocean Ground Bed (OGB), acting as grounding) will be generally laid along the bundled cable system near the TKOIE landing point and to the same depth as the fibre-optic cables. Divers with hand jet or jetting machine (as shown in ***Figure 2.1b***) will be used to carry out the installation of OGB and then the grounding cable. The seabed is expected to naturally reinstate to its original condition shortly after burial.

Cable and Pipeline Crossings Protection

When the submarine optical cable system crosses the in-service cables, the burial tool will be graded out from the seabed, the cable system will be surface laid for a distance of 50 meters prior to and after the cable crossing point. Whereas where the SHV-HK cable route crosses the existing gas pipeline of Hongkong Electric Company Limited (HEC) and sewer pipes of Drainage Services Department

(DSD), to ensure the pipeline safety, the cable laying barge will stop where the burial tool will be raised, which is 100m away from the either side of the crossing point.

The burial tool will be raised above the seabed and secured on deck of the cable laying barge at 100m before the pipeline if using a injector burial tool or fully retract the blade by divers if using a sled burial tool (as shown in ***Figure 2.1a***). After confirmed by deck crew inspection prior to the commencement of surface lay to a calculated position, they will start to apply the URADUCT® protection sleeve (as shown in ***Figure 2.1b***) with a maximum width of 0.2 m or articulated pipes with an estimated width of 0.24 m or possible placement of reinforced precast concrete slabs with dimensions of approximately 80m (length) x 6m (width) on top of the submarine cable system at the crossing location. In case of shallow burial, hand jetting machine will be utilised by divers/ or jet sled will be utilised with the jetting sword recovered, with maximum trench width of 0.5 m. The diver will perform post lay inspection and burial by hand jetting to bury the surface laid cable to approximate 1 meter depth in later stage. Neither the existing seabed level nor the utility that is crossed will be affected.

2.1.1.4 Post-Lay Inspection and Burial ("PLIB")

There will be some locations where the burial tool cannot be used, e.g. crossing areas over existing cables or pipelines. At these locations, the cable will not be buried but rest temporarily on the seabed. Thereafter, Post-Lay Inspection and Burial ("PLIB") will be carried out by means of driver operated water jetting. The water jetting power is of either same or less than the injector burial tool/sledge tool (as referred to ***Figure 2.1a***) used during cable installation. Thus, the seabed can be expected to naturally reinstate to before-work level and conditions shortly after completion of the Post-Lay Inspection and Burial works, similar to that of the cable installation.

Figures 2.1a and ***2.1b*** illustrate the key equipment/ tools involved in the works and the estimated time required for the works is provided in ***Section 2.2***. ***Table 2.1*** provides details of the proposed burial depths and methods to be used at respective water depths, and the approximate extent of works.

Table 2.1 Burial Method in Hong Kong

	Target Tools & Methods Used and Extent of Works, at Respective Water and Burial Depths	
Approximate water depth, m	0 – 9 [1]	>9 – 32
Approximate burial depth, m	5	5 - 6
Approximate extent of works (cable system length), km	0.27	35.083
Cable Sections	From the Beach Manhole (BMH) landing duct connection point to the end of articulated pipe	From the end of the articulated pipe to the eastern boundary of Hong Kong waters
Target tools & methods	Diver hand jetting tools, using water jetting techniques	Professional burial tools installed on barge, i.e. An "Injector Burial Tool" or "Sledge Tool" towed behind a cable laying vessel (as referred to ***Figure 2.1a***)

Notes:
[1] Jetting by diver will also be conducted at crossings with existing gas pipeline and sewer pipes where water depth is >9 m.

Figure 2.1a Photographs of Typical Key Equipment/ Tools Used (1)

Typical Cable Installation Barge / Vessel using Injector Burial Tool

Typical Injector Burial Tool

Typical Injector Burial Tool

Typical Sledge Tool

Typical Grapnel (e.g. for Route Clearance)

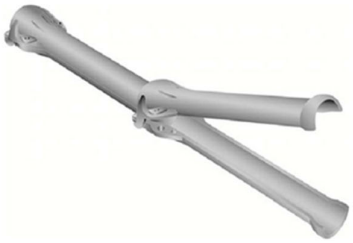
Figure 2.1b Photographs of Typical Key Equipment/ Tools Used (2)

Buoys / Floats on Messenger Line and Cable

Diver Cutting Off Buoys / Floats

Diver Jetting

URADUCT® used for Crossing Protection



Articulated Pipe

2.1.2 *Operation Phase (including Maintenance)*

During cable system operation (after completion of installation), there may be a potential requirement for maintenance work (i.e. cable maintenance/ repairing at particular fault location due to unexpected damage) to be carried out.

In case of land-based maintenance works, earthworks and civil works would not be required. In case submarine cable maintenance/ repairing work is required during project operation, the recovery of any faulty cable section to the surface would involve similar equipment for fluidizing the sediment that covers the cable. For all potential cable maintenance/ repairing works, the selection of plant and equipment would be “fit-for-purpose”, adopting smaller plants and / or use of divers if considered.

In general, since only a short section of faulty cable would need to be removed, maintenance works will be similar in nature to cable installation works described in ***Section 2.1.1*** above and include using similar equipment and methods but generally be smaller scale.

2.2 Project Programme

The SHV-HK cable system is provisionally scheduled to be landed and installed at TKOIE commencing in Q1 of 2025, upon completion of required permits.

The expected construction schedule within the HKSAR is as presented in ***Table 2.2*** noting that some phases of work may overlap. Overall, the submarine cable installation during construction is expected to be approximately 95 working days.

Table 2.2 Tentative Construction Schedule

Works Stage	Tentative Timeframe
PLGR and RC (***Section 2.1.1.1***)	Approximately 35 working days
Inshore (0 – 9 m water depth) works and connecting cable system to BMH (***Section 2.1.1.2***)	Approximately 5 working days
Submarine Cable Installation Shore End Laying, Burial, Ocean Ground Bed Installation and Cable and Pipeline Crossings Protection (***Section 2.1.1.3)***	Approximately 55 working days
TOTAL	Approximately 95 days

Note: Post-lay works (***Section 2.1.1.4***), if necessary, would take approximately 40 days

All cable installation/ maintenance/ repairing works are expected to be undertaken during non-restricted working hours, i.e. between 0700 and 1900 hours on any day not being a general holiday or a Sunday. If works during restricted hours are later found to be necessary, a Construction Noise Permit (CNP) will be applied for under Noise Control Ordinance.

The cable system is expected to be operational for a minimum of 25 years. Duration of any cable maintenance/ repairing work during operation phase is anticipated to be of shorter duration than cable installation during construction.

2.3 Interaction with Concurrent Projects

The proposed SHV-HK cable system is provisionally scheduled to be landed and installed at TKOIE commencing in Q3 of 2025. The following projects are planned in the vicinity of the proposed SHV-HK cable system. Their locations are indicated in ***Figure 2.2***.

- **Hong Kong – Guam Submarine Cable Project (HK-G):** Based on its Project Profile (No. PP-579/2019), HK-G was scheduled to be installed in 2019. However, the installation is yet to commence by the time this Project Profile is being prepared. There is no updated information of its construction programme. The Project Proponent will keep track of any updates of the HK-G cables, and liaise with the HK-G project team to avoid overlapping of the construction activities of HK-G Cable and SHV-HK cable. However, if overlapping is unavoidable, potential cumulative environmental impacts are anticipated to be negligible, considering the relatively minor scale of both projects.
- **Hong Kong Offshore Wind Farm in Southeastern Waters:** CLP Power Hong Kong Limited proposed to construct an offshore wind farm (OWF) in the Southeastern waters of HKSAR. Based on the latest EP for the project (No. FEP-01/341/2009/B), the landing site for the OWF cable system is proposed to be located at Fat Tong Chau, to the south of TKOIE. According to its EIA Report (Register No. AEIAR-140/2009), Environmental Review Report (ERR), as well as the website of CLP Power Hong Kong Limited, there is no information on the construction programme for the OWF. Considering that further economic viability and technical design studies might be required for the OWF, the construction of the OWF is unlikely to commence prior to the completion of SHV-HK cable in 2024. The OWF is unlikely to be constructed concurrently with the Project. Cumulative impact from OWF is not anticipated.
- **Tseung Kwan O Desalination Plant:** WSD's desalination plant at Tseung Kwan O Area 137 has been under construction since Dec 2019. Based on the information on WSD's website, the

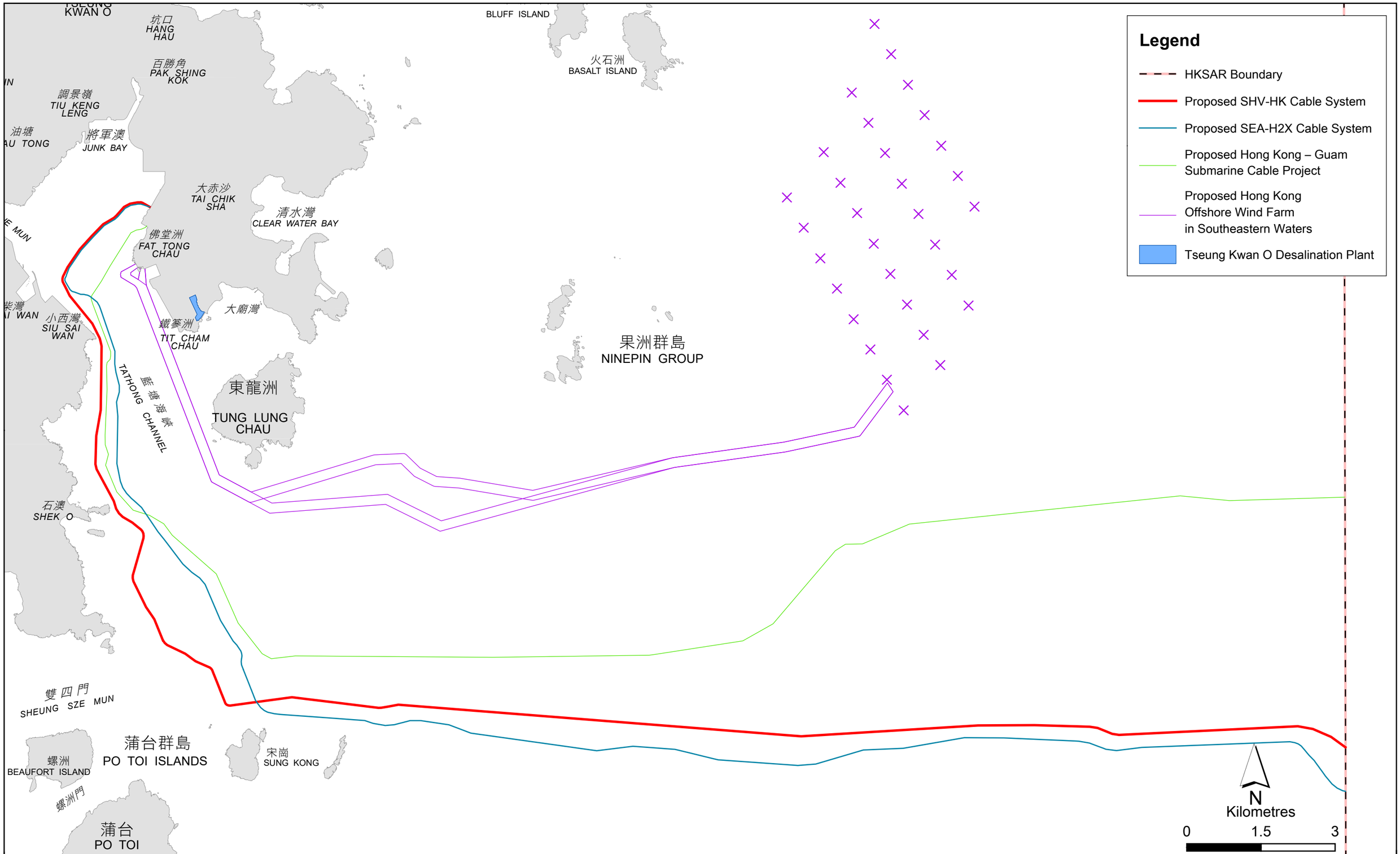


Figure 2.2

Other Projects in Vicinity of the Proposed Cable System

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desalination plant has commenced operation in Q3 of 2024 . Therefore, the desalination plant will not be constructed concurrently with the Project. According to the approved EIA Report (Register No. AEIAR-192/2015), no unacceptable residual environmental impact is anticipated from the operation of the desalination plant. Therefore, Cumulative impact from the construction and operation of the desalination plant is not anticipated.

- **South-East Asia Hainan-Hong Kong Express Submarine Cable System (SEA-H2X):** SEA-H2X is also scheduled to be installed in Q3 of 2025. As the cable alignment of SEA-H2X is similar to that of SHV-HK with the same landing point at TKOIE, the installation barge will be operated for each cable one-by-one without overlapping for safety reason. However, if overlapping is unavoidable, potential cumulative environmental impacts are anticipated to be negligible, considering the relatively minor scale of both projects.

3. MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT

Figure 3.1 shows the major elements of the environment surrounding the proposed cable alignment and details are provided below.

3.1 Major Vessel Fairways

The Tathong Channel is a major vessel fairway under the Traffic Separation Scheme (TSS), where it elongates eastbound from Lei Yue Mun to the southeast of Tung Lung Chau. While the majority of the proposed cable corridor is laid parallel to and clear of this major vessel fairway, a crossing, which is located at the southwest of the cable landing site, is unavoidable. It would be perpendicular to the TSS so as to minimise the time of works within the fairway and thus the impacts on marine traffic as well as maximise the safety of the cable laying works.

3.2 Gazetted Marine Facilities

There are no gazetted marine facilities in the proposed cable corridor.

3.3 Cable, Pipelines and Outfalls

Hong Kong waters have a number of existing cables with a congested nature and therefore crossings are unavoidable. There is a planned submarine telecommunication cable and a sewer outfall located outside of the cable landing site at TKOIE. There are also a number of crossings of cables and the Hong Kong Electric Company Limited (HEC) gas pipeline as well as sewer pipes of Drainage Services Department (DSD), along the cable corridor. Crossings have been minimised to the cable route between existing submarine cables and pipelines to minimise disturbance to them, thereby ensuring that the cable laying works do not compromise their integrity and operation.

With reference to the ICPC, recommendations of having a minimum separation distance of three times water depth from in-service cables is adhered and adopted to the cable routing. Appropriate separation from existing cables and pipelines is important for successful and efficient maintenance/ repairing if required in the future.

3.4 Other Proposed Facilities or Amenities

At present, there are no other known proposed marine facilities or amenities that the cable corridor will cross.

3.5 Gazetted Bathing Beaches

There is no gazetted beach falling within 500 m of the cable landing site or cable corridor. The nearest gazetted beach is Rocky Bay Beach located ~820 m to the west of cable alignment. Hotspots of water sports or other leisure activities are also not in proximity of the Project.

3.6 Coastal Protection Area

While the cable landing site is not within CPA, the cable alignment falls within 500 m of two CPAs, which are located along the entire coast from Siu Sai Wan to Big Wave Bay, and along the coastlines of Tai Tau Chau near Shek O with the distances being approximately 60 and 150 m away, respectively. These CPAs are designated under Chai Wan Outline Zoning Plan (OZP) No. S/H20/26, and Tai Tam and Shek O OZP No. S/H18/10, respectively.

It should be noted that several other operating cable systems share similar alignment and distances to the CPAs.

3.7 Seawater Intake

The nearest seawater intake is Water Supplies Department (WSD) Siu Sai Wan Flushing Water Intake (see ***Figure 3.1***) positioned ~320 m from the cable alignment.

3.8 Sites of Special Scientific Interest

The closest SSSI are the Shek O Headland SSSI and Hok Tsui (Cape D'Aguilar) SSSI, located approximately 470 m and 730 m, respectively, away from the cable landing site. These two SSSIs are marine in nature. As detailed further in ***Section C3.1*** of ***Appendix B***, no impacts are anticipated to any of these SSSI areas due to the Project.

As detailed in ***Section 4.2.2***, it is expected that the maximum distance of transport for suspended sediments from Project works would be 180 m and would settle onto the seabed in less than 4 minutes (see ***Appendix A*** for details), hence any sediment plume due to the Project works would not be expected to reach any of the identified SSSIs and overall, no anticipated impact is foreseen in these areas.

3.9 Coral Communities

There are coral communities of ecological importance along the coast of Ngan Wan and Cape Collison, at Tai Long Pai, at Sung Kong Islet, along the entire coasts of Sung Kong and Waglan Island, as well as along the eastern coast of Beaufort Island and entire coast of Po Toi which are further from the proposed alignment (***Figure 3.1***). The closest coral community, located at Cape Collinson and Ngan Wan would be ~80 m away from the cable corridor, respectively. The remaining coral communities are approximately ~450 m to >6.7 km away from the corridor. The potential impacts to coral communities are further discussed in ***Appendix B***.

3.10 Designated Marine Parks and Marine Reserve

Cape D'Aguilar Marine Reserve is located ~730 m from the proposed SHV-HK cable alignment. As detailed in ***Section 4.2.2***, it is expected that the maximum distance of transport for suspended sediments from Project works would be 180 m and would settle onto the seabed in less than 4 minutes (see ***Appendix A*** for details), hence any sediment plume due to the Project works would not be expected to reach any of the identified SSSIs and overall, no anticipated impact is foreseen in these areas.

3.11 Spawning and Nursery Grounds of Commercial Fisheries Resources

Spawning and nursery grounds of commercial fisheries resources were identified at the southern and eastern waters of Hong Kong (***Figure 3.1***). Parts of the cable alignment from the north of Cape D'Aguilar to east of Waglan Island will be located within the spawning ground of commercial fisheries resources. The potential impacts to the spawning grounds of commercial fisheries resources are further discussed in ***Appendix C***.

3.12 Cultural Heritage

Desktop review identified one declared monument, one Grade 3 historic building and one SAI within 500 m area from the proposed SHV-HK cable system or a BMH at the TKOIE as shown in ***Figure 3.2***. They are namely, the Rock Carving at Cape Collinson (declared monument) and the Cape Collinson Lighthouse (Grade 3 historic building) located 86 m and 104 m respectively from the proposed cable. The Fat Tau Chau SAI is located 492 m from the BMH.

The proposed SHV-HK cable system is located within a disturbed marine area installed/ planned to install with numerous submarine cables or utilities. Desktop review revealed that the proposed SHV-HK cable system mostly fall within areas that had been covered by previous marine archaeological assessment/ survey areas, the surveyed areas are shown in ***Figure 3.2*** and detailed in ***Table E4.2*** in ***Appendix E***. All of the previously surveyed or assessed areas that overlapped with geophysical

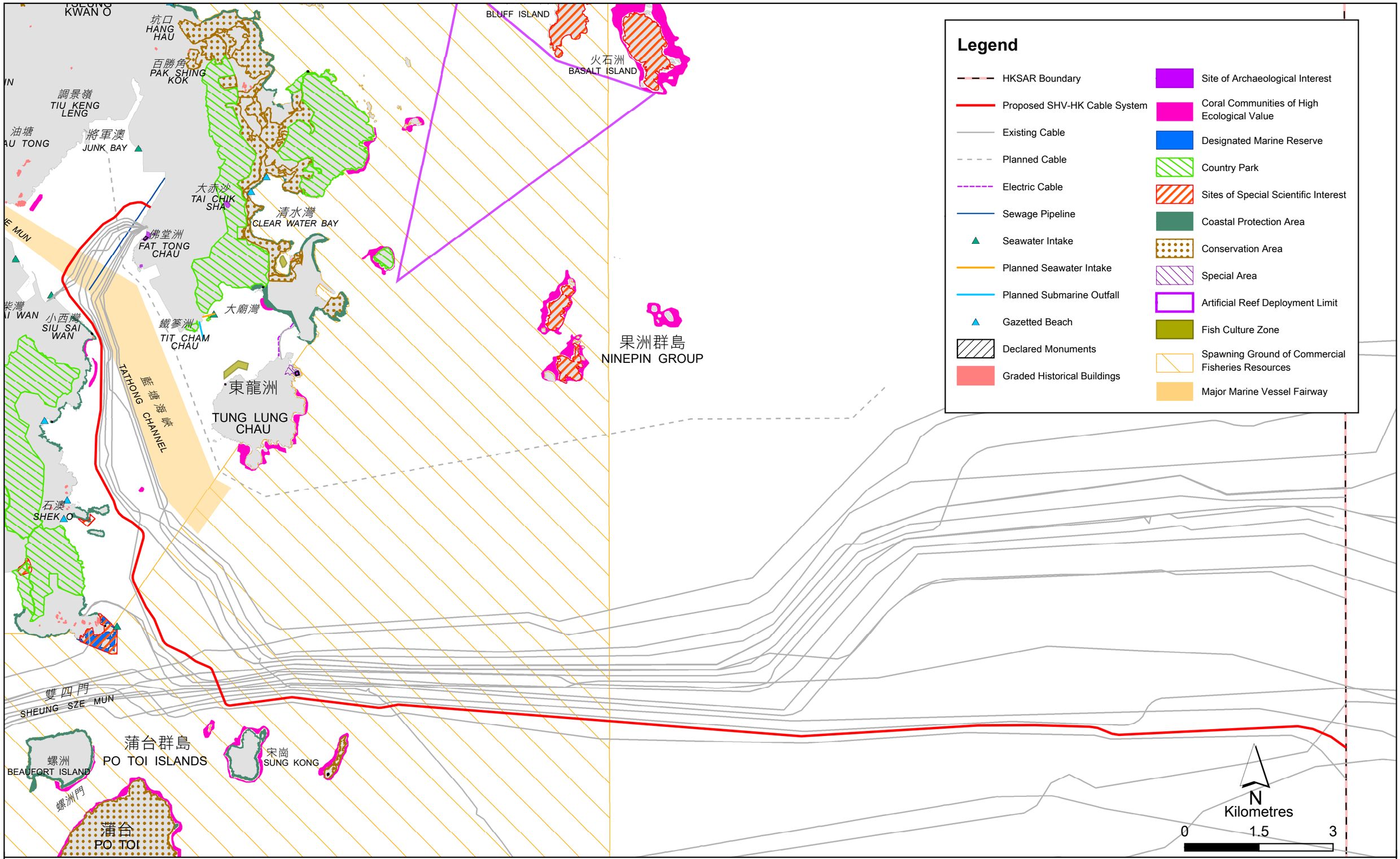

Figure 3.1a

Major Environmental Elements of the Areas in Vicinity of the Proposed Cable System

ERM

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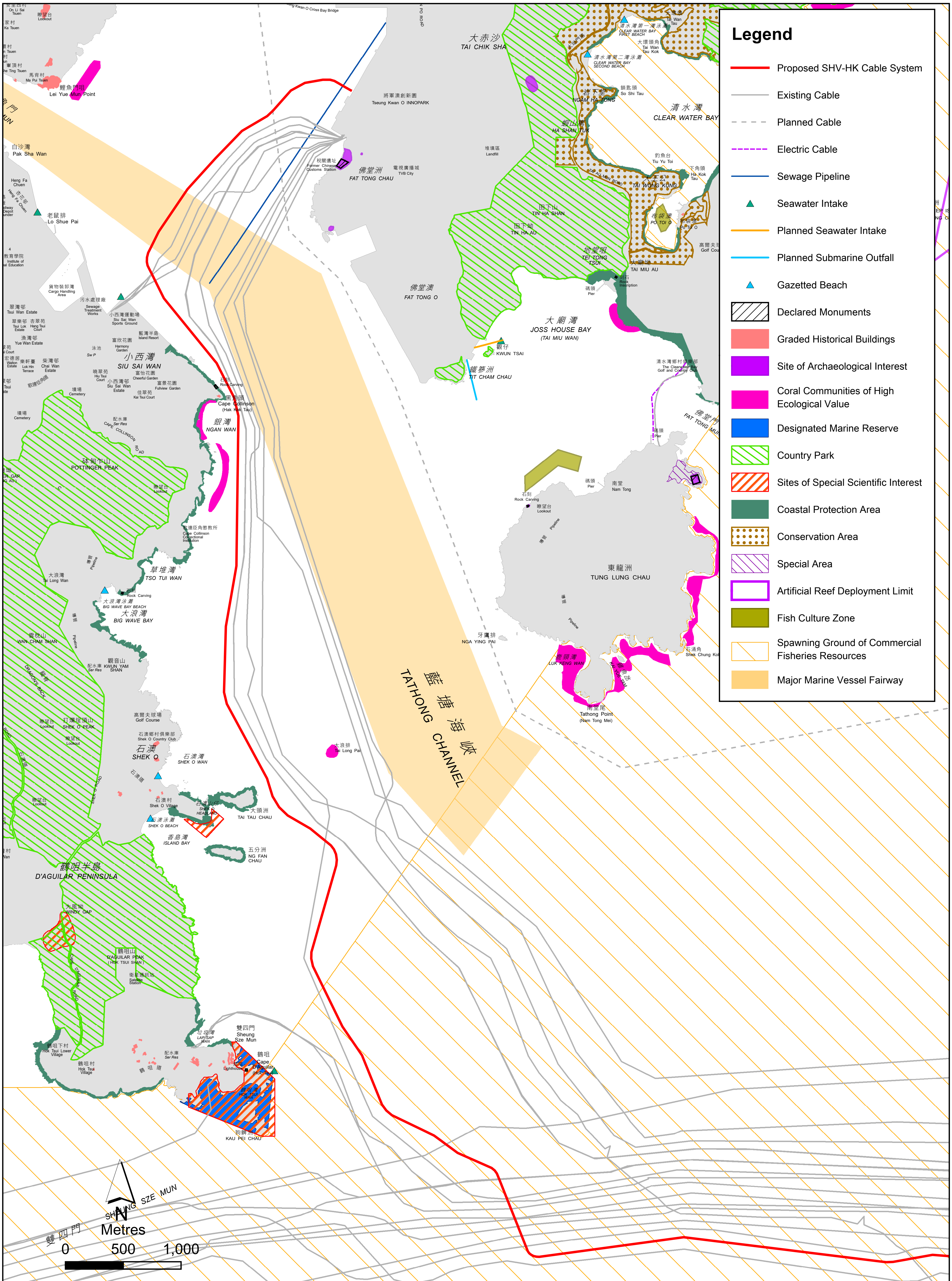

Figure 3.1b

Major Environmental Elements of the Areas in Vicinity of the Proposed Cable System (Part Plan)

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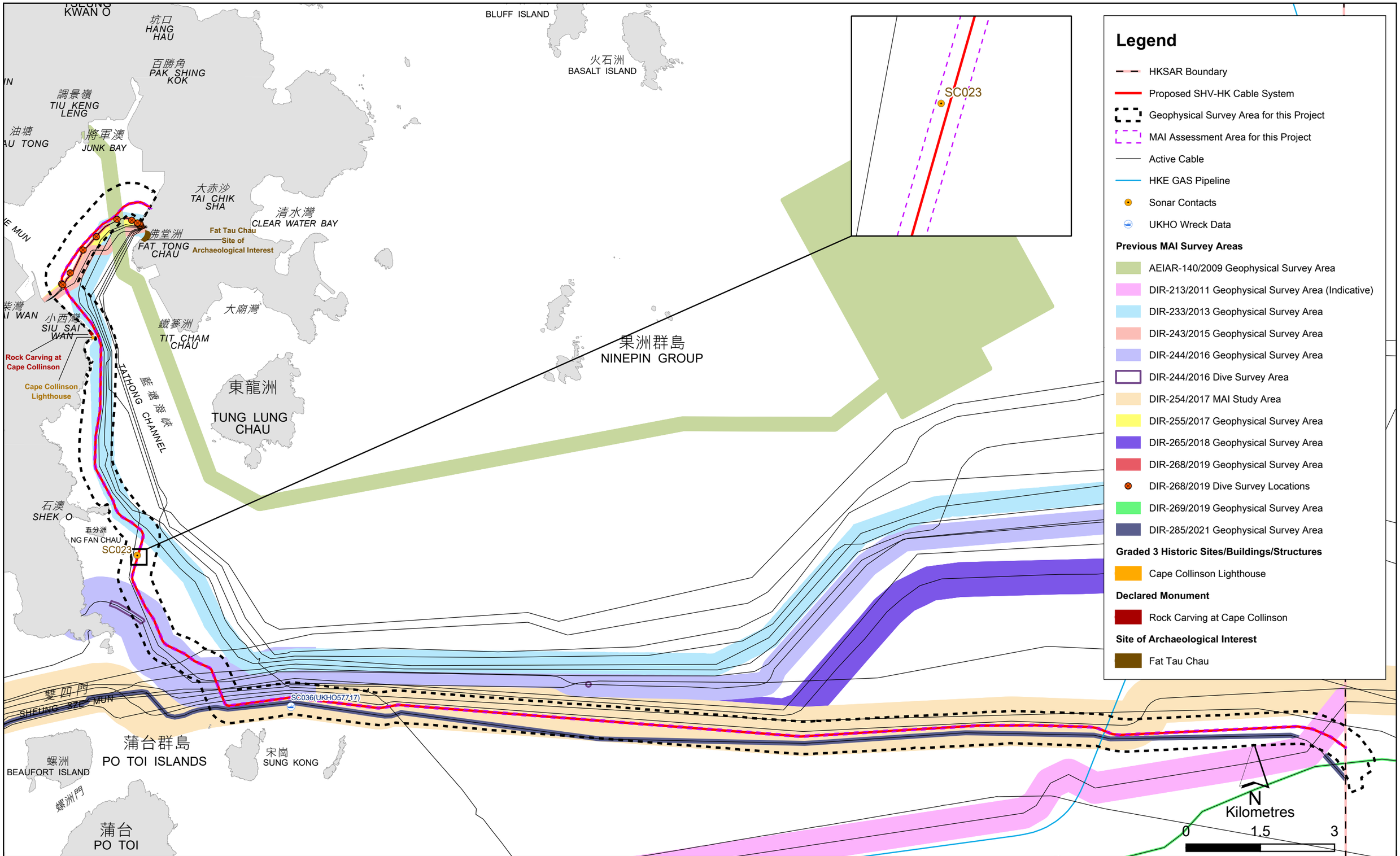

Figure 3.2

Land-based Cultural heritage sites and MAI Study Areas/Survey Areas in the Vicinity

ERM

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survey area for this Project concluded to have no marine archaeological interest. A geophysical survey was conducted for this Project and the area coverage is shown as “Geophysical Survey Area for this Project” in **Figure 3.2**.

The submarine cable laying process will involve minor marine works for a relatively short period of time. The seabed disturbance only involves a narrow trench of approximately 0.5 m wide at a target depth of up to around 6 m below the seabed. After the cable is laid, the seabed will return to its original profile (see ***Sections 2.1*** and ***2.2*** for details). Given this minimal disturbance area, an assessment area of 20 m from both sides of the proposed cable route is sufficient to assess the marine archaeological impact caused by the proposed works, as a 0.5 m wide and 6 m deep trench is relatively narrow and shallow, its impact will be localized and constrained to the immediate area of the trench itself. Therefore, an assessment area of 20 m from both sides of the proposed cable route is adequate and the MAI Assessment Area for this Project is shown in **Figure 3.2**.

One sonar contact (SC023) is identified in MAI Assessment Area and located 11.8 m from the proposed cable route and was identified as debris. It has been interpreted as having no marine archaeological value because it is a small isolated object and contained no magnetic value. Therefore, it was deemed to be a natural feature (e.g. possible broken rock), similar to other nearby sonar contacts interpreted as debris that exhibits no cultural or man-made features. Moreover, sonar contact (SC036) located 183 m away from the proposed cable system was identified as a modern ship (UKHO57717) sunk in 1999 according to the database of UKHO, therefore it is of no marine archaeological significance.

No magnetic and seismic contacts are located within the MAI Assessment Area.

3.13 Cumulative Impacts from Other Concurrent Projects

Section 2.3 identified potential interactions between the installation of the SHV-HK cable system and construction of other projects in the vicinity. As described in ***Section 2.3***, the installation of the SHV-HK submarine cable system will not coincide with other projects. Therefore, cumulative impacts are not anticipated.

4. POSSIBLE IMPACTS ON THE ENVIRONMENT

4.1 Summary of Potential Environmental Impacts

The SHV-HK cable system installation/ maintenance/ repairing process in HKSAR waters will require minor works within the marine environment and only small-scale construction works at the cable landing site, to guide and pull the cable via the cable duct (submerged) and connect to the BMH and Cable Landing Station at TKOIE. It should be noted that the cable duct and BMH will be constructed separately prior to this Project.

The construction, operation (including potential maintenance/ repairing) impacts associated with the proposed SHV-HK cable system are summarised in ***Table 4.1*** and elaborated on in the following sections.

No environmental impacts are expected to occur during the operation of the submarine cable system. There is a potential requirement for maintenance work (i.e. cable maintenance/ repairing at particular fault location due to unexpected damage) to be carried out during operation phase.

Table 4.1 Potential Sources of Environmental Impacts

Potential Impact	Construction Phase	Operation Phase (including Maintenance[1])
Water Quality		
Activities at landing point	✓	×
Marine based activities	✓	×
Disruption of Water Movement or Bottom Sediment	✓	×
Ecology		
Terrestrial	×	×
Marine	✓	×
Fisheries	✓	×
Cultural Heritage	✓	×
Noise	✓	×
Others		
Air Quality	×	×
Dust	×	×
Emissions from Marine Vessels	×	×
Emissions from PMEs	×	×
Odour	×	×
Induced Vehicular Traffic	×	×
Waste Management	×	×
Landscape and Visual Impact	×	×
Hazard to Life	×	×
Dangerous Goods	×	×
Hazardous materials or wastes, including potentially contaminated materials	×	×
Risk of Accidents resulting in Pollution or Hazard	×	×

Notes:
✓ = Potential to result in adverse impacts
× = Not expected to result in adverse impacts
[1] The magnitude of potential adverse impacts arising from the potential maintenance/ repairing during operation phase is expected to be less than that during construction due to shorter duration for maintenance/ repairing work than construction work, involvement of smaller extent, and use of smaller / less powerful equipment for maintenance/ repairing work than construction work, e.g. remotely operated vehicles (ROV) rather than injector tool (see **Section 4.10**).

4.2 Water Quality

Appendix A provides a detailed assessment of potential impacts to water quality due to the Project, covering disruption to water movement or bottom sediment, and is summarised as follows.

4.2.1 *Activities at Landing Point*

Activities at the TKO landing point involve pulling and guiding the bundled cables into the cable duct at the toe of the seawall. The cable duct will be constructed separately prior to this Project. As shown in ***Figure 1.2***, the landing point is an artificial sloped rock armour seawall. There will not be exposed soil or sediment at the landing point. The pulling of bundled cables by winches will not involve any major earthworks and thus runoff and erosion would be kept at minimal. The potential impacts to water quality during the activities at the landing point primarily relate to construction wastewater. However, the following measures will be incorporated into the construction activities at the landing point to prevent any adverse impacts to water quality.

- The machinery employed will be inspected prior to work to ensure the waters and the shoreline will not be polluted with oil/grease/fuel. No machinery maintenance will be carried out onsite. Oil absorbent materials will be readily placed on site and will be applied immediately should any oil leakage incidents occur, to ensure the nearby water quality would not be affected; and

- All construction waste and drainage will be handled and disposed in accordance with the *Waste Disposal Ordinance* and *Practice Note for Professional Persons*, *Construction Site Drainage* (*ProPECC PN2/23*) and in particular the following measures adhered to:

    - If there are any stockpiles of materials, these will be covered with tarpaulin or similar fabric to minimise runoff during the rainy season;

    - Care will be taken during the cable landing and construction to avoid any spillage of materials to the adjacent marine waters and to ensure that spoil materials are not discharged into adjacent waters; and

    - Best Management Practices (BMPs) will be applied to avoid and minimise contaminated runoff from work sites, marine plants and vessels, including wastewater being properly treated and discharged to storm drain.

The above measures will be sufficient to prevent adverse impacts to water quality during the landing activities. Therefore, there are no predicted adverse impacts (either direct or indirect) to water quality from these activities.

During operation phase, no activities at the landing point are anticipated and no water quality impacts are expected.

4.2.2 *Marine Based Activities*

4.2.2.1 Construction phase

The marine based construction activities include the preparation for cable installation (RC and/or PLGR), and submarine cable installation shore end laying, burial and ocean ground bed installation (as refer to **Section 2.1.1.3**).

During the inshore works, the BMH seaward duct will be layed approximately 220 m from the BMH, the bundled cables will then be buried by divers (as shown in ***Figure 2.1b***) using jet probes to achieve target burial depth of 2 m, to approximately 5 m below the sea-bed/ mudline at the point where the installation barge can be set up (in approximately 9 m water depth).

Cable Laying

Cable laying, and to a lesser degree some RC/ PLGR work(s), will result in the temporary formation of an area of high suspended sediment concentration around the injection tool or grapnel anchor, which will remain close to the seabed and settle out quickly. The sediment disturbed during cable laying will remain in suspension for a very short period of time; analysis of the potential transport of fine sediments suspended in the water column was undertaken and it was determined that the sediments would settle onto the seabed in less than 4 minutes (see ***Appendix A*** for details). There are no contaminated mud pits in the vicinity of the cable alignment and results of sediment quality monitoring by EPD (***Section A3.3*** of ***Appendix A***) also indicate that there is no sign of contamination for sediment at monitoring stations around the cable route. No release of sediment-bound contaminant from the cable installation would therefore be expected. Hence the release of any contaminants from sediments is not expected and exertion of an oxygen demand on the receiving waters will be very limited and are not expected to cause adverse impacts to water quality. The maximum distance of transport for the suspended sediments is calculated to be no more than 180 m. Among all identified WSRs, most except one are located far beyond 180 m and thus sediment plume will not encroach into these WSRs (see ***Appendix A***). The coral communities at Cape Collinson and Ngan Wan (WSR E3) are located ~80 m from the Project site only, within the sediment plume travel distance. To avoid elevation of SS from the sediment plume from the cable installation works, silt curtains will be installed between WSR E3 and the Project site prior to and during the cable laying works near Cape Collinson. The silt curtains will contain and avoid sediment plume spread to WSR E3. Furthermore, as the 200 m cable alignment close to the landing point as well as the OGB and grounding cables would be installed by diver with less powerful handheld tool, there will limited suspended solids elevation and thus limit change in water quality on the coral near the landing point (WSR T1), No unacceptable adverse impacts to water quality are expected during or after the marine works.

Burial Works

After the marine cable shore end landing and laying is successfully completed, the installation barge will use injector/ jet sled for simultaneous lay and burial works (typical operating speed of approximately 1 km hr-1) in a narrow trench approximately 0.5 m wide at a target depth of approximately 5 m below the seabed, out to the boundary of Hong Kong waters. The burial depth will be increased to 6 m below the seabed at the submarine cable section that overlaps with the Tathong Channel Traffic Separation Scheme to the cable landing site to avoid potential impact to the submarine cable due to the high traffic flow, such as emergency anchoring within the Channel. The seabed is expected to reinstate to its original condition shortly after burial. The burial depth is necessary to provide protection to the cable system. An injector tool/ jet sled tool utilises water injection technology to fluidise seabed sediments, which then enables the tool to penetrate the seabed to the desired depth and so to lay the cable system. The submarine cable laying works for the whole alignment are short term in nature, last approximately 95 working days (including contingency and buffer).

4.2.2.2 Operation Phase (including Maintenance)

The operation of the cable will not result in any pollutant emissions into the surrounding waters and no water quality impacts are anticipated.

Maintenance/ repairing works will be conducted (and repaired cable laid back) along the same proposed alignment as installed cable system but duration of any cable maintenance/ repairing work is anticipated to be of shorter duration than cable installation during construction, since maintenance/ repairing work will generally be conducted at point fault location(s) rather than along the whole cable alignment. ROVs generally have reduced jetting power compared to installation injector tools (typical injector tools jet around eight times (x8) more litres of water per minute than typical ROVs) and diver hand jetting is even less powerful (ROVs jet around four times (x4) more litres of water per minute than typical diver jetting). Grapnels on the other hand do not use jetting but simply penetrate the seabed and are therefore not expected to cause significant sediment plumes. The recovery of any faulty cable using diver, ROV or grapnels is expected to cause sediment plume that would be no greater than sediment plume generated during installation, i.e. the maximum distance of transport for the suspended sediments would not be more than 180 m. Therefore overall, the potential impacts presented in above subsections are anticipated to be less during cable maintenance and repairing works than those for cable installation during construction. Since cable installation during construction is not considered to cause adverse environmental impacts, therefore no adverse environmental impacts are considered likely should maintenance and repairing be required.

4.2.3 *Disruption of Water Movement or Bottom Sediment*

There will be small scale temporary displacement of bottom sediment during the laying of the submarine cable system using the cable burial tool. Once the cable is installed, the bottom sediment will naturally resettle (see ***Section A4.2*** of ***Appendix A***). No long term disruption of bottom sediment will occur and no disruption to water movement will result from this Project.

4.3 Ecology

4.3.1 *Terrestrial Ecology*

No impacts to terrestrial ecology will arise from the construction and operation of the submarine cable system as no land-based activities are involved for the Project.

4.3.2 *Marine Ecology*

Appendix B provides a detailed assessment of potential impacts to marine ecology resources due to the Project, which is summarised as follows.

4.3.2.1 Impacts on Sites of Special Scientific Interest

The marine SSSIs located closest to the Project are Shek O Headland SSSI and the Hok Tsui (Cape D'Aguilar) SSSI, which are located approximately 470 m and 730 m from the closest cable segment, respectively. As detailed in ***Section 4.2.2***, it is expected that the maximum distance of transport for suspended sediments from Project works would be no more than 180 m and these would settle onto the seabed in less than 4 minutes (see ***Appendix A*** for details). It is therefore expected that any sediment plume due to the Project works would not reach any of the identified SSSIs and overall no direct or indirect impacts during construction phase are anticipated (see ***Appendix B***).

4.3.2.2 Evaluation of Impacts

A review of the existing information on the marine ecological resources surrounding the cable route has identified the area as supporting benthic fauna which can be considered as typical for Hong Kong waters and thus of low ecological value (see ***Appendix B***). Although these soft bottom assemblages will be disturbed during the cable laying works, the area of disturbance is small and rapid

reinstatement of the seabed will result in the area being available for prompt recolonization. Hence, no permanent impacts are likely to occur.

4.3.2.3 Potential Impact on Subtidal Hard Bottom Assemblages

No coral communities of high ecological importance have been identified within the cable corridor (see ***Section B3.7*** of ***Appendix B*** and ***Figure 3.1***). Coral assemblages of high ecological value have been identified at South West Junk Bay, Sung Kong, Waglan Island, Ninepins, Fat Tong Chau, Cape Collinson and Ngan Wan, Tai Long Pai, Tung Lung Chau, Cape D'Aguilar Marine Reserve, Beaufort Island and Po Toi Island. Except for the coral communities at Cape Collinson and Ngan Wan which are located at ~80 m from the nearest cable alignment, the other identified coral communities of high ecological value are located are approximately ~450 m to >6.7 km away from the corridor.

As the dispersion of the sediment plume is predicted to be no more than 180 m from the cable burial tool, the coral communities are not expected to be affected by the Project (see ***Appendix A***). Coral colonies of low ecological value were recorded in the vicinity of the cable alignment at the landing site based on desktop study [(2)] and supplementary dive surveys, and impact to the coral colonies is not anticipated to be significant with mitigation measures in place (see ***Section B3.7*** and ***Section B5.1*** of ***Appendix B***).

4.3.2.4 Potential Impact on Marine Mammal

The south-eastern waters of Hong Kong are not considered to be a frequently used habitat for the Chinese White Dolphin (CWD). Sightings of the Finless Porpoises (FPs) were also found to be infrequent along the proposed cable corridor. It is expected that the submarine cable installation works will last for a short duration (approximately 95 working days including contingency and buffer) and will involve one main cable installation barge. Given the cable installation barge to be used is slow moving, the risk of vessel collision with marine mammals is considered to be very small. As such, direct impacts to marine mammals due to vessel collision are not anticipated to be significant. Cable laying works using injector burial tools are not expected to cause unacceptable elevations in underwater sounds to marine mammals as the water jets will be located within marine sediments which will dampen down sounds generated during the works. Significant disturbance to the FP and CWD, in terms of underwater noise, marine traffic and food sources, is therefore not expected (***Section B3.8*** of ***Appendix B***).

Based on this, and the predicted localised and very short-term impacts to water quality, no unacceptable impacts are predicted to occur to marine mammals.

4.3.2.5 Potential Impacts during Construction Phase

Impacts to marine ecological resources have largely been avoided during cable laying, as well as RC/ PLGR work(s), through the selection of a landing site and cable corridor that reduces impacts to coral communities and through the employment of cable laying techniques that result in little disruption to the marine environment.

4.3.2.6 Potential Impact during Operation Phase

During operation phase, the cable system will be below the seabed and no impacts on marine ecology are anticipated.

4.3.2.7 Mitigation Measures

Mitigation measures that have been recommended to reduce impacts to water quality are also expected to control impacts to marine ecological resources, particularly for coral communities in the

(2) ERM (2018). Project Profile for HKA Submarine Cable – Chung Hom Kok. Project Profile submitted for Applications for Permission to Apply Directly for an Environmental Permit (Application No. DIR-265/2018)

vicinity of the cable alignment. These mitigation measures include limiting the maximum speed of the cable laying machine (typically it will operate at a speed up to 0.2 km hr^{-1}, with a maximum forward speed not exceeding 1 km hr^{-1}) and implementing good house-keeping practices during land based activities. Where necessary, there will be minor adjustment in the cable alignment by divers in case corals are encountered near the landing site at TKO to avoid direct impacts to the corals. Meanwhile, divers are expected to avoid contacting corals as much as possible when underwater. In addition, a marine mammal exclusion zone during cable installation works is recommended to be implemented as a precautionary measure to ensure that no adverse impacts to marine mammals, especially the FPs, will result from cable installation works or any future maintenance/ repairing work that might be required, as described in ***Appendix F***.

4.4 Fisheries

Appendix C provides a detailed assessment of potential impacts to fisheries resources and fishing operations due to the Project, which is summarised as follows.

4.4.1.1 Existing Fisheries Resources

A review of the existing information on the fisheries resources (in terms of weight of adult fish) showed that fisheries production along the cable corridor ranges from >0 – 50 kg per hectare to >300 – 400 kg per hectare, with most of the waters with production of >0 – 50 kg per hectare or >50 – 100 kg per hectare. Overall fishing operations along the cable corridor ranges from >0 – 50 vessels to >400 – 600 vessels, with most of the waters with operation of >100 – 200 vessels. Along the proposed alignment, the grid at the northeast of Po Toi Island has the highest fisheries production in terms of weight of adult fish (>300 – 400 kg per hectare) and fishing operations (>400 – 600 vessels). The fish fry production along the proposed cable corridor is negligible, however, a section of the cable route passes through waters identified as important spawning grounds of commercial fisheries resources, which is a fisheries sensitive receiver. There are no AFCD gazetted FCZs within 500 m of the proposed cable route. The closest FCZ, Tung Lung Chau FCZ, is located ~2.5 km from the Project Site.

4.4.1.2 Potential Impact during Construction Phase

Since the increase in suspended solids (SS) concentrations will be localised and temporary, occurring within 180 m of the cable alignment, and the marine works over the whole submarine cable corridor will last for a short period of time (i.e. approximately 95 working days including contingency and buffer), it is expected that the sediments lost in suspension are likely to remain in the lower part of the water column (i.e. within 1 m of the seabed, independent of the water depth) and settle back onto the seabed within a short period of time (i.e. within 200s as detailed in ***Appendix A***) and fishing vessels could continue to operate in nearby waters during the construction the Project (see ***Appendix C***). Therefore, no long-term direct impacts to fisheries resources, fishing operations or fisheries sensitive receivers, including fish culture zones, and spawning and nursery grounds, are expected to occur aside from minor short-term disturbances to the seabed and fishing ground/ important spawning ground of commercial fisheries resources in the immediate vicinity of cable laying activities, as well as RC/ PLGR work(s), and short-term displacement of fishing activities from the works area. The seabed will be reinstated to before-work level and condition very shortly. Hence the works are not expected to result in any unacceptable impacts to water quality (see ***Appendix A***) that would affect fisheries resources, nor to result in any unacceptable impacts to fishing operations (see ***Appendix C***).

4.4.1.3 Potential Impact during Operation Phase (including Maintenance)

During operation phase, the cable system will be below the seabed and no impacts on fisheries are anticipated.

Any maintenance/ repairing works during operation phase are of smaller scale and are considered to take less time, are thus not predicted to cause unacceptable impacts to water quality and consequently unacceptable impacts to fisheries sensitive receivers.

4.4.1.4 Mitigation Measures

No specific mitigation measures have been recommended as no significant impacts to fisheries resources and fisheries sensitive receivers have been identified. Mitigation is not considered necessary, however as a precautionary measure water quality monitoring will be carried out, to help verify that the Project works will not result in any unacceptable impacts to water quality, and consequently to fisheries sensitive receivers. These monitoring details are presented in ***Appendix F***.

4.5 Cultural Heritage

4.5.1.1 Heritage Sites Impact Assessment

The Rock Carving at Cape Collinson (declared monument) and the Cape Collinson Lighthouse (Grade 3 historic building) located 86 m and 104 m respectively from the proposed cable system (see **Figure 3.2** for their location). The Fat Tau Chau SAI is located 492 m from the BMH at the TKOIE. As the BMH and the land-based cable ducts (see **Figure 1.1** for location) connecting to the data centre will be constructed separately under other project, no major land-based earthworks will be involved in this Project. Therefore, the identified declared monument, Grade 3 historic building and SAI will not be impacted by the construction and operation of the Project. Therefore, no mitigation measure is required.

4.5.1.2 Marine Archaeological Impact Assessment

Appendix E provides a detailed assessment of potential impacts to marine archaeological resources due to the Project, and a summary of potential impact is provided as follows.

One sonar contact SC023 is located 11.8 m from the proposed cable route (see ***Figure 3.2*** for its location). It has been interpreted as debris and considered to have no marine archaeological value because it is a small isolated object and contained no magnetic value. Therefore, it was deemed to be a natural feature (e.g. possible broken rock), similar to other nearby sonar contacts interpreted as debris that exhibits no cultural or man-made features. The submarine cable laying process will involve minor marine works for a relatively short period of time and the seabed disturbance only involves a narrow trench of approximately 0.5 m wide at a target depth of up to around 6 m below the seabed. After the cable is laid, the seabed will return to its original profile (see **Sections 2.1** and **2.2** for details). Given this minimal disturbance area, although SC023 is located 11.8 m from the proposed cable route, no impact to it is anticipated. Sonar contact (SC036) located 183 m away from the proposed cable system was identified as a modern ship (UKHO57717) sunk in 1999 according to the database of UKHO, therefore it is of no marine archaeological significance. Moreover, the wreck is far away from the proposed cable system, no impacts are anticipated. Additionally, no impacts to the magnetic and seismic contacts are anticipated due to their sufficient separation distance from the proposed cable route, thus, no mitigation measure is required. Therefore, no marine archaeological impact is anticipated due to the proposed works, no mitigation measure is required.

4.6 Noise

A noise assessment was undertaken to describe and evaluate the potential noise impacts arising from the onshore and offshore works associated with submarine cable installation. The results of this assessment are presented in ***Appendix D***. No noise exceedances would occur at the identified Noise Sensitive Receivers.

Cable laying and burial is at present expected to take place during non-restricted hours, i.e. between 0700 and 1900 hours on any day not being a Sunday or a general holiday. If works during restricted hours are later found to be necessary, a Construction Noise Permit (CNP) will be applied for.

No induced traffic movements nor dump truck movements is expected in the Project during construction and is not expected to generate noise impact.

During operation and maintenance phase, the Project is not expected to generate vehicular traffic.

In overall, no adverse noise impacts are anticipated.

4.7 Others

4.7.1 Air Quality Impact

4.7.1.1 Air Sensitive Receivers

6 representative air sensitive receivers (ASRs) have been identified within the 500m from the proposed cable alignment as shown in **Figure 4.1** and listed in **Table 4.2**. While there are 2 target tools and methods that will be used for the construction of the Project (details refer to **Section 2.1.1.4**), the S2 method involves using burial tools installed on the cable installation barge. **Table 4.2** presents detailed approximate distances for the entire proposed cable alignment section and sections under the S2 method.

Table 4.2 Identified Representative Air Sensitive Receivers

ASR ID	Description	Type of Use	Approximate Distance from the Proposed Cable Alignment (m)	Approximate Distance from the Proposed Cable Alignment (S2 Method Section) (m)
A1	Island Resort	Residential	250	250
A2	Fullview Garden	Residential	335	335
A3	Cape Collinson Correctional Institution	Governmental	440	438
A4	ASB Biodiesel (HK) Limited	Industrial	25 (landing site)	200
A5	China Unicom (HK) Global Centre	Industrial	200 (landing site)	348
A6	HKSTP Project Development Office	Commercial	200 (landing site)	380

4.7.1.2 Evaluation of Air Quality Impacts during Construction Phase

Dust

The Project only involves submarine cable installation works. During the cable landing work, only pulling and guiding the bundled cables to the duct for connection to the BMH would be involved. No construction and excavation works are required at the landing site. Generation of dust during construction of the Project is not expected. Thus, dust impact on ASRs during construction phase is not expected.

Emissions from Marine Vessels

The marine vessels for the construction of the Project are diesel-powered. Gaseous (NO_2, SO_2 and CO) and particulate (RSP and FSP) emissions from these diesel-powered marine vessels would be generated during cable pulling along the proposed cable alignment. It is expected that there will be only 3 marine vessels (including 1 cable installation barge and 2 supporting tugboats) operating concurrently. The cable installation barge is limited to cruise along the cable alignment, and the travelling route of the supporting tugboats during cruising to/from cable landing site will be separated from the nearby ASRs as far as practicable.

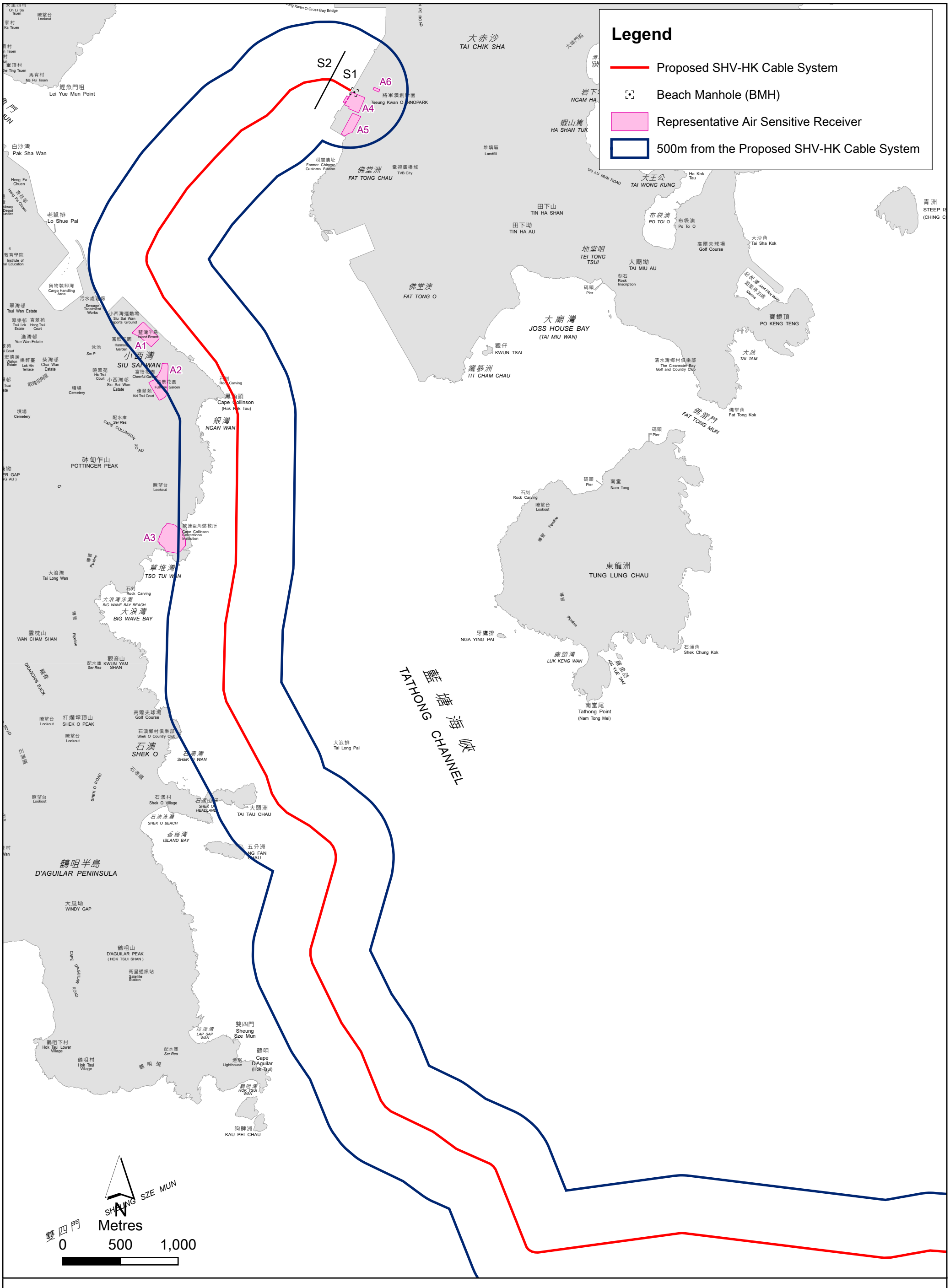

Figure 4.1

Representative Air Sensitive Receivers

File: T:\GIS\CONTRACT\0619471\mxd\0619471_ASR.mxd
Date: 25/11/2024

With the limited number of marine vessels used during construction phase and the considerable separation distances between the marine vessels and nearby ASRs, no unacceptable air quality impacts due to emissions from the marine vessels to the nearby ASRs are anticipated during construction phase.

In addition, *Air Pollution Control (Marine Light Diesel) Regulation* and *Air Pollution Control (Fuel for Vessels) Regulation* will be followed to control the fuel use for marine vessels used in the Project during construction phase, including the limitation of 0.05% sulphur content in marine diesel fuel.

Emissions from PMEs

Gaseous (NO_2, SO_2 and CO) and particulate (RSP and FSP) emissions from the powered mechanical equipment (PMEs) would be generated during cable pulling from the diesel generator on the cable installation barge. Given the only one PME on the cable installation barge and the considerable separation distance between the PME on the cable installation barge and nearby ASRs, adverse air quality impact from the emissions from PME to the nearby ASRs during construction phase are not anticipated.

The injector burial tool installed in the barge would be used under water. Therefore, no adverse air quality impact from the injector burial tool is expected.

The requirements stipulated in the *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation*, *Air Pollution Control (Fuel Restriction) Regulation* and *Air Pollution Control (Smoke) Regulation* will be followed to control potential emissions from any PME(s) during construction phase.

Odour

During the cable installation, sediment will not be removed out of the sea for disposal. No odour emission is expected during the construction phase. Thus, odour impact on ASRs during construction phase is not expected.

Air Quality Impact due to Induced Vehicular Traffic

No induced vehicular traffic (including construction vehicles and dump trucks) is involved during the construction phase. Thus, no air quality impact due to the induced vehicular traffic during the construction phase is expected.

4.7.1.3 Evaluation of Air Quality Impacts during Operation Phase (including Maintenance)

No machinery or equipment will be in operation during the operation phase as the submarine cable will be laid stationary beneath the seabed. Also, additional marine traffic and vehicular traffic is not expected to be generated during operation phase. Therefore, dust, gaseous, particulate and odour emissions are not expected during operation phase. Hence, air quality impacts during the operation phase of the Project are not expected.

It is unlikely that the submarine cable system will require maintenance during operation phase. However, should a cable fault arise, maintenance and repair operations will be necessary. Methods used for cable maintenance and repair at any location along the proposed submarine cable route are anticipated to be the same as those used for cable installation during construction phase, but with the potential to use a smaller equipment such as remotely operated vehicles (ROVs) equipped with injector tool, diver hand jetting and/or grapnels. Thus, the potential impacts from the maintenance and repair operations are anticipated to be lesser than the cable installation during construction phase.

4.7.2 Waste Management

During the cable landing work, only pulling and guiding the bundled cables to the duct for connection to the BMH would be involved.

No excavated materials or waste materials are anticipated from the landing works. Any debris collected during preparation for cable laying (RC and/or PLGR) will be retained on board at the vessel for proper disposal ashore at EPD waste facility (i.e. South East New Territories (SENT) Landfill). Waste Disposal Ordinance (Cap. 354) will be followed for the disposal of debris collected.

There will be no dredged materials and no waste generated during submarine cable installation, with the seabed expected to naturally reinstate do its original state. Recycling arrangement will be implemented where practicable for debris collected during the construction works. There will be no waste generated during operation phase of the cable system.

Therefore, overall no adverse waste impacts are anticipated from the Project.

4.7.3 Landscape and Visual

Since the submarine cable system is buried in the seabed it will not cause any visual obstruction. At the landing site, the installation will use the cable duct and conduits from BMH to CLS infrastructure which will be constructed separately prior to this Project, and no tree felling is anticipated.

There will be no trenching nor excavation works required at the landing point. As the cable duct will be constructed under the rock armours of the seawall, the cable system and the cable duct will not be visible from the seawall surface. Therefore, the existing condition of the landing area will not be disturbed by the Project, and the proposed works are not anticipated to cause any long term adverse impact on existing landscape resources or character. Therefore, no adverse landscape, tree or visual impact is anticipated during either construction or operation.

4.7.4 *Hazard to Life*

4.7.4.1 Dangerous Goods

No dangerous goods will be involved in this project in either the construction or operation phases.

4.7.4.2 Hazardous Materials or Wastes, including Potentially Contaminated Materials

No hazardous materials, including potentially contaminated materials or wastes will be generated by this Project at either construction or operation phases. There are no contaminated mud pits in the vicinity of the cable alignment and results of sediment quality monitoring by EPD (***Section A3.3*** of ***Appendix A***) also indicate that there is no sign of contamination for sediment at monitoring stations around the cable route. No release of sediment-bound contaminant from the cable installation would therefore be expected.

4.7.4.3 Risk of Accidents Resulting in Pollution or Hazard

Laying of submarine cables is an established process in Hong Kong, and there is only a minimal risk of accident. Since the Project does not involve the use or generation of any dangerous goods or hazardous materials, the risk of an accident resulting in pollution or hazard is negligible.

5. PROTECTION MEASURES AND ANY FURTHER IMPLICATIONS

5.1 Environmental Protection Measures

5.1.1 *Construction Phase*

Minimal disturbance is anticipated during construction of the Project. Nevertheless, some specific measures have been proposed to minimise any potential impacts to water quality, marine ecology and fisheries (refer to ***Appendix A***, ***Appendix B*** and ***Appendix C***, respectively for full details). In addition, some minor precautionary measures have been proposed for the land and shore-end cable installation, with reference to water quality and detailed in ***Appendix A***.

5.1.2 *Operation Phase (including maintenance)*

TKOIE is already the landing site of a number of submarine cable systems, the geotechnical environment at the proposed landing point is considered to be suitable for submarine cable installation. The area has already been used for other systems under Environmental Permit, which indicates there are no adverse effects to the surrounding environment from the operation of the submarine cables.

The methods used for cable installation, as described above, have been used in Hong Kong and around the world for many years and are widely accepted to have very little impact on the surrounding marine environment. The working period is normally very short and no waste or contaminant disposal issues or excessive noise will be generated by such an operation.

Since no operational impact is anticipated due to the Project, no environmental protection measures are required.

Should maintenance/ repairing be required, protection and mitigation measures proposed during construction phase will be put in place, as set in ***Appendix A***.

5.2 Possible Severity, Distribution and Duration of Environmental Effects

The actual installation of the submarine cable system in HKSAR waters is expected to take up to 95 working days including contingency and buffer. The residual environmental impacts of the works activities are predicted to be localised to the immediate vicinity of the cable alignment, of low severity and acceptable.

With the exception of brief period when emergency maintenance is required, no environmental impacts are predicted during the operation of the submarine cable system. In case of emergency maintenance, the duration, potential extent and magnitude of impact would be shorter/ smaller/ lower than that of the construction phase of the Project. Therefore, the potential impact to the immediate vicinity of the cable alignment is considered to be low severity and acceptable.

6. ENVIRONMENTAL MONITORING & AUDIT

6.1 EM&A Programme

An Environmental Monitoring and Audit Programme has been set out in **Appendix F** to:

- outline the responsibilities of the Project Proponent, Environmental Team (ET) and Independent Environment Checker (IEC) with respect to the environmental monitoring and audit requirements during the course of the project;
- verify whether the monitoring results are in line with the predicted impact;
- monitor the implementation and effectiveness of the control measures employed during the Project works;
- verify that the Project works are not resulting in any adverse impacts to water quality, especially at water sensitive receivers, and to marine mammals; and
- ensure that any adverse impacts are detected during the cable laying process/ works and that appropriate action is undertaken in the event that impacts are identified to sensitive receivers and are found to be associated with the cable works.

The Project Proponent will engage an Environmental Team (ET) to carry out the Environmental Monitoring & Audit (EM&A) requirements as set out fully in ***Appendix F***. The ET shall not be in an associated body of the Project Proponent, any works contractors or the Independent Environmental Checker (IEC). The ET shall be headed by an ET Leader who has at least 7 years of experience in EM&A or environmental management.

In addition to the ET, the Project Proponent will engage an IEC. The IEC shall not be an associated body of the Permit Holder, the works contractors or the ET. The IEC shall have at least 7 years of experience in EM&A or environmental management. The IEC shall audit the overall EM&A performance of the Project, including the Contractor's implementation of all environmental mitigation measures.

6.2 Precautionary Measures

No unacceptable environmental impacts have been identified due to the Project. However, as precautionary measures, it is recommended to carry out water quality monitoring and to implement a marine mammal exclusion zone during construction to verify and confirm that the project works will not result in any unacceptable impacts during construction.

Water Quality Monitoring

The Project site has been divided into two zones for the purpose of water quality monitoring. The Project site within Junk Bay WCZ and Eastern Buffer WCZ is zoned as Zone A and the Project site within Southern WCZ is zoned as Zone B. The location of the monitoring stations, frequency and timing for baseline, impact and post monitoring and other details are discussed in ***Appendix F***.

In addition, the following reports are to be provided to EPD:

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

Marine Mammal Exclusion Zone

A marine mammal exclusion zone within a radius of 250 m from the cable installation/ maintenance/ repairing work vessel will be implemented during the cable installation/maintenance/ repairing works taking place in daylight hours along the section starting from Zone B (Chainage distance 5.388 km) to the east boundary of Hong Kong along the cable alignment. The marine mammal exclusion zone will

be monitored by qualified observer(s) with an unobstructed, elevated view of the area. These are detailed in **Appendix F**.

The marine mammal exclusion zone monitoring will be required during periods when there are cable installation works or maintenance/ repairing works as necessary. Daily monitoring will be conducted until the completion of cable installation works or maintenance/ repairing works as agreed.

Should maintenance/ repairing works be necessary during operation phase of the cable system, appropriate mitigation and monitoring measures, as proposed for the construction phase, will be implemented.

7. USE OF PREVIOUSLY APPROVED EIA REPORTS

The proposed landing site for SHV-HK cable system at TKOIE is currently not used by other submarine cable systems. The southern tip of TKOIE is the landing site for multiple existing submarine cable systems, including TKO Connect Cable System, Ultra Express Link, Tseung Kwan O Express, Asia Pacific Gateway (APG), Asia Submarine-cable Express (ASE) and two East Asian Crossing (EAC) Cable Systems. Hong Kong – Guam Submarine Cable Project (HK-G) was also proposed to land at TKOIE.

Project Profiles (PPs) were prepared under the EIAO for these cable systems as detailed below.

- **TKO Connect Cable System, by Hong Kong Broadband Network Limited:** The PP for this study was submitted to EPD on 3 Jun 2019 (AEP- 570/2019). The length of the cable in HKSAR waters is ~2.83 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 22 Jul 2019 (EP-570/2019).
- **Hong Kong - Guam Submarine Cable Project (HK-G), by NTT Com Asia Limited:** The PP for this study was submitted to EPD on 2 Apr 2019 (AEP-568/2019). The length of the cable in HKSAR waters is ~33.6 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 18 Jun 2019 (EP-568/2019).
- **Ultra Express Link, by Hong Kong Telecommunications (HKT) Limited:** The PP for this study was submitted to EPD on 29 Jun 2017 (AEP- 543/2017). The length of the cable in HKSAR waters is ~2.76 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 14 Sep 2017 (EP-543/2017).
- **Tseung Kwan O Express - Cable System, by Superloop (Hong Kong) Limited:** The PP for this study was submitted to EPD on 16 Dec 2015 (AEP- 509/2016). The length of the cable in HKSAR waters is ~2.7 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 20 May 2016 (EP-509/2016).
- **Asia Pacific Gateway (APG) - Tseung Kwan O, by China Mobile International Limited (CMI):** The PP for this study was submitted to EPD on 24 Jan 2014 (AEP- 485/2014). The length of the cable in HKSAR waters is ~35 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 18 Feb 2014 (EP-485/2014).
- **Asia Submarine-cable Express (ASE) - Tseung Kwan O, by NTT Com Asia Limited:** The PP for this study was submitted to EPD on 7 Oct 2011 (AEP-433/2011). The length of the cable in HKSAR waters is ~33.5 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 20 Dec 2011 (EP-433/2011)."
- **East Asian Crossing (EAC) Cable System (TKO), by Asia Global Crossing Limited (AGC):** The PP for this study was submitted to EPD on 11 Aug 2000 (AEP-081/2000). The length of the cable in HKSAR waters is ~25 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 4 Oct 2000 (EP-081/2000).
- **East Asian Crossing (EAC) Cable System, by Asia Global Crossing Limited (AGC):** The PP for this study was submitted to EPD on 30 Jun 2000 (AEP-079/2000). The length of the cable in HKSAR waters is ~25 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 6 Sep 2000 (EP-079/2000).

Other similar projects that have been conducted in the HKSAR include the following:

- **Cheung Chau Submarine Cable System, by Hong Kong Telecommunications (HKT) Limited:** The PP for this study was submitted to EPD on 5 May 2022 (AEP-612/2022). The length of the cable in HKSAR waters is ~4.4 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 28 Jun 2022 (EP-612/2022).
- **Peng Chau Cable System, by Hong Kong Telecommunication (HKT) Limited:** The PP for this study was submitted to EPD on 7 Mar 2022 (AEP-610/2022). The length of the cable in HKSAR waters is ~1.5 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 6 May 2022 (EP-610/2022).
- **Lamma Island Cable System, by Hong Kong Telecommunication (HKT) Limited:** The PP for this study was submitted to EPD on 7 Mar 2022 (AEP-609/2022). The length of the cable in HKSAR waters is ~2.3 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 6 May 2022 (EP-609/2022).
- **Asia Direct Cable System - Hong Kong Segment (ADC-HK) - Chung Hom Kok, by China Telecom Global Limited:** The PP for this study was submitted to EPD on 21 Jun 2021 (AEP- 595/2021). The length of the cable in HKSAR waters is ~34.6 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 23 Aug 2021 (EP-595/2021).
- **H2H Express Submarine Cable, by China Mobile International Limited:** The PP for this study was submitted to EPD on 18 Mar 2020 (AEP- 575/2020). The length of the cable in HKSAR waters is ~38 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 21 May 2020 (EP-575/2020).
- **Bay to Bay Express Cable System - Hong Kong Segment (BtoBE-HK) – Chung Hom Kok, by China Mobile International Limited:** The PP for this study was submitted to EPD on 2 Mar 2020 (AEP- 573/2020). The length of the cable in HKSAR waters is ~36.6 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 5 May 2020 (EP-573/2020).
- **South East Asia - Japan 2 Cable System - Hong Kong Segment (SJC2-HK) - Chung Hom Kok, by China Mobile International Limited:** The PP for this study was submitted to EPD on 19 Dec 2019 (AEP- 572/2020). The length of the cable in HKSAR waters is ~37.9 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 4 Mar 2020 (EP-572/2020).
- **HKA Submarine Cable - Chung Hom Kok, by China Telecom Global Limited:** The PP for this study was submitted to EPD on 26 Nov 2018 (AEP- 567/2019). The length of the cable in HKSAR waters is ~34 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 20 Feb 2019 (EP-567/2019).
- **Pacific Light Cable Network (PLCN) – Deep Water Bay, by PCCW Global (HK) Limited:** The PP for this study was submitted to EPD on 27 Apr 2017 (AEP-539/2017). The length of the cable in HKSAR waters is ~40 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 10 Jul 2017 (EP-539/2017).
- **Asia-Africa-Europe-1 (AAE-1) Cable System, by PCCW Global (HK) Limited:** The PP for this study was submitted to EPD on 1 Feb 2016 (AEP- 508/2016). The length of the cable in HKSAR waters is ~ 27.65 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 20 Apr 2016 (EP-508/2016).

- **Replacement of the Existing 11KV Submarine Cable Circuit Connecting Liu Ko Ngam and Pak Sha Tau Tsui at Kat O, by CLP Hong Kong Limited:** The PP for this study was submitted to EPD on 30 May 2013 (AEP-461/2013). The length of the cable in HKSAR waters is ~880 m. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 27 Aug 2013 (EP-461/2013).
- **South-East Asia Japan Cable System (SJC) Hong Kong Segment, by China Telecom (Hong Kong) International Limited:** The PP for this study was submitted to EPD on 22 Jun 2011 (AEP-423/2011). The length of the cable in HKSAR waters is ~37 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 24 Oct 2011 (EP-423/2011).
- **Asia-America Gateway (AAG) Cable Network, South Lantau, by Reach Networks Hong Kong Ltd.:** The PP for this study was submitted to EPD on 5 Oct 2007 (AEP-298/2007). The length of the cable in HKSAR waters is ~10 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 20 Dec 2007 (EP-298/2007).
- **VSNL Intra Asia Submarine Cable System - Deep Water Bay, by Videsh Sanchar Nigam Ltd.:** The PP for this study was submitted to EPD on 31 Aug 2007 (AEP-294/2007). The length of the cable in HKSAR waters is ~40 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 23 Nov 2007 (EP-294/2007).
- **Proposed 132kV Submarine Cable Route for Airport "A" to Castle Peak Power Station Cable Circuit, by CLP Power Hong Kong Limited:** The PP for this study was submitted to EPD on 18 Jul 2006 (AEP-267/2007). The length of the cable in HKSAR waters is ~6.2 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 29 Mar 2007 (EP-267/2007).
- **132kV Submarine Cable Installation for Wong Chuk Hang - Chung Hom Kok 132kV Circuits, by The Hongkong Electric Co., Ltd:** The PP for this study was submitted to EPD on 21 Jan 2002 (AEP-132/2002). The length of the cable in HKSAR waters is ~2.9 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 16 Apr 2002 (EP-132/2002).
- **Submarine Cable Landing Installation at Tuen Mun for HGC Optical Fibre Submarine Cable System between Tuen Mun and Chek Lap Kok, by Hutchison Global Crossing Limited:** The PP for this study was submitted to EPD on 19 Apr 2001 (AEP-106/2001). The length of the cable in HKSAR waters is ~500 m. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 24 Oct 2001 (EP-106/2001).
- **FLAG North Asian Loop, by FLAG Telecom Asia Limited:** The PP for this study was submitted to EPD on 28 Mar 2001 (AEP-099/2001). The length of the cable in HKSAR waters is ~10 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 18 Jun 2001 (EP-099/2001).
- **C2C Cable Network - Hong Kong Section: Chung Hom Kok, by GB 21 (Hong Kong) Limited:** The PP for this study was submitted to EPD on 5 Dec 2000 (AEP-087/2001). The length of the cable in HKSAR waters is ~30 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 16 Feb 2001 (EP-087/2001).
- **New T&T Hong Kong Limited Domestic Cable Route, by New T&T Hong Kong Limited:** The PP for this study was submitted to EPD on 5 Dec 2000 (AEP-086/2001). The length of the cable in HKSAR waters is ~37 km & 32 km. The study concluded that the project would give rise to no

unacceptable adverse impacts to the environment and an EP was granted on 16 Feb 2001 (EP-086/2001).

- **Cable Landing Work in Tong Fuk Lantau for APCN 2 Fibre Optic Submarine Cable System, by EGS (ASIA) Limited:** The PP for this study was submitted to EPD on 12 May 2000 (AEP-069/2000). The length of the cable in HKSAR waters is ~9 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 26 Jul 2000 (EP-069/2000).
- **Telecommunication Installation at Lot 591SA in DD328, Tong Fuk, South Lantau Coast and the Associated Cable Landing Work in Tong Fuk, South Lantau for the North Asia Cable (NAC) Fibre Optic Submarine Cable System, by Level 3 Communications Limited:** The PP for this study was submitted to EPD on 29 Mar 2000 (AEP-064/2000). The length of the cable in HKSAR waters is ~8.5 km. The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 5 Jun 2000 (EP-064/2000).
- **Cable Landing Work in Deep Water Bay for SEA-ME-WE 3 Fibre Optic Submarine Cable System, by Hong Kong Telecom International Limited:** The PP for this study was submitted to EPD on 26 May 1998 (AEP-001/1998). The study concluded that the project would give rise to no unacceptable adverse impacts to the environment and an EP was granted on 27 Jul 1998 (EP-001/1998).

APPENDIX A REVIEW ON POTENTIAL IMPACTS TO WATER QUALITY

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1. INTRODUCTION

This **Appendix** presents an evaluation of the potential water quality impacts associated with the construction and operation (including maintenance) of the Hong Kong section of the proposed Sihanoukville-Hong Kong Submarine Cable (SHV-HK Cable System) (hereafter referred to as the Project). The cable system will consist of a trunk cable bundled with two stub cables and will travel from Tseung Kwan O Industrial Estate (TKOIE) southward along Tathong Channel. After crossing Tathong Channel and near Cape Collinson, the cable system then runs approximately parallel to the Tathong Channel until north of Sung Kong Island where it then turns eastward to the boundary of Hong Kong Special Administrative Region (HKSAR) waters, entering the South China Sea as indicated in ***Figure 1.1***.

Once installed, the cable system is not expected to result in any water quality impacts during operation and the focus of this water quality assessment is on the potential impacts during the construction (i.e. cable laying and burial) phase. There is a potential requirement for maintenance work (i.e. cable repair at a particular fault location due to unexpected damage) to be carried out during operation, and the potential water quality impacts associated with these maintenance/ repair works are also considered in this **Appendix**.

2. RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The following legislation and associated guidance or non-statuary guidelines are applicable to the evaluation of water quality impacts associated with the construction of the proposed submarine cable system.

- *Water Pollution Control Ordinance* (WPCO) *(Cap. 358);*
- *Environmental Impact Assessment Ordinance* (EIAO) *(Cap. 499. S.16)* and the *Technical Memorandum on EIA Process* (EIAO-TM), Annexes 6 and 14;
- *Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters* (TM- ICW); and,
- *Professional Persons Environmental Consultative Committee Practice Notes, Construction Site Drainage* (ProPECC PN2/23).

2.1 WPCO

The *WPCO* is the primary legislation for the control of water pollution and water quality in Hong Kong. Under the *WPCO*, HKSAR waters are divided into 10 Water Control Zones (WCZs). Each WCZ has a designated set of statutory Water Quality Objectives (WQOs). The route for the proposed SHV-HK Cable system passes through the Junk Bay, Eastern Buffer, Southern, and Mirs Bay WCZs, as indicated in ***Figure A1***. A summary of the WQOs for these WCZs is presented in ***Table A2.1***, and the WQOs are applicable as evaluation criteria for assessing the compliance of any discharge from the proposed Project.

Table A2.1 Summary of Water Quality Objectives for the Junk Bay, Eastern Buffer, Southern, and Mirs Bay WCZs

Parameter	Associated WCZs	WQOs
Temperature	All associated WCZs	Change due to waste discharge not to exceed 2°C
Salinity	All associated WCZs	Change due to waste discharge not to exceed 10% of natural ambient level
pH	All associated WCZs	To be in the range 6.5 - 8.5, change due to waste discharge not to exceed 0.2

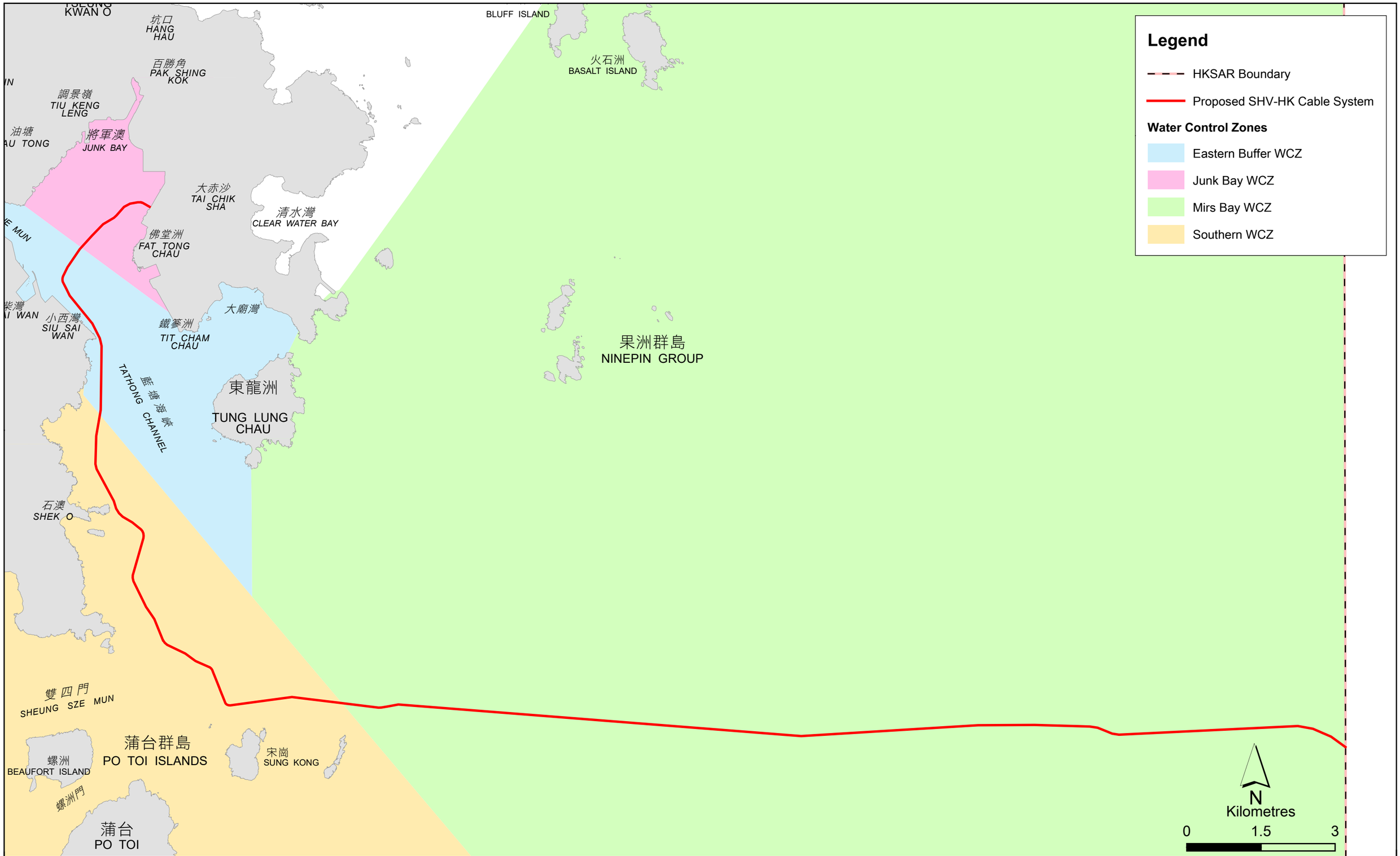

Figure A1

Water Control Zones (WCZs) Passed through by SHV-HK Cable System

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Parameter	Associated WCZs	WQOs
Suspended Solids (SS)	All associated WCZs	Waste discharge not to raise the natural ambient level by 30% nor cause the accumulation of suspended solids which may adversely affect aquatic communities
Dissolved Oxygen (DO)		
Bottom	All associated WCZs	Not less than 2 mg L^{-1} for 90% samples
Depth-averaged	All associated WCZs	Not less than 4 mg L^{-1} for 90% samples
Nutrients (measured as total inorganic nitrogen)	Junk Bay and Mirs Bay WCZ	Not to exceed 0.3 mg L^{-1} (annual mean depth-averaged)
	Eastern Buffer WCZ	Not to exceed 0.4 mg L^{-1} (annual mean depth-averaged)
	Southern WCZ	Not to exceed 0.1 mg L^{-1} (annual mean depth-averaged)
Unionised Ammonia	All associated WCZs	Not to exceed 0.021 mg L^{-1} (annual mean)
Toxicants	All associated WCZs	Not to be present at levels producing significant toxic effect
E.coli	All associated WCZs	Annual geometric mean not to exceed 610 cfu/100mL (secondary contact recreation subzones in Southern and Mirs Bay WCZ; and fish culture subzones in Junk Bay, Eastern Buffer, Southern, and Mirs Bay WCZs)

Note:
[1] Unless specified, WQOs for each parameter are the same for Junk Bay, Eastern Buffer, Southern, and Mirs Bay WCZs.

2.2 EIAO-TM

Annex 6 and *Annex 14* of the *EIAO-TM* (*Criteria for Evaluating Water Pollution* and *Guidelines for Assessment of Water Pollution*) provide general guidelines and criteria to be used in assessing water quality impacts. The *EIAO-TM* recognises that, in the application of the above water quality criteria, it may not be possible to achieve WQOs at the point of discharge as there are areas which are subjected to greater impacts [which are termed by the Environmental Protection Department (EPD) as the mixing zones], where the initial dilution of an input of pollutants takes place. The definition of this area is determined on a case-by-case basis. In general, the criteria for acceptance of the initial dilution area are that it must not impair the integrity of the water body as a whole and must not damage the ecosystem.

2.3 WSD Seawater Intakes

Quality of seawater intake should comply with the relevant Water Quality Objectives established by the Water Supply Department as listed in ***Table A2.2***.

Table A2.2 WSD Water Quality Objectives for Seawater for Flushing Supply at Intake Point

Parameter	Target [1]
Colour (H.U.)	<20
Turbidity (N.T.U.)	<10
Threshold Odour No. (T.O.N.)	<100
Ammoniacal N	<1
Suspended Solids	<10
Dissolved Oxygen	>2
Biochemical Oxygen Demand	<10
Synthetic Detergents	<5
E.coli / 100 mL	<20,000

Note:
[1] Chemical values are expressed in mg/L (parts per million).

2.4 ProPECC PN 2/23

Apart from the above statutory requirements, the *Professional Persons Environmental Consultative Committee Practice Notes*, *Construction Site Drainage* (*ProPECC PN 2/23*), issued by EPD in 2023, shall also be followed to prevent water pollution associated with construction activities. The applicable measures from *ProPECC PN 2/23* are listed in ***Section A4.4***.

3. DESCRIPTION OF THE ENVIRONMENT

3.1 Hydrodynamics

The first section of the proposed cable system lies in the inner part of Junk Bay and is therefore sheltered from main tidal current in the Victoria Harbour. Beyond the section within the Eastern Buffer WCZ, other sections of the cable system located in the south-eastern waters are mainly influenced by the oceanic water from South China Sea.

3.2 Water Quality

The proposed route for the submarine cable system passes through the Junk Bay, Eastern Buffer, Southern, and Mirs Bay WCZs. These WCZs are shown in in ***Figure A1***. There are seven EPD routine water quality monitoring stations in the vicinity of the cable route, namely, JM3, JM4, EM1, EM2, EM3, MM8, and MM13. The latest five years of the published water quality data for these stations from 2019 to 2023 have been extracted from EPD's Annual Marine Water Quality Monitoring Programme, and summarised in ***Table A3.1***. The locations of the stations are indicated in ***Figure A2***.

The data show that the depth-averaged and bottom dissolved oxygen complied with the WQO during 2019 to 2023. Compliance of total inorganic nitrogen and unionised ammonia was observed at all identified stations throughout the period. The SS concentrations show a wide range from 0.3 mg/L at MM13 to 45 mg/L at EM3. *E. coli* levels are also in compliance with the WQO at all stations between 2019 to 2023. The maximum *E. coli* level could be up to 1400 cfu/100 mL (at EM1).

3.3 Sediment Quality

There are six EPD routine sediment quality monitoring stations in the vicinity of the cable route, namely JS2, ES1, ES2, ES4, MS8, and MS13. The latest five years of the published sediment quality data for these stations from 2019 to 2023 have been adopted from EPD's Marine Sediment Quality Monitoring Program, and summarised in summarised in ***Table A3.2***. The locations of the sediment quality monitoring stations are also shown on ***Figure A2***.

Sediment quality, management and classification specified under *Works Bureau Technical Circular (Works) No. 34/2002 Management of Dredged/Excavated Sediment* comprise two criteria for a broad range of Contaminants of Concern. The lower criterion is referred to as the Lower Chemical Exceedance Limit (LCEL) and the upper criterion is referred to as the Upper Chemical Exceedance Limit (UCEL). The extracted data (mean values) as presented in ***Table A3.2*** show that there were no exceedances of the LCEL at the identified sediment quality monitoring stations, and the sediment in the vicinity of the proposed cable route was not contaminated based on the existing sediment classification guidelines.

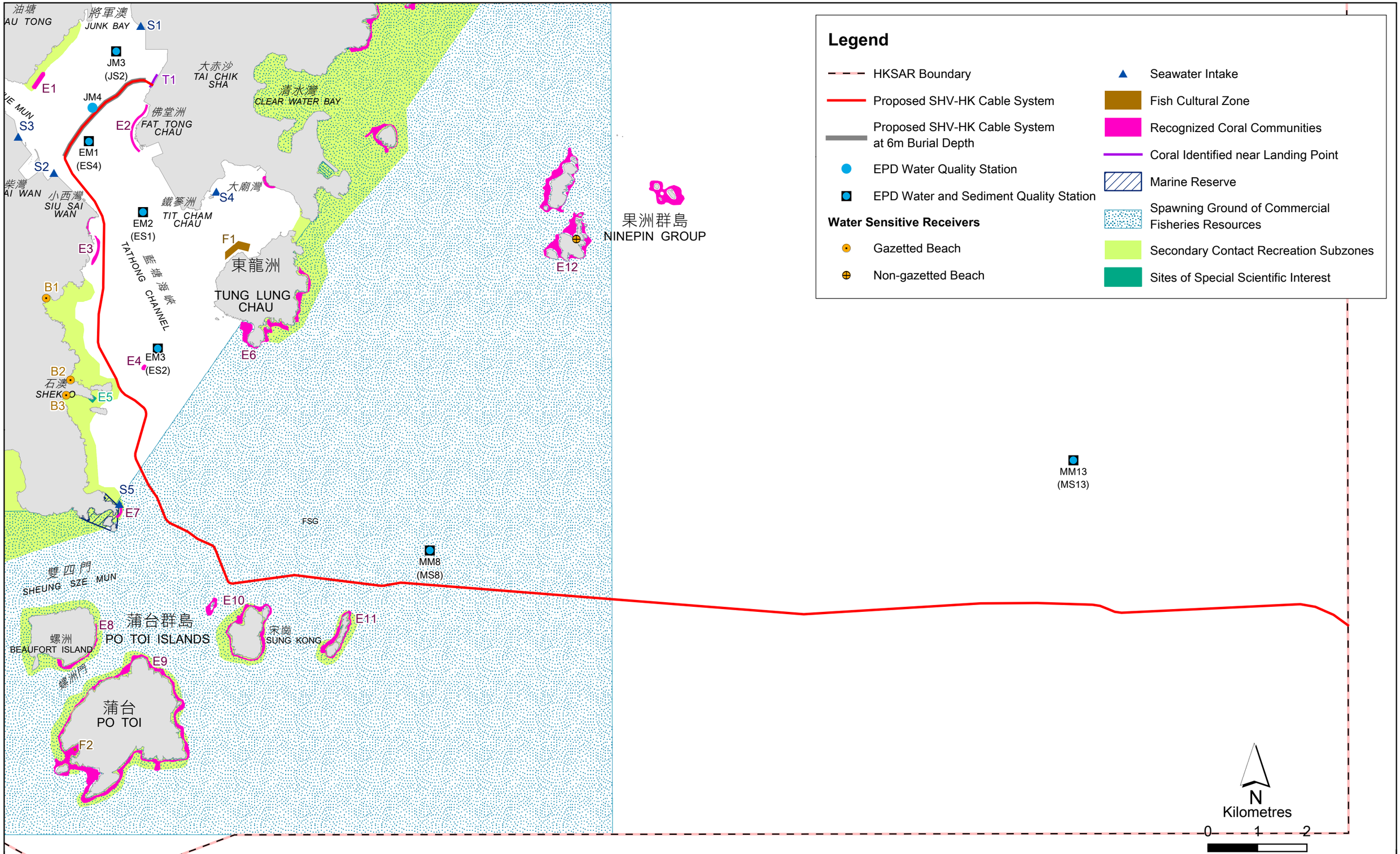

Figure A2

EPD Monitoring Stations and Water Sensitive Receivers

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Table A3.1 EPD Routine Water Quality Monitoring Data along the Cable Route (2019 - 2023)

WQ Parameter	Junk Bay		Chai Wan	Tathong Channel		Waglan Island	Mirs Bay (South)
	JM3	JM4	EM1	EM2	EM3	MM8	MM13
Temperature (^oC)	24.1 (17.3 - 29.8)	23.6 (17.0 - 29.4)	23.9 (17.1 - 29.4)	23.6 (17.0 - 29.4)	23.9 (17.0 - 29.4)	23.7 (15.2 - 29.7)	23.9 (15.1 - 29.4)
Salinity (ppt)	32.3 (25.0 - 33.7)	32.6 (26.3 - 33.7)	32.5 (25.2 - 33.8)	32.6 (25.6 - 33.8)	32.8 (26.7 - 34.0)	33.0 (30.8 - 34.2)	33.1 (30.4 - 34.3)
pH	7.8 (7.1 - 8.6)	7.8 (7.1 - 8.6)	7.8 (7.1 - 8.6)	7.8 (7.1 - 8.6)	7.8 (7.2 - 8.7)	7.9 (7.2 - 8.4)	7.9 (7.2 - 8.4)
Dissolved Oxygen – Depth-averaged (mg L^{-1})	6.0 (4.2 - 9.7)	5.9 (4.0 - 7.8)	5.9 (4.0 - 7.9)	5.9 (3.5 - 8.0)	5.9 (4.0 - 8.0)	6.0 (4.0 - 7.8)	6.0 (4.0 - 7.9)
Dissolved Oxygen – Bottom (mg L^{-1})	5.9 (2.7 - 11.6)	5.7 (2.5 - 7.9)	5.6 (2.7 - 7.9)	5.8 (2.4 - 8.0)	5.7 (2.6 - 7.9)	5.7 (2.7 - 8.1)	5.7 (2.9 - 8.1)
5-day Biochemical Oxygen Demand (BOD_5) (mg L^{-1})	0.6 (0.1 - 1.8)	0.6 (0.1 - 2.2)	0.6 (0.1 - 2.2)	0.6 (0.1 - 1.9)	0.5 (0.1 - 3.1)	0.5 (0.1 - 1.9)	0.5 (0.1 - 1.9)
Suspended Solids (mg L^{-1})	5.8 (1.5 - 15.3)	5.9 (1.7 - 13.3)	5.8 (1.5 - 21.9)	5.9 (1.3 - 13.2)	5.6 (1.2 - 23.7)	5.0 (0.6 - 17.0)	5.0 (0.3 - 13.3)
Total Inorganic Nitrogen (mg L^{-1})	0.15 (0.04 - 0.43)	0.15 (0.03 - 0.44)	0.15 (0.02 - 0.42)	0.13 (0.03 - 0.39)	0.10 (0.02 - 0.37)	0.07 (0.01 - 0.25)	0.07 (0.01 - 0.23)
Unionised Ammonia (mg L^{-1})	0.002 (0.001 - 0.007)	0.002 (0.001 - 0.007)	0.002 (0.001 - 0.007)	0.001 (0.001 - 0.008)	0.001 (0.001 - 0.005)	0.001 (0.001 - 0.002)	0.001 (0.001 - 0.003)
Chlorophyll-*a* (µg L^{-1})	3.7 (0.3 - 19.0)	3.2 (0.2 - 10.7)	3.2 (0.3 - 11.9)	2.9 (0.1 - 9.9)	2.7 (0.3 - 11.0)	2.3 (0.2 - 14.5)	1.8 (0.2 - 10.1)
Escherichia coli (cfu 100mL^{-1})	35 (1 - 367)	47 (1 - 380)	63 (1 - 997)	40 (1 - 510)	8 (1 - 201)	1 (1 - 16)	1 (1 - 25)

Notes:
1. Data presented are five-year annual arithmetic means of the depth-averaged results except for *E. coli* which are annual geometric means of depth-averaged values.
2. Data in brackets indicate the ranges
3. Data below the corresponding reporting limits are treated as 0.5X of the reporting limits, except for *E.coli*. For *E.coli*, data below detection limit are treated as 1.

Table A3.2 EPD Routine Sediment Quality Monitoring Data in the Vicinity of the Cable Route (2019 – 2023)

Parameter	LCEL	UCEL	Junk Bay	Chai Wan	Tathong Channel		Waglan Island	Mirs Bay (South)
			JS2	ES1	ES2	ES4	MS8	MS13
Chemical Oxygen Demand (COD) (mg kg^{-1})	-	-	13950 (8500 - 18000)	12590 (8900 - 17000)	10840 (6400 - 15000)	13060 (9600 - 19000)	10430 (8500 - 13000)	10020 (7200 - 14000)
Total Kjeldahl Nitrogen (TKN) (mg kg^{-1})	-	-	520 (440 - 620)	515 (360 - 730)	459 (340 - 640)	491 (380 - 620)	474 (340 - 560)	426 (340 - 500)
Cadmium (mg kg^{-1})	1.5	4	0.1 (0.1 - 0.2)	0.1 (0.1 - 0.1)	0.1 (0.1 - 0.2)	0.1 (0.1 - 0.2)	0.1 (0.1 - 0.1)	0.1 (0.1 - 0.1)
Chromium (mg kg^{-1})	80	160	42 (12 - 54)	32 (16 - 42)	32 (8 - 50)	37 (17 - 51)	34 (16 - 49)	35 (21 - 51)
Copper (mg kg^{-1})	65	110	72 (19 - 130)	32 (17 - 50)	35 (5 - 89)	49 (23 - 83)	15 (11 - 21)	15 (10 - 24)
Mercury (mg kg^{-1})	0.5	1	0.21 (0.10 - 0.26)	0.14 (0.03 - 0.41)	0.10 (0.03 - 0.14)	0.16 (0.10 - 0.31)	0.04 (0.03 - 0.13)	0.04 (0.03 - 0.10)
Nickel (mg kg^{-1})	40	40	21 (6 - 27)	18 (10 - 25)	19 (6 - 27)	19 (9 - 26)	22 (11 - 30)	23 (16 - 31)
Lead (mg kg^{-1})	75	110	49 (24 - 58)	34 (21 - 41)	35 (15 - 52)	42 (22 - 55)	35 (21 - 41)	34 (28 - 43)
Silver (mg kg^{-1})	1	2	0.9 (0.0 - 1.0)	0.1 (0.0 - 1.0)	0.3 (0.0 - 1.0)	0.8 (0.0 - 2.0)	0.0 (0.0 - 0.0)	0.0 (0.0 - 0.0)
Zinc (mg kg^{-1})	200	270	170 (52 - 240)	110 (59 - 160)	115 (30 - 220)	144 (63 - 210)	91 (51 - 120)	95 (69 - 130)
Arsenic (mg kg^{-1})	12	42	9.3 (4.1 - 12.0)	7.4 (5.1 - 9.0)	7.5 (3.6 - 11.0)	8.0 (4.2 - 11.0)	8.9 (5.2 - 11.0)	9.4 (6.9 - 12.0)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (μg kg^{-1})	550	3,160	94 (90 - 102)	97 (90 - 121)	132 (90 - 285)	104 (90 - 150)	91 (90 - 97)	93 (90 - 120)
High Molecular Weight PAHs (μg kg^{-1})	1,700	9,600	204 (54 - 353)	158 (39 - 281)	197 (18 - 704)	241 (43 - 562)	38 (19 - 99)	35 (22 - 65)
Total Polychlorinated Biphenyls (PCBs) (μg kg^{-1})	23	180	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 21)	18 (18 - 18)	18 (18 - 18)

Note:

1. Data presented are five-year arithmetic means; data in brackets indicate ranges.

3.4 Water Quality Sensitive Receivers

Water quality sensitive receivers (WSRs) in the vicinity of the proposed cable alignment and the landing site have been identified under the broad designations of gazetted bathing beaches, coral sites, intertidal mudflats, fish culture zones (FCZs), designated marine reserves or sites of high marine ecological importance, seawater intakes, secondary contact recreation subzones and spawning ground of commercial fisheries resources.

The identified WSRs in these categories, shown on ***Figure A2***, are summarised as follows.

- **Gazetted Bathing Beaches:** Big Wave Bay Beach (B1), Rocky Bay Beach (B2), and Shek O Beach (B3);
- **Seawater Intakes:** Water Services Department (WSD) seawater intakes at the Junk Bay (S1) and Siu Sai Wan (S2); Pamela Youde Nethersole Eastern Hospital cooling water intake at Heng Fa Chuen (S3); seawater intake of the Tseung Kwan O Desalination Plant (S4), seawater intake for the Swire Institute of Marine Science (S5);
- **Fisheries:** Tung Lung Chau FCZ (F1), Po Toi FCZ (F2) and Spawning Ground of Commercial Fisheries Resources (FSG);
- **Sites of High Ecological Importance:** Recognized coral communities along the coast of South West Junk Bay (E1), Fat Tong Chau (E2), Cape Collinson and Ngan Wan (E3), Tai Long Pai (E4), Tung Lung Chau (E6), Beaufort Island (E8), Po Toi Island (E9), Sung Kong (E10), Waglan Island (E11), Ninepins (E12); as well as the Cape D'Aguilar Marine Reserve (E7);
- **Coral Identified in Survey under this Project:** Coral near the landing point (T1); and
- **Sites of Special Scientific Interest (SSSI):** Shek O Headland SSSI (E5) and Cape D'Aguilar Marine Reserve.

Noted that secondary contact recreation subzones and spawning ground of commercial fisheries resources both cover large swath of marine water and overlapped with a lot of identified WSRs above. Therefore, no separate WSR point was assigned for these two WSRs.

The distances between the proposed cable alignment and the identified representative sensitive receivers are summarised in ***Table A3.3***.

Table A3.3 Closest Approach of the Proposed Cable Alignment to Water Sensitive Receivers

ID	Water Sensitive Receivers	Approximate Geodesic Distance to Proposed Cable Alignment (m) [1][2]
B1	Big Wave Bay Beach	1,100
B2	Rocky Bay Beach	820
B3	Shek O Beach	1,050
S1	WSD Junk Bay Seawater Intake	1,100
S2	WSD Siu Sai Wan Flushing Water Intake	325
S3	Pamela Youde Nethersole Eastern Hospital Cooling Water Intake	1,020
S4	Tseung Kwan O Desalination Plant Seawater Intake	2,360
S5	Seawater Intake for the Swire Institute of Marine Science	700
F1	Tung Lung Chau FCZ	2,450
F2	Po Toi FCZ	4,560
FSG	Spawning Ground of Commercial Fisheries Resources	Immediate proximity
E1	Recognized coral communities at South West Junk Bay	1,215

ID	Water Sensitive Receivers	Approximate Geodesic Distance to Proposed Cable Alignment (m) [1][2]
E2	Recognized coral communities at Fat Tong Chau	430
E3	Recognized coral communities at Cape Collinson and Ngan Wan	80
E4	Recognized coral communities at Tai Long Pai	550
E5	Shek O Headland SSSI	520
E6	Recognized Coral communities along Tung Lung Chau	2,420
E7	Cape D'Aguilar Marine Reserve SSSI	730
E8	Recognized coral communities along the coast of Beaufort Island	2,520
E9	Recognized coral communities along the coast of Po Toi Island	2,210
E10	Recognized coral communities along the coast of Sung Kong	450
E11	Recognized coral communities along the coast of Waglan Island	580
E12	Recognized coral communities along the coast of Ninepins	6,730
T1	Corals near the landing point	Immediate proximity

Notes:

[1] Geodesic distance refers to the shortest straight-line distance between two locations, without regard on the physical obstacles in between. Also note that distances from earth system to all WSRs are greater than that from the cable alignment. Distances have been rounded to the nearest 10 m.

[2] For the recognized coral communities, the distance has been estimated from the outermost point of the coral communities' boundary to the closest point of the cable alignment.

4. IMPACT ASSESSMENT

There will be no impacts to water quality from the operation of the proposed fibre optic submarine cable system. The potential for any adverse direct and indirect impacts to water quality from the construction of the submarine cable system as well as the earth system, or from maintenance and repair work during operation have been assessed below.

There are no contaminated mud pits in the vicinity of the cable alignment and results of sediment quality monitoring by EPD (***Section A3.3***) also indicate that there is no sign of contamination for sediment at monitoring stations around the cable route. No release of sediment-bound contaminant from the cable installation would be expected and is not assessed further.

The cable alignment has been reviewed and optimised taking into consideration existing environmental and physical constraints, in particular noting other submarine cables and pipelines, avoiding major marine vessel fairways, maximising its distance from the environmental sensitive receivers (e.g. corals), minimising disturbance to known marine archaeological resources, and avoiding anchorage areas and rocky outcrop areas, as detailed further in the ***main report Section 1.5.2***. The effect of the optimised alignment has been taken into account in the assessment in the following section.

4.1 Construction Phase

Key steps of potential water quality concern are discussed as follows. Certain steps described under ***Section 2.1.1*** of the main text are omitted for this reason.

4.1.1 Pre-Lay Grapnel Run (PLGR) and Route Clearance (RC)

Prior to the submarine cable burial, Route Clearance (RC) and/or Pre-Lay Grapnel Run (PLGR) will be conducted over the length of the proposed cable route. RC and PLGR are carried out for all cable burial projects and involve grapnels penetrating up to 1.5 m or may be supported by diver hand-jetting as described in the ***main report Section 2.1.1.*** Hand jetting has low jetting power only applying at specific point(s) if needed (see ***main report Section 4.2*** for details), while grapnels simply penetrate the sea bed and are therefore not expected to cause significant sediment plumes. It is therefore anticipated that PLGR/ RC will not cause significant water quality impacts.

4.1.2 Cable Installation at the Landing Site

As stated in ***main report Section 4.2.1***, land-based activities involve pulling and guiding the bundled cables into an existing duct. No civil work / earthwork would be required. Potential water quality impact at this phase of the project relate to surface water run-off, which could be readily controlled through the measures discussed in ***Section A4.4***.

4.1.3 Submarine Cable Installation

After the marine cable shore end landing is successfully completed, the installation barge will use injector/ jet sled for simultaneous lay and burial works (maximum speed up to 1 km hr^{-1}) in a narrow trench approximately 0.5 m wide at a target depth of approximately 5 m below the seabed, out to the boundary of Hong Kong waters. The extent of submarine cable system installation and inshore installation are shown in ***Figure 1.1***.

4.1.3.1 Inshore Cable Installation Shore End Laying, Burial and Ocean Ground Bed Installation

From Beach Manhole (BMH) to approximately 45 m out from the BMH, the fibre-optic cables will be pulled into the Beach Manhole (BMH) via an as-built duct. From the 45 m to approximately 220 m out from the BMH, the cable system will be laid in a trench approximately 0.5 m wide and with target burial depth from approximately 0.1 to 1.5 m to approximately 5 m below the sea-bed/ mudline at the

point where the installation barge can be set up (in approximately 9 m water depth). The burial depth will be increased to 6 m below the seabed at the submarine cable section that overlaps with the Tathong Channel Traffic Separation Scheme and toward inshore to avoid potential impact to the submarine cable due to the high traffic flow, such as emergency anchoring within the Channel. Three electrical earthing cables and anodes (called Ocean Ground Bed (OGB), acting as grounding) will be laid in this section, and generally laid along the bundled cable system and to the same depth as the fibre-optic cables. Divers with hand jet or jetting machine will be used to carry out the installation of OGB and then the grounding cable, as well as the inshore section (~200 m as shown in **Figure 1.1**) where water depth is less than 9 m (thus installation barge cannot reach). The seabed is expected to naturally reinstate to its original condition shortly after burial.

As the installation of inshore section of cable, as well as the OGB and grounding cable, would be conducted by diver(s) using less powerful handheld jetting tools, the associated suspended solids elevation would be minimal. No adverse water quality impact on the nearest corals at the landing point (T1) is anticipated. No adverse water quality impact from the installation of inshore section of cable, the OGB and grounding cable at other identified WSRs which are further would be expected as well.

4.1.3.2 Remaining Submarine Cable Main Installation Seaward

These works involving jetting by an injector burial tool or sledge tool have been assessed in a quantitative manner. The approach detailed below has been utilised to calculate the transportation of sediment in suspension in the following Project Profiles for which Environmental Permits have been issued:

- *Cheung Chau Submarine Cable System* (AEP-612/2022). *Environmental Permit* was granted on 28 Jun 2022 (EP-612/2022)
- *Peng Chau Cable System* (AEP-610/2022). *Environmental Permit* was granted on 6 May 2022 (EP-610/2022)
- *Lamma Island Cable System* (AEP-609/2022). *Environmental Permit* was granted on 6 May 2022 (EP-609/2022)
- *Asia Direct Cable System - Hong Kong Segment (ADC-HK) - Chung Hom Kok* (AEP-595/2021). *Environmental Permit* was granted on 23 Aug 2021 (EP-595/2021)
- *H2H Express Submarine Cable* (AEP-575/2020). *Environmental Permit* was granted on 21 May 2020 (EP-575/2020)
- *Bay to Bay Express Cable System - Hong Kong Segment (BtoBE-HK) – Chung Hom Kok* (AEP-573/2020). *Environmental Permit* was granted on 5 May 2020 (EP-573/2020)
- *South East Asia - Japan 2 Cable System - Hong Kong Segment (SJC2-HK) - Chung Hom Kok* (AEP-572/2020). *Environmental Permit* was granted on 04 Mar 2020 (EP-572/2020)
- *HKA Submarine Cable - Chung Hom Kok* (AEP-567/2019). *Environmental Permit* was granted on 20 Feb 2019 (EP-567/2019)
- *Pacific Light Cable Network (PLCN) – Deep Water Bay* (AEP-539/2017). *Environmental Permit* was granted on 10 Jul 2017 (EP-539/2017)
- *Asia-Africa-Europe-1 (AAE-1) Cable System* (AEP-508/2016). *Environmental Permit* was granted on 20 Apr 2016 (EP-508/2016).
- *Tseung Kwan O Express – Cable System* (AEP-243/2015). E*nvironmental Permit* was granted on 20 May 2016 (EP-509/2016).
- *Asia Pacific Gateway (APG) - Tseung Kwan O* (AEP-485/2014). *Environmental Permit* was granted on 18 Feb 2014 (EP-485/2014).

- *Asia Submarine-cable Express (ASE) - Tseung Kwan O* (AEP-433/2011). *Environmental Permit* was granted on 20 December 2011 (EP-433/2011).
- *South-East Asia Japan Cable System (SJC) Hong Kong Segment* (AEP-423/2011). *Environmental Permit* was granted on 24 October 2011 (EP-423/2011).
- *VSNL Intra Asia Submarine Cable System – Deep Water Bay* (AEP-294/2007). *Environmental Permit* was granted on 23 November 2007 (EP-294/2007).
- *Proposed 132kV Submarine Cable Route for Airport "A" to Castle Peak Power Station Cable Circuit* (AEP 267/2007). *Environmental Permit* was granted on 29 March 2007 (EP-267/2007).
- *132kV Submarine Cable Installation for Wong Chuk Hang - Chung Hom Kok 132kV Circuits* (AEP132/2002). *Environmental Permit* was granted on 16 April 2002 (EP-132/2002).
- *FLAG North Asian Loop* (AEP 099/2001). *Environmental Permit* was granted on 18 June 2001 (EP-099/2001).
- *C2C Cable Network - Hong Kong Section: Chung Hom Kok* (AEP-087/2001). *Environmental Permit* was granted on 16 February 2001 (EP-087/2001).
- *New T&T Hong Kong Limited: Domestic Cable Route* (AEP-086/2001). *Environmental Permit* was granted on 16 February 2001 (EP-086/2001).
- *East Asian Crossing (EAC) Cable System (TKO)* (AEP-081/2000). *Environmental Permit* was granted on 4 October 2000 (EP-081/2000).
- *Telecommunication Installation at Lot 591SA in DD 328, Tong Fuk, South Lantau Coast and the Associated Cable Landing Work in Tong Fuk, South Lantau for the North Asia Cable (NAC) Fibre Optic Submarine Cable System* (AEP-064/2000). *Environmental Permit* was granted in June 2000 (EP-064/2000).
- *Black Point to Shekou Submarine Cable System, CLP Power.* Gazetted under *Foreshore Seabed (Reclamation) Ordinance* in 2005.
- *11kV Cable Circuits from Tai Mong Tsai to Kiu Tsui, CLP Power.* Gazetted under *Foreshore Seabed (Reclamation) Ordinance* in 2004.

For cable installation through jetting, the bundled cables and injector are lowered to the seabed. The injector fluidises a trench using high pressure water jets and the bundled cables is immediately laid within the trench. The sides of the trench slip around the bundled cables, burying it and leaving a small depression in the seabed, which is infilled by natural sedimentation. The maximum width of the seabed fluidised by the injector is 0.4 m and while for this Project the cable system will be buried to a depth of 5 m (with burial depth increase to 6 m below the seabed at the submarine cable section that overlaps with the Tathong Channel Traffic Separation Scheme and toward inshore, approximate length of 2.25 km of the 35.402 km in Hong Kong waters), other cables have been buried up to a maximum depth of 10 m in the past. The same applies to a short section near the landing site, with trench width of about 0.5 m and trench depth of 0.1 to 5 m.

During the jetting cable laying process, and to a lesser degree during RC and/or PLGR works, 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 cable laying process, per stated in previous paragraph and adopted in a list of past approved cable installation projects, has been conducted and is presented in the following paragraphs.

4.1.3.2.1 Calculation of Sediment Transport

The rate of sediment lost to suspension is calculated as follows for laying of the cable alignment based on maximum work speed of 1 km hr^{-1}.

Release rate	=	Cross-sectional area of disturbed sediment × speed of cable laying machine × sediment dry density × percentage loss
Depth of disturbance	=	6 m (target maximum burial depth of cable system)
Width of disturbance	=	0.5 m (width of seabed disturbance as cable system buried)
Maximum cross-sectional area	=	3.0 m^2
Loss rate	=	20% (majority of sediment not disturbed)
Speed of machine	=	0.2778 m s^{-1} (1 km hr^{-1})
In-situ dry density	=	600 kg m^{-3} (typical of Hong Kong sediment)
Release rate	=	**100.00 kg s^{-1}**

During cable laying works, and to a lesser degree during RC and/or PLGR works, 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 [(1)(2)(3)(4)(5)(6)].

Similar projects including those listed at the start of this ***Section A4.1.3.2*** above 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 cable laying works, however the potential impacts have been addressed using a conservative assumption that a cross-current carries the sediment towards the sensitive receivers.

(1) SMEC (2022a) Project Profile for Cheung Chau Submarine Cable System (AEP-612/2022). For Hong Kong Telecommunications (HKT) Limited.

(2) SMEC (2022b) Project Profile for Peng Chau Cable System (AEP-610/2022). For Hong Kong Telecommunications (HKT) Limited.

(3) SMEC (2022c) Project Profile for Lamma Island Cable System (AEP-609/2022). For Hong Kong Telecommunications (HKT) Limited.

(4) SMEC (2021) Project Profile for Asia Direct Cable System - Hong Kong Segment (ADC-HK) - Chung Hom Kok (AEP-595/2021). For China Telecom Global Limited.

(5) ERM - Hong Kong, Ltd (2020) Project Profile for H2H Express Submarine Cable (AEP-575/2020). For Huawei Marine Networks Co., Ltd.

(6) SMEC (2020) Project Profile for Bay to Bay Express Cable System - Hong Kong Segment (BtoBE-HK) – Chung Hom Kok (AEP-573/2020). For China Telecom Global Limited.

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	=	100.00 kg s^{-1}
Current velocity	=	0.9 m s^{-1}
Height of sediment	=	1 m
Width of sediment	=	6 m
Initial concentration	=	**18.519 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} (7). As the predicted initial concentration exceeds this value for this project, this settling velocity of 10 mm s^{-1} is deemed applicable.

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}**. This is the same approach as was adopted in the Environmental Impact Assessment (EIA) for the gas pipeline serving the Lamma Power Station Extension (8).

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.

Using the same calculation for up to ~1.5 m burial depth with trench width of ~0.5 m for the areas that require hand jetting by diver, the initial concentration is predicted to be 4.63 kg m^{-3}, which exceeds 1 kg m^{-3}. The distance travelled by the disturbed sediments will also be no more than 180 m from the cable alignment.

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

(8) ERM - Hong Kong, Ltd (1998) EIA for a 1,800MW Gas-fired Power Station for Lamma Extension (Register No. AEIAR-010/1999). For The Hongkong Electric Co Ltd.

4.1.3.2.2 Evaluation of Sediment Impact

Table A4.1 shows that all identified WSRs, with the exception of the Spawning Ground of Commercial Fisheries Resources (FSG), the Secondary Contact Recreation Subzones along the coastline of Shek O, and the Recognized coral communities at Cape Collinson and Ngan Wan (WSR E3), are located beyond the above predicted distance of 180 m.

The Spawning Ground of Commercial Fisheries Resources and the Secondary Contact Recreation Subzones along the coastline of Shek O cover a large swath of water (9). They would potentially be impacted by the predicted SS elevation by the cable installation under this Project. Given the relatively localised area (10) and short-term nature of the impact during the installation, such impact would only affect a relatively small fraction of area where sensitive use of the Spawning Ground of Commercial Fisheries Resources and the Secondary Contact Recreation Subzones along the coastline of Shek O would be affected in any moment of the marine installation. As such, no unacceptable water quality impact on these WSRs is expected.

The Recognized coral communities at Cape Collinson and Ngan Wan (WSR E3) are located ~80 m from the Project site only, within the sediment plume travel distance. To control the level of disturbance to bottom sediment close to WSR E3, the forward speed for jetting machine should be kept at lower end of 0.2 km hr^{-1} at the vicinity (from 4.0 km to 5.0 km from the landing point). Furthermore, to avoid elevation of SS from the sediment plume from the cable installation works from affecting WSR E4, a mobile silt curtain of length of at least 500 m will be installed between WSR E3 and the works area prior to and during the cable laying works near Cape Collinson and Ngan Wan. The mobile silt curtain will be kept in an orientation approximately parallel to the cable alignment, with about 250 m length in both directions from the jetting machine. The mobile silt curtain should consist of impermeable geotextile membrane and connectors that are sufficiently strong to withstand the current condition near WSR E3. The setup should make use of floats and sinkers to ensure the silt curtain extends throughout the entire water column. Both ends of the silt curtain should be controlled by work vessels to allow adjustment of location as the jetting work progresses. As demonstrated by the recent environmental monitoring and audit exercise conducted under the Hong Kong Offshore LNG Terminal Project with adopt floating silt curtain between identified WSR and the jetting alignment for protection of the WSR, water quality monitoring results indicated the adopted floating silt curtain would be able to contain the encroachment of sediment plume from jetting. Pilot test conducted under the Hong Kong Offshore LNG Terminal Project confirmed such floating type silt curtain to would be able to reduce concentration of suspended solids by over 90% (11). It is therefore expected the proposed mobile silt curtain could also contain and avoid sediment plume spread to WSR E3 under this Project. Furthermore, the presence of silt curtain would block the direct path from the jetting machine to WSR E3 (shortest 80 m). Given 250 m length of silt curtain would be kept in both the forward and backward direction, sediment plume will need to travel for more than 250 m to reach WSR E3. This would lengthen the path length from the jetting machine to WSR E3 to be above 180 m, and thus the sediment plume should settle before reaching WSR E1. The proposed location of the mobile silt curtain is indicated in ***Figure A3***. With the mobile silt curtain, SS elevation due to sediment plume spread from the cable installation works at WSR E3 is not anticipated, and no unacceptable water quality impact on E3 is expected.

In addition, continuous monitoring of turbidity would be implemented at WSR E3 when jetting at close to WSR E3 to protect against any potential sediment impact from the Project. Please refer to ***Appendix F*** for the detailed monitoring procedures. With the continuous monitoring at WSR E3, any

(9) The total area of Spawning Ground of Commercial Fisheries Resources is up to 477 sq. km; while the total area of Secondary Contact Recreation Subzones in Hong Kong is ~260 sq. km.

(10) Maximum impact area at any moment of time = 0.18 km × 0.18 km × π = 0.1 sq. km, which is < 0.1% of the area of this WSRs.

(11) Corresponding monitoring report recording the quoted findings is available at: https://env.hkolng.com/ema-monthly/202201/0505354_Monthly%20EM&A%20Report_2022-01_Rev_0.htm (Last retrieved on 21 Nov 2024).

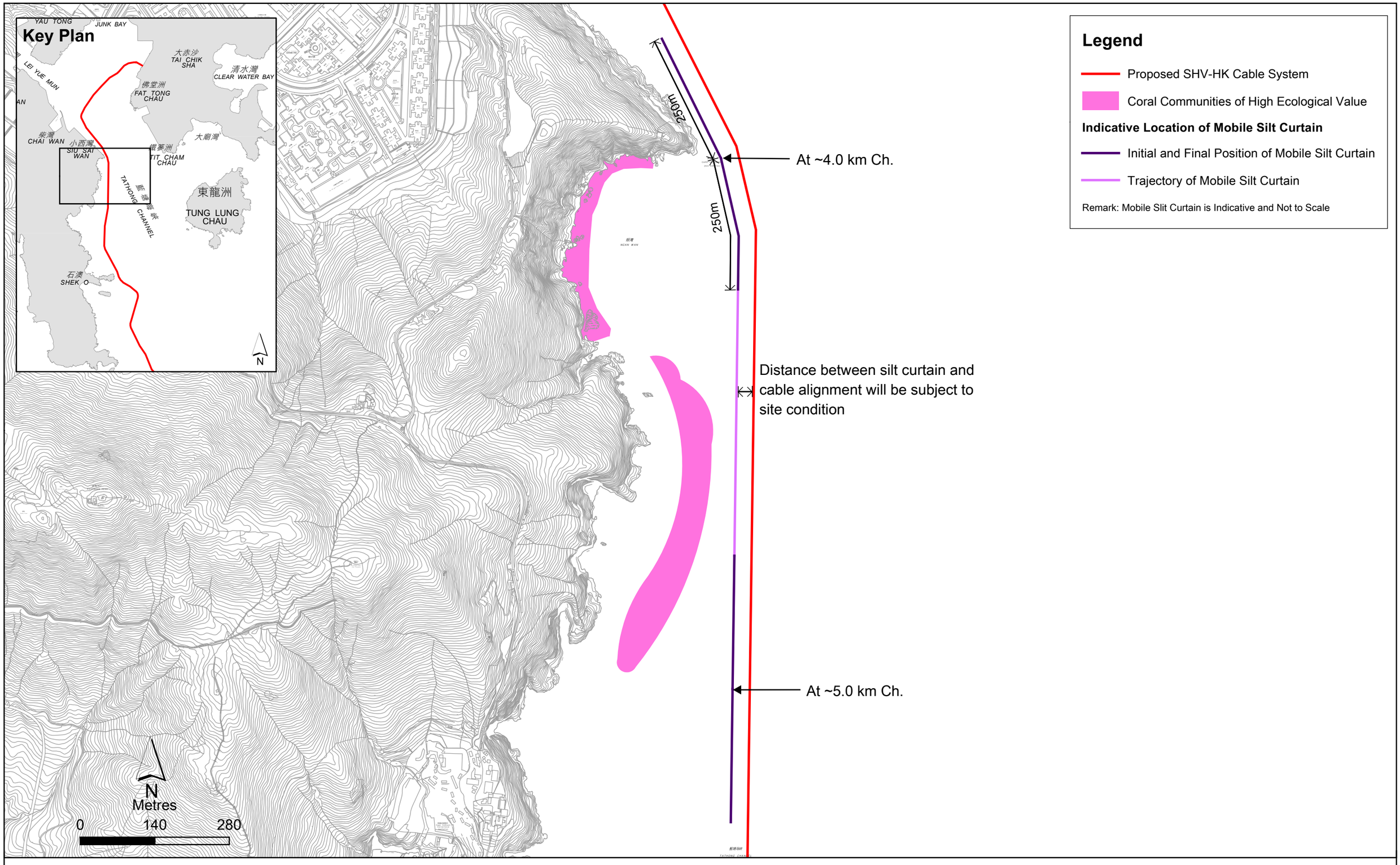

Figure A3

Location of Proposed Mobile Silt Curtain near Cape Collinson and Ngan Wan

ERM

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Date: 26/11/2024

exceedance could be quickly picked up and responded to, and thus protect WSR E3 against the potential sediment impact from the Project.

Table A4.1 Evaluation of Impacts with respect to the Extension of the Sediment Plume

ID	Water Sensitive Receiver	Approximate Geodesic Distance to Proposed Cable Alignment (m) [1][2]	Sediment may reach the WSR?	Likelihood of Adverse Impact	Reason
B1	Big Wave Bay Beach	1,100	No	No	Sediment would not reach WSR.
B2	Rocky Bay Beach	820	No	No	Sediment would not reach WSR.
B3	Shek O Beach	1,050	No	No	Sediment would not reach WSR.
S1	WSD Junk Bay Seawater Intake	1,100	No	No	Sediment would not reach WSR.
S2	WSD Siu Sai Wan Flushing Water Intake	325	No	No	Sediment would not reach WSR.
S3	Pamela Youde Nethersole Eastern Hospital Cooling Water Intake	1,010	No	No	Sediment would not reach WSR.
S4	Tseung Kwan O Desalination Plant Seawater Intake	2,360	No	No	Sediment would not reach WSR.
S5	Seawater Intake for the Swire Institute of Marine Science	700	No	No	Sediment would not reach WSR.
F1	Tung Lung Chau FCZ	2,450	No	No	Sediment would not reach WSR.
F2	Po Toi FCZ	4,560	No	No	Sediment would not reach WSR.
FSG	Spawning Ground of Commercial Fisheries Resources	Immediate proximity	Yes	Yes	Sediment may reach WSR.
E1	Recognized coral communities at South West Junk Bay	1,215	No	No	Sediment would not reach WSR.
E2	Recognized coral communities at Fat Tong Chau	430	No	No	Sediment would not reach WSR.
E3	Recognized coral communities at Cape Collinson and Ngan Wan	80	Yes	Yes	Sediment may reach WSR.
E4	Recognized coral communities at Tai Long Pai	550	No	No	Sediment would not reach WSR.
E5	Shek O Headland SSSI	520	No	No	Sediment would not reach WSR.
E6	Recognized coral communities along Tung Lung Chau	2,420	No	No	Sediment would not reach WSR.
E7	Cape D'Aguilar Marine Reserve SSSI	730	No	No	Sediment would not reach WSR.
E8	Recognized coral communities along the coast of Beaufort Island	2,520	No	No	Sediment would not reach WSR.
E9	Recognized coral communities along the coast of Po Toi Island	2,210	No	No	Sediment would not reach WSR.
E10	Recognized coral communities along the coast of Sung Kong	450	No	No	Sediment would not reach WSR.
E11	Recognized coral communities along the coast of Waglan Island	580	No	No	Sediment would not reach WSR.
E12	Recognized coral communities along the coast of Ninepins	6,730	No	No	Sediment would not reach WSR.

ID	Water Sensitive Receiver	Approximate Geodesic Distance to Proposed Cable Alignment (m) [1][2]	Sediment may reach the WSR?	Likelihood of Adverse Impact	Reason
T1	Corals near the landing point	Immediate proximity to inshore section (installed by diver(s)	Yes	No	Minimal sediment elevation from diver jetting for this section.
		>200 from remaining cable alignment (installed machine jetting)	No	No	Sediment would not reach WSR.

Notes:

[1] Geodesic distance refers to the shortest straight-line distance between two locations, without regard on the physical obstacles in between. Also note that distances from earth system to all WSRs are greater than that from the cable alignment. Distances have been rounded to the nearest 10 m.

[2] For the recognized coral communities, the distance has been estimated from the outermost point of the coral communities' boundary to the closest point of the cable alignment.

The remaining WSRs are located beyond 180 m from the remaining cable alignment, i.e. beyond the range of which sediment plume from the jetting works could travel. Thus, they would not be impacted by the cable installation works under this Project.

Generally, it is anticipated that the cable installation works will not cause unacceptable adverse impacts to water quality at the WSRs. For areas of high ecological importance and the spawning ground of commercial fisheries resources, assessment of associated impacts to marine ecology and fisheries are presented in **Appendices B** and **C** respectively.

4.2 Operation Phase (including Maintenance)

4.2.1 Submarine Cable Operation

Under normal condition, the operation of the installed submarine cable system would not result in change in water quality. In case of land-based maintenance works, earthworks and civil works would not be required as well and thus no unacceptable change in water quality would be anticipated as well.

It should be noted that in case submarine cable repair work is required during project operation, the recovery of any faulty cable section to the surface would involve similar equipment for fluidizing the sediment that covers the cable. Therefore, the calculation for maximum distance travelled by disturbed sediment above still applies. Since only a short section of faulty cable would need to be removed, the potential extent of impact would be smaller than that of the construction phase (as explained in ***main report Section 4.10***) and the duration of impact would also be shorter. The selection of plant and equipment would be "fit-for-purpose", adopting smaller plants and / or use of divers if considered appropriate, which would reduce potential water quality impacts associated with potential cable repair works. No unacceptable water quality impact to the identified WSRs is expected from the potential cable repair works.

4.3 Cumulative Impact

Three projects are planned in the vicinity of the proposed SHV-HK Cable system, yet none of them are anticipated to be constructed concurrently with the Project. As discussed in ***main report Sections 2.3*** and ***3.13***, given that the installation of the proposed SHV-HK Cable system will not coincide with other projects, cumulative water quality impacts are not anticipated.

4.4 Mitigation Measures

4.4.1 Land Cable Works

Land-based activities under this Project at the Tseung Kwan O landing point involve pulling and guiding the bundled cables into an existing duct on the seawall. As shown in ***Figure 1.2***, the landing point is an artificial sloped rock armour seawall. There will not be exposed soil or sediment at the landing point due to the project. The pulling of bundled cables by winches will not involve any major earthworks and thus runoff and erosion would be kept at minimal. The potential impacts to water quality from land-based work primarily relate to surface water run-off. These may be readily controlled through water quality protection measures incorporated as part of good working practices:

- The machinery employed will be inspected prior to work commencing to ensure the waters and shoreline will not be polluted with oil/grease/fuel. No machinery maintenance will be carried out onsite. Oil absorbent materials will be readily placed on site and will be applied immediately should any oil leakage incident occur, to ensure the nearby water quality would not be affected; and
- All construction waste and drainage will be handled and disposed in accordance with the *Waste Disposal Ordinance* and *Practice Note for Professional Persons*, *Construction Site Drainage* (*ProPECC PN2/23*) and in particular the following measures adhered to:

- Care will be taken during the cable landing and construction to avoid any spillage of materials to the adjacent marine waters; and
- Best Management Practices (BMPs) will be applied to avoid and minimise contaminated runoff from work sites, marine plants and vessels, including wastewater being properly treated and discharged to storm drain.

4.4.2 Cable Installation Works and Earth System Installation

During inshore (area with 0 – 9 m of water depth) marine based cable laying activities, the following mitigation measures will be undertaken:

- To better control the emission of sediments into the water column, the installation works would be conducted using the more controlled method of diver handheld device (which has lower level of sediment disturbance) at the area close to shore. For the area beyond, cable installation (using cable installation barge and jetting machine), would be used but at a controlled forward rate to limit the level of disturbance. Specifically,
  - Jet probe would be used by divers for cable installation from the BMH at Tseung Kwan O out to about 200 m away (See ***Figure 1.1***);
  - diver hand jet or jetting machine should be adopted for installation of the earth system steel plate; and
  - the forward speed of the cable installation barge during inshore cable installation works will be limited to a maximum of 1 km hr^{-1}.

During remaining submarine works to the boundary of HKSAR the following mitigation measures will be undertaken:

- The forward speed of the jetting machine should be kept at 0.2 km hr^{-1} at the vicinity of Recognized coral communities at Cape Collinson and Ngan Wan (E3) (specifically from 4.0 km to 5.0 km from the landing point).
- Deployment of a mobile silt curtain to the east of the Recognized coral communities at Cape Collinson and Ngan Wan (E3) prior to and during the cable laying works near Cape Collinson (from 4.0 km to 5.0 km from the landing point). The proposed location of the mobile silt curtain is indicated in ***Figure A3***. The silt curtain should extend along the direction of cable alignment and maintain length of about 250 m in both the forward and backward direction.
- To better control the emission of sediments into the water column, the forward cable installation barge will typically operate at 0.2 km hr^{-1} (maximum will be limited to 1 km hr^{-1}) for the rest of the cable alignment.
- If a specific vessel/ barge is used for the transport of debris recovered from the seabed during RC/ PLGR in order to prevent leakage of material during loading and transport to the disposal site, it shall:
  - be fitted with tight bottom seals;
  - be filled to a level which ensures that material does not spill over during loading and transport; and
  - maintain adequate freeboard to ensure that the decks are not washed by wave action.

With the implementation of these proposed measures, adverse impact from disturbed sediment during cable installation work and earth system installation, is not expected to encroach into WSR areas either temporally (i.e. due to avoidance of peak seasons) or spatially (i.e. sediment plume would not reach nearby WSRs due to physical separation).

Nevertheless, as a precautionary measure and following standard practice for submarine cable installation in Hong Kong, to verify that the Project works will not result in any adverse impacts to water quality (and consequently water sensitive receivers, particularly to marine ecology and

fisheries), and to rectify any anomalies considered due to the Project, it is recommended that water quality monitoring be carried out, as further detailed in ***Appendix F***. In case any Limit Levels are exceeded, cable installation/ repair works will be suspended if considered due to the Project (until the cause of non-compliance is detected and the situation rectified) and appropriate methods of reducing impacts will be discussed including, but not limited to reduction of speed of cable installation barge; and reduction in jetting water pressure.

4.4.3 Cable Operation (After Completion of Installation), including Maintenance

For any potential maintenance and repair works for the cable, the mitigation and precautionary measures listed above would apply, according to where the maintenance and repair works were located, i.e.:

- For maintenance/repair works located in the land cable area, measures outlined in ***Section A4.4.1*** would apply;
- For maintenance/repair works for submarine cable system, measures outlined in ***Section A4.4.2*** would apply, except exceptional circumstances as agreed with EPD, such as:
  - For repair/ maintenance works, such works are usually unexpected and require addressing immediately, and also involve smaller scale works with restricted locations and timeframe, compared to installation works. In the event that any revision to the measure outlined in ***Section A4.4.2*** is required, approval from EPD and other relevant authorities should be sought before action.

5. SUMMARY AND CONCLUSIONS

A review and assessment of water quality impacts associated with construction and operation (including maintenance) of the proposed submarine cable system have been undertaken.

5.1 Evaluation of Impact

The calculation of sediment transport from the construction works, using a conservative settling velocity, indicates that the sediments disturbed during the cable laying works using jetting technique for injector burial tool or sledge tool, and to a lesser degree during RC and/or PLGR works, will settle onto the seabed within approximately 180 m from the cable alignment. For the inshore cable section as well as OGB and grounding cables, installation works will be conducted by diver with less powerful handheld tool, and thus result in minimal suspended solids elevation at the nearest corals at the landing point (WSR T1). For the rest of the cable alignment, WSRs have been identified and only one (WSR E3) of them are located within 180 m from the proposed cable route. For the remaining WSRs which are located beyond 180 m from the proposed cable alignment, the plume of suspended sediments is not anticipated to reach these WSRs.

5.2 Mitigation Measures

Mitigation measures are recommended, for example, the installation barge will typically operate at 0.2 km hr^{-1}, (with a maximum speed of 1 km hr^{-1}) and a water quality monitoring programme will be carried out, in order to minimise the water quality impacts and verify that the Project works will not result in any unacceptable adverse impacts to water quality at WSRs. For the WSR within 180 m from the proposed cable alignment (WSR E3), a mobile silt curtain will be installed between WSR E3 and the Project Site prior to and during the cable laying works near Cape Collinson. Forward speed of the jetting machine would also be capped at 0.2 km hr^{-1} for cable segment close to WSR E3.

Due to the physical separation of the other WSRs from the cable laying works and the short duration of working period, the identified WSRs are unlikely to be affected by adverse changes in water quality within the assessment area and water quality is likely to comply with the WQOs.

Overall, no unacceptable water quality impacts have been identified.

APPENDIX B REVIEW ON POTENTIAL IMPACTS TO MARINE ECOLOGICAL RESOURCES

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1. INTRODUCTION

This **Appendix** presents the baseline conditions of marine ecological resources in the vicinity of the proposed cable alignment including its grounding system which, is the footprint of the proposed routing for the Hong Kong section of the proposed Sihanoukville-Hong Kong Submarine Cable ("SHV-HK Cable System") (hereafter referred to as the Project) and evaluates the potential for direct and indirect impacts to them during construction and operation phase (including maintenance) of the Project. Baseline conditions are evaluated based on information from literature for the purposes of this assessment. Measures required to mitigate identified impacts are recommended, where appropriate.

2. RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The criteria for evaluating marine ecological impact are laid out in the *Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)*. *Annex 16* describes the general approach and methodology for assessment of impacts to marine ecological resources arising from a project or proposal to allow a complete and objective identification, prediction and evaluation. *Annex 8* sets out the criteria for evaluating such potential ecological impacts.

3. EXISTING MARINE ECOLOGICAL RESOURCES

3.1 Sites of Special Scientific Interest

The closest Site of Special Scientific Interest (SSSI) is the Shek O Headland SSSI, approximately 470 m from the closest cable segment, and Cape D'Aguilar SSSI and Ninepin Group SSSI are situated about 740 m and 6,730 m from the closest cable segment, respectively. Cape D'Aguilar SSSI is partially located in marine water but would not be affected due to the long distance from the closest cable segment. Ninepin Group SSSI is located on land and is located at a long distance from the cable segment, it would thus not be affected by the submarine cable installation works.

3.2 Cape D'Aguilar Marine Reserve

The Cape D'Aguilar Marine Reserve is designated to protect the diverse marine life and the ecologically important habitats such as coral community. As it is located 740 m from the closest proposed cable segment, it is not expected to be affected by the Project, since the maximum distance of transport of suspended sediments generated by the construction of the Project would be approximately 180 m, settling onto the seabed in less than 4 minutes (see ***Appendix A*** for details).

3.3 Coastal Protection Areas and Conservation Areas

A small strip of land along Hong Kong Island and Fat Tong Chau (Junk Island), locating about 430 m from the Project, is designated as Green Belt, though this classification does not represent a designated conservation area.

The coastline of Shek O Headland, including Tai Tau Chau and Ng Fan Chau is designated as "Coastal Protection Area (CPA)", and the shortest distance from the cable alignment to this CPA is around 119 m. In addition, the coastline from Cape Collinson to Big Wave Bay is designated as CPA as well, and the shortest distance from this CPA to the cable alignment is approximately 70 m.

Given that parts of the designated CPAs are located on land, it is anticipated that no unacceptable impacts would occur to the CPAs at Shek O Headland (including Tai Tau Chau and Ng Fan Chau) and Cape Collinson to Big Wave Bay. The intertidal and subtidal hard bottom assemblages below the CPA zone have been assessed in the following sections.

3.4 Intertidal Soft Bottom Assemblages

A small area of sandy shore is located 507 m to the south of the proposed cable landing point at Tseung Kwan O Industrial Estate (TKOIE). The proposed cable segment is located ~820 m and ~1,050 m from the gazetted beaches at Shek O. However, information regarding the ecology of these sandy shores is not available. Nonetheless, sandy shores are, in general, known to be mobile and unstable environments that are subject to constant water movement and wave action. Since few intertidal organisms are able to tolerate these conditions, sandy shores in Hong Kong may appear devoid of intertidal life [1]. Considering that the maximum distance of transport of suspended sediments generated by the construction of the Project would be approximately 180 m, settling onto the seabed in less than 4 minutes (see ***Appendix A*** for details), no water quality and ecological impacts are anticipated from the Project to the identified sandy shores.

3.5 Intertidal Hard Bottom Assemblages

Intertidal surveys had previously been conducted at the artificial seawall of the proposed landing site at TKOIE, as well as at the natural rocky shore of Fat Tong Chau near the landing site [2] [3] and along the Cape Collinson Headland near the cable alignment [4].

Findings from the intertidal survey undertaken in the wet season of 2008 indicated that the assemblage structure on the natural rocky shore at Fat Tong Chau and on the artificial seawall at TKOIE was considered to be typical of sheltered to semi-exposed rocky shores and artificial seawalls in Hong Kong [6]. The artificial seawall exhibited a low diversity of species. Animals recorded were mainly the rock oyster *Saccostrea cucullata*, periwinkles *Echinolittorina radiata* and *E. trochoides,* and limpets *Nipponacmea concinna* and *Patelloida pygmaea*. Dominant species of the natural rocky shore recorded from the same survey included the rock oyster *Saccostrea cucullata*, periwinkles *Echinolittorina radiata* and *E. trochoides*, limpets *Nipponacmea concinna* and topshell *Monodonta labio*. These species are all common species on natural rocky shores of Hong Kong.

In 2011, intertidal surveys were undertaken along the seawall of TKOIE (including the proposed landing site of the APG cable system) and on the shorelines along the northwest side of Cape Collinson Headland using qualitative spot checks and standard quantitative belt transect method [7]. Results of the 2011 intertidal surveys were similar to those obtained by the 2008 surveys, which revealed that the artificial seawall of the Study Area exhibited a low diversity of species. A total of 14 faunal taxa and one encrusting alga were encountered during the qualitative spot checks. These species are all very common and widespread species on artificial shores/ wharfs of Hong Kong. For natural rocky shores along Cape Collinson Headland, dominant organisms recorded included the periwinkles *Echinolittorina spp*. in the high-shore, the topshell *Monodonta labio* and the limpet *Siphonaria japonica* in the mid-shore, and the limpet *Cellana toreuma* and the chiton *Acanthopleura japonica* in the low-shore. Sessile species including the barnacle *Tetraclita spp.* were also present in the low-shore. Both the abundance/ density of mobile species and percentage cover of sessile species were considered to be low to moderate (mean of 65 – 80 m^{-2} and 2 – 42% m^{-2} respectively).

In 2015, intertidal surveys were undertaken in the coastal habitats at Fat Tong Chau for the Desalination Plant at Tseung Kwan O EIA [8]. Both qualitative walk-through survey and quantitative

(1) Morton, B., & Morton, J. (1983). The Sea Shore Ecology of Hong Kong. Hong Kong University Press.

(2) ERM (2008). Environmental Impact Assessment Report for Development of a Biodiesel Plant at Tseung Kwan O Industrial Estate. Prepared for ASB Biodiesel (Hong Kong) Limited. (Register No.: AEIAR-131/2009)

(3) ERM (2011). Project Profile for Asia Submarine-cable Express (ASE) – Tseung Kwan O. Prepared for the NTT Com Asia Limited. (PP No.: PP-452/2011)

(4) ERM (2011). *Op. cit.* (PP No.: PP-452/2011)

(6) ERM (2008). *Op. cit.* (Register No.: AEIAR-131/2009)

(7) ERM (2011). *Op. cit.* (PP No.: PP-452/2011)

(8) B&V & ERM (2015). Environmental Impact Assessment Report for Desalination Plant at Tseung Kwan O. Prepared for the Water Supplies Department. (Register No.: AEIAR-192/2015)

transect survey were conducted in dry and wet seasons. Results of the 2015 intertidal surveys were similar to previous results. Dominant organisms recorded included periwinkles *Echinolittorina radiata* and *E. trochoides.* Sessile species included the rock oyster *Saccostrea cucullate,* the bivalve *Planaxis sulcatus* and the barnacle *Balanus amphitrite* were found of highest abundance in the rocky shore. The abundance/ density of mobile species was considered to be moderate to high (mean of 385-559 m^{-2}) [9]. High abundance of those aforementioned species were recorded and resulted in high density. However, the species found is common and widespread in other intertidal shores in Hong Kong.

Attempts for intertidal surveys were made in June 2023 to review the latest ecological conditions of the proposed cable landing point at TOKIE where very limited baseline ecological information of the area is available. However, the artificial seawall at the proposed cable landing point at TKOIE and its vicinities were fenced off and were inaccessible. As such, alternative method using spot check dive survey was conducted to investigate the intertidal communities of the artificial seawall at the proposed landing point. The result is similar to those obtained previously, which revealed that the artificial seawall of the Study Area exhibited a low diversity of species. Low abundance of species including rock oyster, barnacles, sponges, sea anemones and tube worms were recorded in the dive survey. These species are all very common and widespread species on artificial shores/ wharfs of HKSAR.

Overall, results from previous intertidal surveys have shown that the intertidal rocky shores and artificial seawall within the Study Area, including the proposed cable landing point at TKOIE, supported generally low abundances and densities of organisms, and therefore of low ecological value. Overall, no species of conservation importance were recorded in the intertidal quantitative surveys within the Study Area. In addition, the land-based CPA is not expected to be affected by the marine construction activities.

3.6 Subtidal Soft Bottom Assemblages

Information on the subtidal soft bottom assemblages in the vicinity of the proposed cable alignment is available from the *Consultancy Study on Marine Benthic Communities in Hong Kong* [10]. Some sampling stations (Sampling Nos. 70-75, 80 and 85) are close to the proposed cable alignment and data extracted from these stations represent the assemblages along the alignment.

According to the findings of the *Consultancy Study*, the substratum of these sampling stations was covered by medium/ fine/ very fine sand. Their benthic assemblages were typical of Hong Kong waters and similar to benthic assemblages in the majority of other subtidal habitats in Hong Kong. In summer, the average number of species is higher (51 species per 0.5 m^2), while the average number of individuals (487 individuals per m^2) and average wet weight (32.3g per m^2) were low when compared with average values of Hong Kong (33 species per 0.5 m^2, 540 individuals per m^2 and 71.2 g per m^2). In winter, the average number of species (50 species per 0.5 m^2) and average wet weight (33.0 g per m^2) were medium, while the average number of individuals (605 individuals per m^2) was low in comparison with average values of benthic assemblages in Hong Kong (34 species per 0.5 m^2, 450 individuals per m^2 and 28 g per m^2). In both seasons, no species of conservation concern were found along the proposed cable alignment.

Subtidal benthos survey was conducted in 2015 in Fat Tong Chau from the Desalination Plant at Tseung Kwan O EIA. The subtidal soft-bottom habitat in Fat Tong Chau was dominated by polychaete *Amaeana trilobata*, *Prionospio ehlersi* and amphipod *Byblis* sp.. The species recorded in Fat Tong Chau were common and widespread in Hong Kong.

(9) B&V & ERM (2015). *Op. cit.* (Register No.: AEIAR-192/2015)

(10) CityU Professional Services Limited (2002). Agreement No. CE 69/2000 Consultancy Study on Marine Benthic Communities in Hong Kong. Final Report submitted to the Agriculture, Fisheries and Conservation Department.

3.7 Subtidal Hard Bottom Assemblages

Several studies undertaken in the period of 2007 to 2013 provide relevant information on subtidal hard bottom habitats within the Study Area [11] [12] [13] [14] [15] [16] [17] [18]. The surveyed subtidal hard bottom habitats included those located at Fat Tong Chau and TKOIE in close vicinity to the proposed cable landing site and near the proposed cable alignment at Cape Collinson, Ngan Wan and Tai Long Pai. Overall, results of these surveys showed that generally very sparse colonies of locally common, widespread hard coral species were present in the vicinity of the proposed cable alignment, and their abundance and diversity were very low in the context of subtidal coral assemblages in Hong Kong. Octocoral assemblages' cover and diversity were low to moderate along the shoreline of Cape Collinson Headland, however, high abundance and diversity of octocoral assemblages was found at the deep depth region of Tai Long Pai.

Dive survey results from Asia Pacific Gateway (APG) – Tseung Kwan O Project confirmed that the seabed from Cape Collinson Headland to Ngan Wan was mainly composed of hard bottom substrate (i.e. ~60% cover of bedrock). The estimated hard coral cover was less than 5% in the shallow depth zone (-3-5 m CD) with eight (8) species recorded. Octocoral cover was between 6-10% with a total of six (6) species recorded. To the south of Cape Collinson and at the northern part of Ngan Wan, more hard coral species and larger hard coral colonies were found. This area is considered as an area of relatively higher coral diversity although the estimated coral cover and number of octocoral species recorded were similar to the adjacent area.

At Shek O Headland, the seabed was observed to be mainly composed of boulders and rocks in the shallow depth zone (-3-5 m CD) while sand was the major abiotic benthic attribute covering the seabed in the deep depth zone (-5-10 m CD). Results also indicated that both hard coral and octocoral covers were very low (<1%) at both shallow and deep water zones. Three (3) hermatypic hard coral species, one (1) ahermatypic hard coral species and four (4) octocorals species were recorded.

At Tai Long Pai, results of the dive surveys confirmed that the seabed was mainly composed of hard bottom substrates (i.e. mostly bedrock). Hard coral cover was very low (i.e. < 5%) with seven (7) hermatypic hard coral species and one (1) ahermatypic hard coral species recorded. A total of seven (7) 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 depth zone (-2-5 m CD) and 11-30% in deep depth zone (beyond -5 m CD). All coral species recorded in the dive surveys are considered as common species and have a widespread distribution throughout Hong Kong's nearshore waters. Due to the relatively high octocoral abundance and diversity recorded at Tai Long Pai, it is being considered as a significant coral habitat in the area.

As there is insufficient information on the ecological condition of the landing site at TKOIE, supplementary dive surveys were conducted in June 2023 for this Project to provide updated information on the status of subtidal hard bottom habitats in the vicinity of the proposed cable

(11) ERM (2007). Environmental Impact Assessment Report for South East New Territories (SENT) Landfill Extension. Prepared for the Environmental Protection Department. (Register No.: AEIAR-117/2008)

(12) ERM (2008). *Op. cit.* (Register No.: AEIAR-131/2009)

(13) CUHK (2011). Additional Works for Provision of Services on Reference Collection and Study on Octocorals and Black Corals in Hong Kong Waters. Final Report submitted to the Agriculture, Fisheries and Conservation Department.

(14) BMT Asia Pacific Ltd (2009). Environmental Impact Assessment Report for Hong Kong Offshore Wind Farm in Southeastern Waters. Prepared for HK Offshore Wind Limited. (Register No.: AEIAR-140/2009)

(15) Area 131 Further Ecological Study Report (1999) and HATS Dive Survey Report (2003).

(16) ERM (2011). *Op. cit.* (PP No.: PP-452/2011)

(17) ERM (2012). Asia Submarine-cable Express (ASE) – Tseung Kwan O. Baseline Coral Monitoring Survey Report and Post Project Coral Monitoring Survey.

(18) ERM (2013). Project Profile for Asia Pacific Gateway (APG) – Tseung Kwan O. Prepared for China Mobile International Limited (CMI Ltd). (PP No.: PP-496/2013)

alignment and at the proposed cable landing site (***Figure B1***). The dive surveys comprised qualitative spot dive surveys and semi-quantitative Rapid Ecological Assessment (REA) surveys at TKOIE (i.e. near the proposed cable landing point), which is indicated ***Figure B2***. Result from the qualitative spot dive checks is presented below.

Results of surveys conducted near the proposed landing point at TKOIE showed the coverage of hard coral was very low (<5%) at all dive locations. A total of six (6) hermatypic hard coral species, including *Bernardpora stutchburyi*, *Coscinaraea* sp., *Montipora peltiformis*, *Oulastrea crispata*, *Plesiastrea versipora* and *Psammocora profundacella* and one (1) ahermatypic hard coral species (*Tubastraea coccinea*) was recorded (***Table B3.1*** to ***Table B3.3***). Octocorals and black corals were not recorded at the survey locations near the proposed landing point at TKOIE. Photos of coral recorded during the dive survey are supplemented in ***Figure B3*** below.

Table B3.1 Substrate Attributes along REA Transects

Substrate attributes (0-6)	C1	C2	C3	C4
Continuous Pavement	0	0	0	0
Bedrock	0	0	0	0
Boulders (>50 cm)	6	6	6	6
Rubble (<50 cm)	0	2	1	2
Sand with gravel	1	0	2	0
Mud & Silt	1	1	1	1
Artificial substrates (marine debris/ anchors)	0	0	1	0
Remarks: 0 = Not recorded; 1 = 1-5%; 2 = 6-10%; 3 = 11-30%; 4 = 31-50%; 5 = 51-75%; 6 = 76-100%.				

Table B3.2 Ecological Attributes along REA Transects

Substrate attributes (0-6)	C1	C2	C3	C4
Hard Coral	1	1	1	0
Dead Standing Coral	0	0	0	0
Soft Coral	0	0	0	0
Gorgonian	0	0	0	0
Black Coral	0	0	0	0
Macroalgae	0	0	0	0
Encrusting algae	3	0	2	0
Turf Algae/ Cyanobacteria	0	0	0	0
Remarks: 0 = Not recorded; 1 = 1-5%; 2 = 6-10%; 3 = 11-30%; 4 = 31-50%; 5 = 51-75%; 6 = 76-100%.				

Table B3.3 Taxon Abundance along REA Transects

Taxon abundance (0-5)	C1	C2	C3	C4
Sponges	1	0	1	0
Barnacles	1	1	3	1
Sea anemones	1	1	1	1
Zoanthids	0	0	0	0
Rock oysters	4	2	4	2
Mussels	0	0	0	0
Bryozoans	1	0	1	0
Tunicates	0	0	0	0

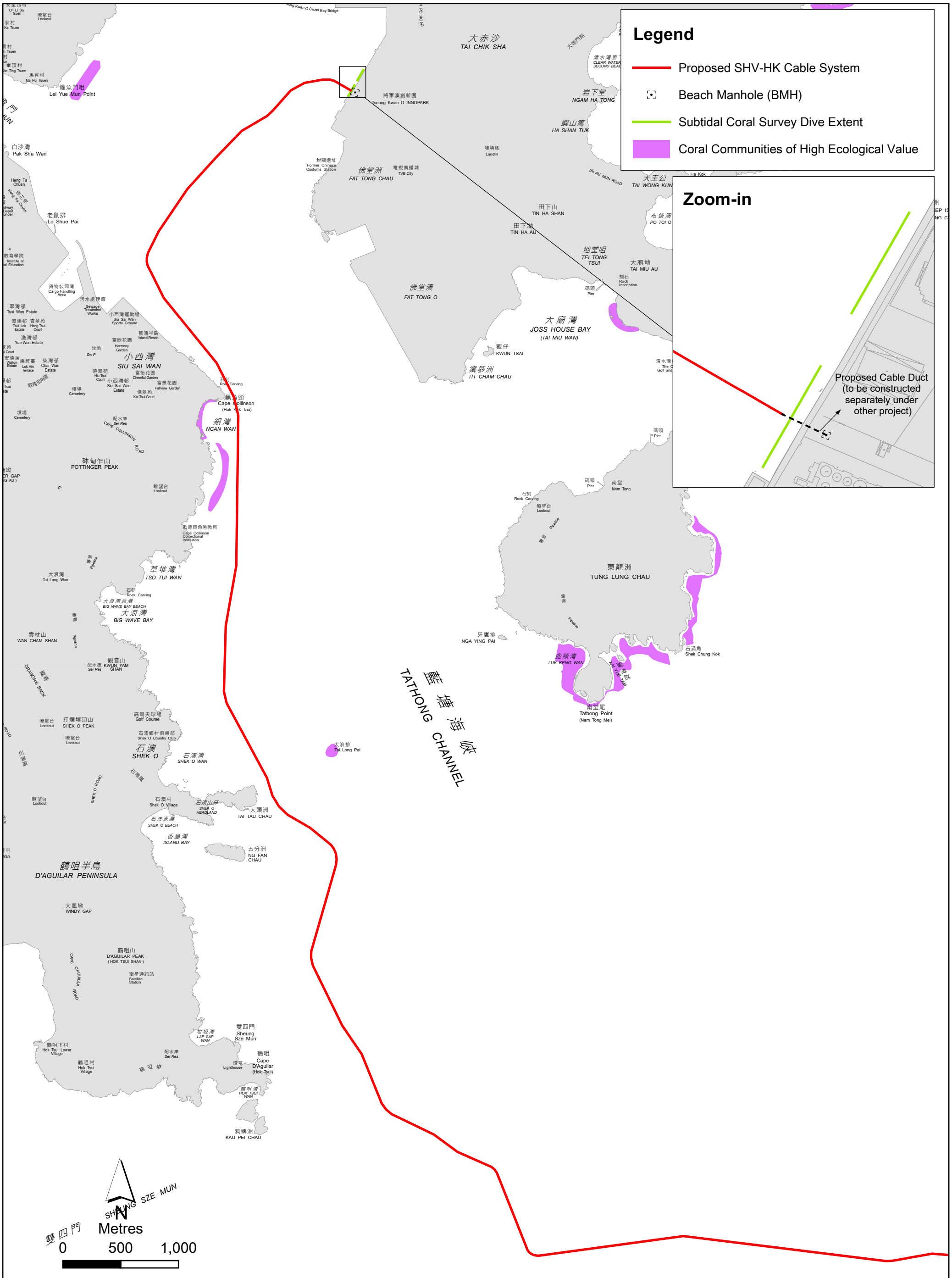
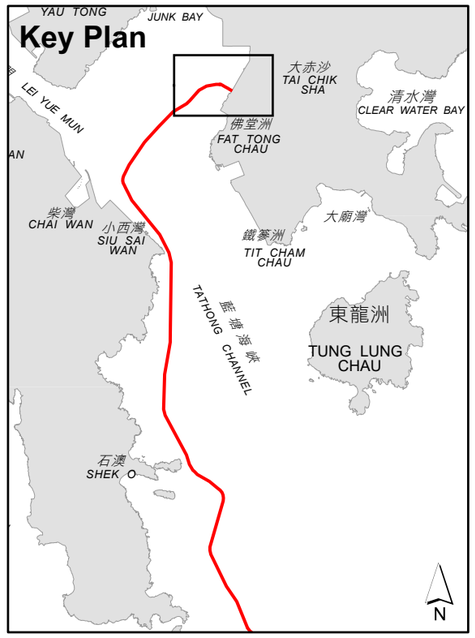


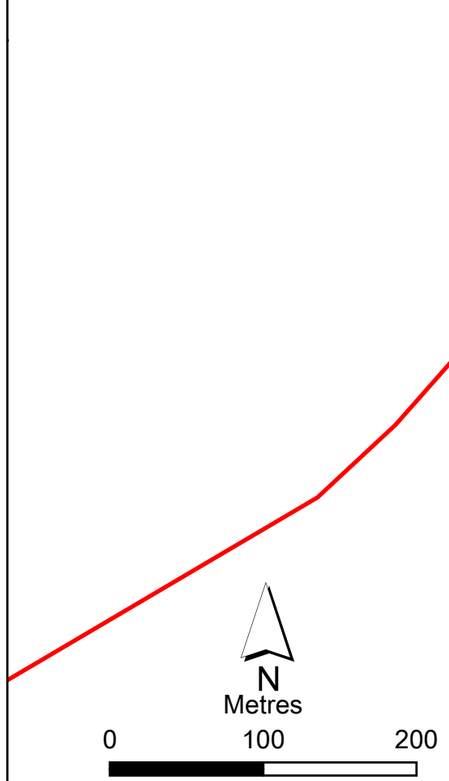
Figure B1

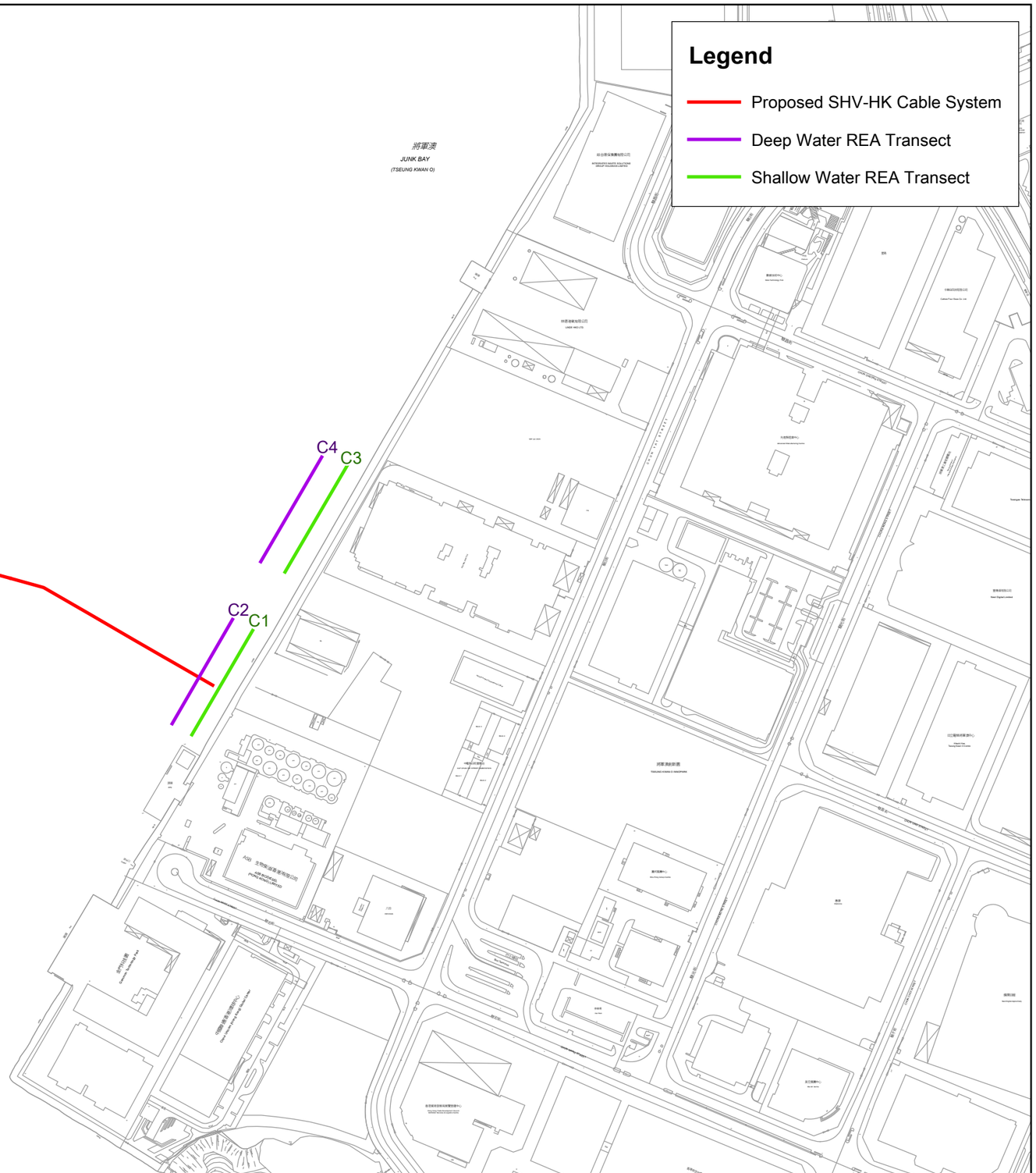
Locations of Marine Ecological Survey

ERM

File: T:\GIS\CONTRACT\0619471\mxd\0619471_Marine_Ecology.mxd
Date: 7/11/2024







Legend

- Proposed SHV-HK Cable System
- Deep Water REA Transect
- Shallow Water REA Transect

Figure B2

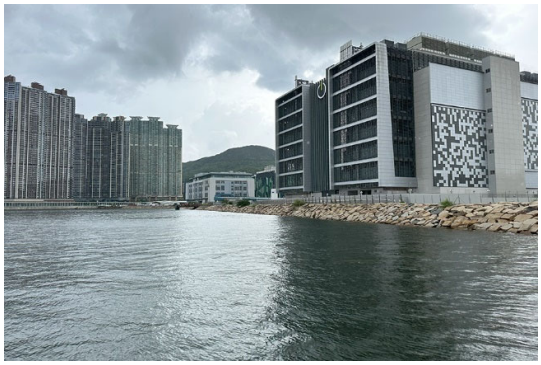
Dive Survey Locations at Junk Bay, Tseung Kwan O (TKO)

File: T:\GIS\CONTRACT\0619471\mxd\0619471_Dive_Survey_Locations_at_TKO_v2.mxd
Date: 1/11/2024

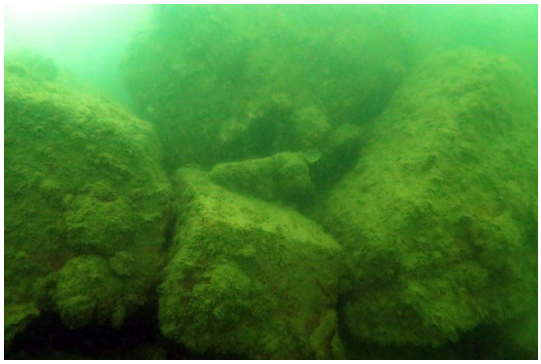
Taxon abundance (0-5)	C1	C2	C3	C4
Tube worms	1	1	1	1
Hard coral species abundance (0-5)	1	1	1	0
Hermatypic corals				
Psammocora profundacella	1	0	1	0
Plesiastrea versipora	1	0	1	0
Oulastrea crispata	1	0	1	0
Montipora peltiformis	1	0	1	0
Coscinaraea sp.	0	0	1	0
Bernardpora stutchburyi	0	0	1	0
Ahermatypic coral				
Tubastraea coccinea	0	1	0	0
Remarks: 0 = absent; 1 = sparse; 2 = uncommon; 3 = common; 4 = abundant; 5 = dominant.				
No. of Hard Coral Species	4	1	6	0
No. of Soft Coral Species	0	0	0	0
No. of Black Coral Species	0	0	0	0

Figure B3 Photos of the Conditions and Representative Taxa at the Survey Locations

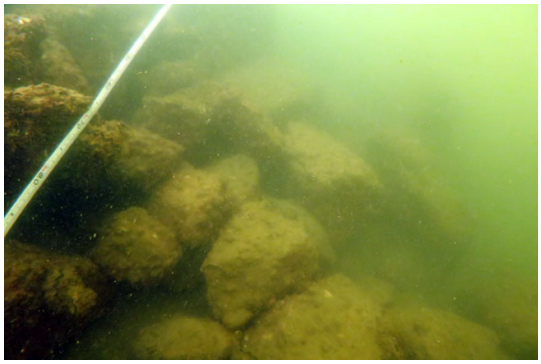
Survey Location C1 & C2



Survey Location C3 & C4



General condition at C1 dominated by boulders



General condition at C3 dominated by boulders

Hard coral, *Psammocora profundacella*, at C1

Hard coral, *Montipora peltiformis*, at C3

Overall, results of the supplementary dive surveys showed that sparse hard coral colonies of locally mostly common, widely-distributed species were recorded in the vicinity of the proposed cable landing point and the proposed cable alignment. The abundance and diversity of hard corals were very low in the context of subtidal hard bottom habitats in Hong Kong.

3.8 Marine Mammal

The Chinese White Dolphin (CWD) (*Sousa chinensis*) and the Finless Porpoise (FP) (*Neophocaena phocaenoides*) are the two species of marine mammals that are regularly sighted in Hong Kong waters. Both species are highly mobile and utilise a wide range of areas seasonally.

The population of the CWD is mostly found near the Pearl River Estuary and the major distribution of the CWDs in Hong Kong waters is in West and Northwest Lantau [(19)]. Sightings are most frequent in the western part of these waters around the Sha Chau and Lung Kwu Chau Marine Park and the west coast of Lantau near Tai O. More CWD usage was found in Southwest Lantau areas in recent years [(20)]. The eastern waters of Hong Kong are not considered to represent an important habitat for CWD as only a small number of sightings have been recorded, mainly within the waters of Port Shelter.

The FP is a small cetacean endemic to southern and eastern Asia and is protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix I. FPs are mostly found in the southern waters and occasionally in the eastern waters of Hong Kong. Their distribution and abundance appear to vary spatially and temporally. It was reported that they are mostly recorded during spring in southern waters near Lamma Island. It has been suggested that the important FP habitats are located to the south of Tai A Chau, southwest of Shek Kwu Chau, south of Cheung Chau and the waters between Shek Kwu Chau and Soko Islands in the dry season. FP generally moves eastwards in the wet season with important habitats around Po Toi Islands and at the juncture of Po Toi and Ninepins [(21)].

The above literature review suggests that sightings of FP are infrequent and seasonal along the proposed cable alignment in the eastern and southeastern Hong Kong waters, whereas southeast Lantau is already the marginal habitat for the CWD. Therefore, the proposed cable alignment situated in the eastern and south-eastern Hong Kong waters is not considered to be a major habitat for cetaceans in Hong Kong.

(22) Sims, P. F. G., Hung, S. K., & Würsig, B. (2012). High-speed vessel noises in West Hong Kong Waters and Their Contributions Relative to Indo-Pacific Humpback Dolphins (*Sousa chinesnis*). Journal of Marine Biology. Vol. 2012, ID169103, 11pp

(22) Sims, P. F. G., Hung, S. K., & Würsig, B. (2012). High-speed vessel noises in West Hong Kong Waters and Their Contributions Relative to Indo-Pacific Humpback Dolphins (*Sousa chinesnis*). Journal of Marine Biology. Vol. 2012, ID169103, 11pp

(22) Sims, P. F. G., Hung, S. K., & Würsig, B. (2012). High-speed vessel noises in West Hong Kong Waters and Their Contributions Relative to Indo-Pacific Humpback Dolphins (*Sousa chinesnis*). Journal of Marine Biology. Vol. 2012, ID169103, 11pp

4. IMPACT ASSESSMENT

4.1 Impacts on Sites of Special Scientific Interest

Shek O Headland SSSI and Cape D'Aguilar SSSI are located approximately 520 m and 740 m, respectively. Since the maximum distance of transport of suspended sediments generated by the construction of the Project would be approximately 180 m, settling onto the seabed in less than 4 minutes (see ***Appendix A*** for details), hence any sediment plume due to the Project works would not be expected to reach any of the identified SSSIs and overall, no anticipated impact is foreseen in these areas.

4.2 Construction Phase

4.2.1 PLGR and RC

Prior to the submarine cable burial, Route Clearance (RC) and/or Pre-Lay Grapnel Run (PLGR) will be conducted over the length of the proposed cable route. PLGR is designed to clean all surface debris (e.g. abandoned fishing nets, wire rope or other significant debris on the seabed surface) that would be an obstruction to the simultaneous cable lay and burial process. RC would remove any out-of-service (OOS) cables identified to be crossing or otherwise obstructing the proposed cable route.

The PLGR would be conducted by towing a grapnel along the proposed cable route before the actual cable installation, using grapnel fluke penetrating between 0.2-1 m into the seabed (subject to seabed conditions). The RC would be conducted using specialized grapnel with longer flukes penetrating up to 1.5 m (or may be supported by diver hand-jetting and manual diver cutting during installation where OOS cables are buried outside the normal reach of specialized grapnel) and a section of the OOS would be cut/removed to allow the installation and burial process to continue.

4.2.2 Inshore (0 – 9 m water depth) works and connecting cable system to BMH

The injector/ jet sledge used in the cable laying process, as well as RC/ PLGR, will result in the formation of suspended sediment around the professional jetting tool, which can be expected to remain very close to the seabed and would settle rapidly. An analysis of the potential transport of fine sediments suspended into the water column during the cable laying process has been conducted (***Appendix A***) and has determined that the maximum distance of transport for suspended sediments would be 180 m from the cable burial machine, assuming a flat seabed.

Based on the above, indirect impacts may occur through seabed disturbance, resulting in elevation of suspended solids in the water column. Such increase above background suspended solid levels may potentially cause impacts to filter feeders and corals.

As the cable installation works will be of a short duration, the increase is not predicted to be high, except for in the immediate vicinity of the cable burial machine; suspended solid levels are expected to settle rapidly back onto the seabed (within 200 seconds) and travel up to 180 m from the cable burial tool (see ***Appendix A*** for details). As such, these impacts will be small scale and of a localised nature. It is expected that only sparse coral colonies of 6 species at Junk Bay will be indirectly impacted. These corals are common in Hong Kong waters with very low coverage at Junk Bay and considered as having low ecological value. With implementation of mitigation measures presented in ***Section 5.1***, the indirect impacts to these coral colonies are not expected to be significant. Coral communities of moderate/ high ecological value at Southwest Junk Bay, Sung Kong, Waglan islands, Ninepins, Fat Tong Chau, Tai Long Pai and Tung Lung Chau, given the proposed cable footprint does not directly affect these areas are all considered too remote from the cable route to be adversely affected by the elevation of suspended solids and settlement of sediment due to the works i.e. they are all at least 430 m from the alignment which is over two times the distance suspended sediments due the Project are expected to travel. The distance of the cable system from sensitive receivers such

as these has been maximized, as detailed in the ***Section 1.5.2 of main report***. Potential disturbance to these corals is therefore also expected to be negligible, given they are over two times the maximum distance of transport for suspended sediments (i.e. 180 m) and at a different depth. For the coral communities in Cape Collinson and Ngan Wan (area with relatively higher coral diversity; see ***Section B3.7*** above) located ~80 m from the proposed cable alignment. Given the short-term nature of the cable laying works and mitigation measures presented in ***Section 5.1***, potential disturbance to corals is expected to be limited and transient. A total of only 95 working days would be required for the whole alignment (including contingency and buffer), the section near the coral communities in Cape Collinson and Ngan Wan is very short in comparison to the whole alignment. The duration of cable laying works near the coral communities in Cape Collinson and Ngan Wan last around a couple days only. It should also be noted that there may be shallow burial or surface lay with protection (i.e. Articulates Pipe) at the cable system section near the coastline of Cape Collinson and Ngan Wan because of the potential shallow rocky sea bottom with thin sediment layer. With the provision of a mobile silt curtain as a mitigation measure for the cable laying works near Cape Collinson and Ngan Wan, no unacceptable adverse impacts to marine ecological resources are predicted to occur. The mobile silt curtain shall be deployed between the coral communities and the proposed alignment of the cable system to be laid prior to the commencement of the cable laying works of the concerned section. The proposed location for deployment of mobile silt curtain is indicated in ***Figure A3***. Therefore, no adverse indirect impacts to coral communities are expected due to the Project.

Marine mammals are highly mobile and can swim into open waters to avoid short term and localized seabed disturbance. In addition, they are air breathing and hence SS in the water column have no effect on their respiratory surfaces. Moreover, as assessed in the fisheries chapter (see ***Appendix C***), this Project is not expected to have significant impacts to fisheries resources due to the cable installation works. Thus, the food source for marine mammals is not considered to be adversely impacted.

Cable installation works may result in a minor and short-term increase in underwater sound from marine vessels. FP, which are the more abundant marine mammal species in this area, use high frequency ultrasonic clicks for foraging and communication. The low frequency underwater sound associated with vessels, injection jetting and cable laying would thus not be expected to interfere significantly with them. Similarly, although some vessel sounds may be within the audible range of CWD, this is generally for high-speed vessels [(22)]. The submarine cable installation works will be short-term and temporary and be carried out by one slow moving cable installation vessel/ barge. The installation vessel/ barge works for submarine cable laying works will take approximately 95 days (including contingency and buffer) in Hong Kong waters and over this short timeframe are not expected to interfere significantly with this cetacean species either. Thus, no unacceptable adverse impacts to FP and CWD from the Project (e.g. from underwater sounds or the cable laying vessel) are expected to occur.

4.2.3 Submarine Cable Installation Shore End Laying, Burial and Ocean Ground Bed Installation

The cable system will be buried by a professional jetting tool to a burial depth of 5 m below the seabed using jetting technique, as indicated in ***Section 2.1.1* of main report**. The burial depth will be increased to 6 m below the seabed at the submarine cable section that overlaps with the Tathong Channel Traffic Separation Scheme and toward inshore to avoid potential impact to the submarine cable due to the high traffic flow, such as emergency anchoring within the Channel. The injector fluidises a trench using high pressure water jets and the cable system is immediately laid within the trench. The maximum width of the seabed fluidised by the injector is 0.5 m for most of the route and

(22) Sims, P. F. G., Hung, S. K., & Würsig, B. (2012). High-speed vessel noises in West Hong Kong Waters and Their Contributions Relative to Indo-Pacific Humpback Dolphins (*Sousa chinesnis*). Journal of Marine Biology. Vol. 2012, ID169103, 11pp

the cable system will be buried to a depth of up to 5 m. It should be noted that the seabed can be expected to naturally reinstate to before-work level and condition shortly after completion of the works.

Coastal Protection Area (CPA): Part of the proposed alignment to be located within 500 m from the CPAs along entire coast from Siu Sai Wan to Big Wave Bay, and along the coastlines of Tai Tau Chau near Shek O. The distances between the alignment and the CPAs have been optimised as much as possible. Considering the small scale and very short period of cable burial works to be carried out at the landing site, the temporary impacts arising from the works will be insignificant.

It should be noted that several other in-service cable systems share similar alignment and distances to the CPAs, as indicated in ***Figure 1.3***. Examples of in-service and planned submarine cable projects which are within 500 m from CPA(s) include Cheung Chau Submarine Cable System; Peng Chau Cable System; Lamma Cable System; Asia Direct Cable System - Hong Kong Segment (ADC-HK) - Chung Hom Kok; H2H Express Submarine Cable; Bay to Bay Express Cable System - Hong Kong Segment (BtoBE-HK) – Chung Hom Kok; South East Asia - Japan 2 Cable System - Hong Kong Segment (SJC2-HK) - Chung Hom Kok; Hong Kong - Guam Submarine Cable Project (HK-G); and HKA Submarine Cable - Chung Hom Kok.

Intertidal Hard Bottom Habitats: The intertidal rocky shore along the shoreline of TKO will not be affected as the cable system will be pulled and guided to the duct opening at the toe of the artificial seawall, which will be constructed separately prior to the Project as described in ***Section 1.4.2 of main report***. No direct impact is anticipated to intertidal hard bottom habitat due to the construction activities.

Intertidal and Subtidal Soft Bottom Habitats: Short-term direct impacts will occur to soft bottom benthic assemblages present in both the intertidal and subtidal zone along any cable or earthing trenches. It is, however, expected that once the cable laying and earth system operations are completed, the soft bottom habitats will be recolonised by benthic fauna which are expected to be similar to the soft bottom benthic assemblages presented before construction (or repair) activities commenced. As a result, direct impacts to intertidal and subtidal soft bottom benthic assemblages are not anticipated to be significant.

Subtidal Hard Bottom Habitats: The subtidal rocky habitat along the coastline of TKO will not be affected as the cable system will land under the rocks. The cable laying and earth system are planned to be installed to avoid direct impacts on the hard bottom habitats and minimize the impacts on coral communities, including the selection of route in soft bottom habitat with low coral coverage and ecological value and cable installation by diver(s) in shallow waters. With implementation of mitigation measures as presented in ***Section 5.1***, direct impact to the coral communities in the vicinity of the proposed cable alignment near TKO is not anticipated to be significant. No direct impacts are expected to any other coral colonies either including coral communities along the coast of Sung Kong, Waglan Island, Ninepins, Ngan Wan and Tai Long Pai, given the proposed cable footprint does not directly affect these areas.

Marine Mammals: In Hong Kong, there have been instances when marine mammals have been killed or injured by vessel collisions [23] [24], and it is thought that this risk is mainly associated with high-speed vessels such as ferries. Given the marine vessel to be used for cable installation works is slow moving, the risk of vessel collision with marine mammals is very small. As such, direct impacts to marine mammals due to vessel collision are not anticipated to be significant.

(23) Parsons, E. C. M., & Jefferson, T. (2000). Post-mortem investigations on stranded dolphins and porpoises from Hong Kong waters. Journal of Wildlife Diseases 36: 342-356.

(24) Jefferson, T. A., Curry, B. E. & Kinoshita, R. (2002). Mortality and morbidity of Hong Kong finless porpoises, with special emphasis on the role of environmental contaminants. Raffles Bulletin of Zoology (Supplement) 10: 161- 171.

4.3 Cumulative Impacts

As discussed in ***Section 2.3 of main report***, the construction of Hong Kong – Guam Submarine Cable Project (HK-G) may be conducted concurrently with the Project. The Project Proponent will keep track of any updates of the HK-G cables, and liaise with the HK-G project team to avoid overlapping of the construction activities of HK-G Cable and SHV-HK Cable system. As such, cumulative marine ecological impacts are not anticipated.

4.4 Operation Phase (including Maintenance)

During operation of the proposed cable system, impacts to marine ecological resources are not expected to occur. There may be a potential requirement for maintenance work (i.e. cable repair at a particular fault location due to unexpected damage) to be carried out during operation phase. For repairs along the inshore and remaining submarine cable alignment, equipment and methods would be similar in nature to that used during cable installation works, but not along the full alignment (i.e. of smaller scale), with the potential to use smaller equipment such as Remotely Operated Vehicles (ROVs) equipped with injector tool and divers with hand held tools. The repair works process for shore end and marine works is therefore expected to have similar or reduced impact as compared to construction phase.

5. EVALUATION OF IMPACTS

An evaluation of the impact in accordance with the *EIAO-TM Annex 8 Table 1* is presented below.

- *Habitat Quality*: Short-term direct impacts are predicted to occur to subtidal soft bottom habitats along the cable trench. Short-term indirect impacts are also predicted to occur to intertidal/ subtidal hard bottom habitats in the vicinity of the cable route and cable landing site. The subtidal soft bottom habitats which may be directly affected are, however, considered to be of low ecological importance. Since the maximum distance of transport for suspended sediments would be 180 m from the cable burial tool and the cable laying works are mostly over 500 m away from marine sensitive receivers and short-term nature (i.e. approximately 95 days including contingency and buffer for the whole alignment in Hong Kong waters), with mitigation measures in ***Section 5.1*** in place, the potential indirect impacts on the intertidal/subtidal hard bottom habitats are not expected to be significant.
- *Species*: No species that are considered of high ecological value are expected to be directly affected. FP occurs in eastern waters with important habitats around Po Toi Islands and at the juncture of Po Toi and Ninepins. FPs are known to use high frequency ultrasonic clicks for foraging and communication. Given the short timeframe of the Project as well as the cable installation vessel/barge being slow-moving and emitting low frequency underwater sound, no unacceptable adverse impacts to FP from the Project are expected to occur. It is expected that only sparse coral colonies of 6 species at Junk Bay will be indirectly impacted, but these corals are common in Hong Kong waters with very low coverage at Junk Bay and considered as having low ecological value, with mitigation measures in ***Section 5.1*** in place, the potential indirect impacts on the coral colonies at Junk Bay are not expected to be significant. Coral communities of moderate/ high ecological value at Southwest Junk Bay, Sung Kong, Waglan islands, Ninepins, Fat Tong Chau, Tai Long Pai and Tung Lung Chau are located at least 430 m from the alignment which is over two times the distance suspended sediments due the Project are expected to travel. Therefore, adverse impact due to elevation of suspended solids and settlement of sediment from the Project to these coral communities is not anticipated. The coral communities in Cape Collinson and Ngan Wan (area with relatively higher coral diversity; see ***Section B3.7*** above) is located within the dispersal range of suspended sediments generated from the jetting works. With deployment of a mobile silt curtain for the works near the concerned coral communities in Cape Collinson and Ngan Wan, it is expected there is no unacceptable adverse impact to corals. The indirect impacts to these coral colonies are not expected to be significant. In addition, the cable burial works are short-term in nature and overall, no unacceptable adverse impacts to the coral communities are expected.
- *Size*: The length of the cable system will be approximately 35.402 km inside Hong Kong waters. The cable system will be buried using a professional jetting tool which the burial depth offshore will be up to around 5 m below the seabed in Hong Kong waters. The burial depth will be increased to 6 m below the seabed at the submarine cable section that overlaps with the Tathong Channel Traffic Separation Scheme and toward inshore to avoid potential impact to the submarine cable due to the high traffic flow, such as emergency anchoring within the Channel.
- *Duration*: The duration of the submarine cable laying will last approximately 95 days (including contingency and buffer).
- *Reversibility*: Direct impacts to soft bottom marine community are expected to be short-term and re-colonisation of the sediments is expected to occur shortly. Indirect impact to hard bottom marine community is expected to be short-term and reversible.
- *Magnitude:* No unacceptable adverse impacts to ecologically important organisms or habitats are predicted to occur. The magnitude of impacts during the laying of the cable system is expected to be of low severity and is considered acceptable, given that the disturbances are of small scale, short-term and localised.

- *Regional significance:* The coral species and intertidal species recorded in field surveys and literature review are common and widespread in Hong Kong and adjacent waters. Unacceptable impacts to habitats or species with restricted distribution are note anticipated.

Overall, it is considered that the impact of the Project is unlikely to be significantly adverse.

5.1 Mitigation Measures

In accordance with the guidelines in the *EIAO-TM* on marine ecology impact assessment, the general policy for mitigating impacts to marine ecological resources, in order of priority, are:

- **Avoidance:** Potential impacts should be avoided to the maximum extent practicable by adopting suitable alternatives.
- **Minimisation:** Unavoidable impacts should be minimised by taking appropriate and practicable measures such as constraints on intensity of works operations (e.g. jetting rates) or timing or works operations.
- **Compensation:** The loss of important species and habitats may be provided for elsewhere as compensation. Enhancement and other conversation measures should always be considered whenever possible.

Based on the above, mitigation measures are discussed below.

5.1.1 Avoidance of Impacts

Impacts to marine ecological resources have largely been avoided for the cable laying through the selection of a landing site and cable corridor that avoids impacts to coral communities with moderate and high ecological value and through the employment of cable laying techniques that result in little disruption to the marine environment. With consideration of other physical constraints, including avoidance of the major marine vessel fairways and minimising crossings with other submarine cables, it is inevitable for part of the proposed alignment to be located within 500 m from the Coastal Protection Areas (CPAs) along entire coast from Siu Sai Wan to Big Wave Bay, and along the coastlines of Tai Tau Chau near Shek O. The distances between the alignment and the CPAs have been optimised as much as possible. The SHV-HK Cable system routing has been carefully considered (See ***Section 1.5.2 of main report***). The route was finalised to avoid all known key environmentally sensitive receivers/ areas, such as Fish Culture Zones (FCZs), coral communities of high ecological value, Marine Reserve and Sites of Special Scientific Interest (SSSI), etc.

5.1.2 Minimisation of Impacts

Mitigation measures that have been recommended to reduce impacts to water quality and are also expected to control impacts to marine ecological resources (refer to ***Section A4.4 of Appendix A***). For all marine works:

- The cable laying barge will typically operate at a speed of up to 0.2 km hr^{-1}, with a maximum forward speed not exceeding 1 km hr^{-1} so that the amount of seabed sediment disturbed and dispersed during the cable laying process can be kept to a minimum.
- To protect the coral communities in Cape Collinson and Ngan Wan from the sediment plume from the cable installation works, mobile silt curtain will be installed between the coral communities in Cape Collinson and Ngan Wan and the works area prior to and during the cable laying works near Cape Collinson and Ngan Wan. The proposed location of the mobile silt curtain is indicated in ***Figure A3***.
- Where necessary, there will be minor adjustment in the cable alignment by divers in case corals are encountered near the landing site at TKO to avoid direct impacts to the corals.

- Furthermore, with the implementation of good house-keeping practices, no unacceptable impacts to either water quality or marine ecological resources are expected to occur from land based activities.

Based on the above mitigation measures (refer to ***Appendix A*** for full water quality mitigation measures details) and short duration of submarine cable laying works for the whole alignment (i.e. last approximately 95 days), no compensation will be required as no unacceptable residual impacts to marine ecological resources are predicted to occur.

5.1.3 Precautionary Measures

Water quality monitoring will be carried out as a precautionary measure, to verify that the Project works will not result in any unacceptable impacts to water quality, and consequently to marine ecology and fisheries. Divers are also expected to avoid contacting corals as much as possible when underwater. Precautionary measures are recommended for marine mammals (marine mammal exclusion zone) to ensure that no adverse impacts to marine mammals result from cable installation works or repair works.

The monitoring details for water quality and marine mammals are presented in ***Appendix F***.

6. SUMMARY AND CONCLUSIONS

6.1 Evaluation of Impacts

The review of the existing information on the marine ecological resources in the vicinity of the proposed cable landing point and the proposed cable alignment have identified the area to be of generally low to moderate ecological value in terms of supporting marine fauna.

Although intertidal and subtidal soft bottom assemblages will be disturbed during the cable laying works, the habitats will be reinstated by similar communities within a short time and thus the impacts are considered acceptable and unlikely to be adverse.

The rocky shores in the vicinity of the proposed cable landing site at TKO support low abundance and diversity of intertidal organisms. All these species are common and widespread on the similar shores in Hong Kong and as such, are considered to be of low ecological value. Impacts to these assemblages are, therefore, not regarded as significant.

Six hard coral species have been identified in the vicinity of the proposed cable landing site at TKO but in low abundance and diversity. The coral communities of high ecological value in Cape Collinson and Ngan Wan are located 80 m from the proposed alignment. Other coral communities of moderate/ high ecological value identified are located at least 430 m away from the alignment which is outside the dispersal range of suspended sediment due to the Project construction. To protect the coral communities in Cape Collinson and Ngan Wan which are in close proximity, deployment of a mobile silt curtain is proposed. Where necessary, there will be minor adjustment in the cable alignment by divers in case corals are encountered near the landing site at TKO to avoid direct impacts to the corals. With the implementation of the mitigation measure, potential disturbance to corals is expected to be limited and transient given the short-term nature of the cable laying works. Due to the small scale of the works, the short duration of impacts and the limited dispersion distance of sediment plume, any potential impacts are not considered to be significant and unlikely to be adverse.

The southeastern waters of Hong Kong are not considered to be frequently used habitat by the CWD. Sightings of the FP were also found to be seasonal and infrequent along the proposed cable corridor. It is expected that the submarine cable laying works will last for a short duration (approximately 95 working days including contingency and buffer) and will involve one main cable installation vessel/barge. Significant disturbance/ adverse impacts to marine mammals, in terms of underwater noise, marine traffic and food sources, is therefore not expected.

6.2 Mitigation Measures

Impacts to marine ecological resources have largely been avoided through the selection of a landing site and cable corridor that reduce impacts to coral communities and through the employment of techniques that result in little disruption to the marine environment.

Mitigation measures that have been recommended to reduce impacts to water quality are also expected to control any impacts to marine ecological resources, particularly the coral colonies in the vicinity of the cable alignment. These mitigation measures include limiting the maximum speed of the cable laying machine and implementing good house-keeping practices during land-based activities (full details in ***Appendix A***). As precautionary measures, a water quality monitoring programme and marine mammal exclusion zone monitoring have also been recommended. Divers are also expected to avoid contacting corals as much as possible when underwater. Where necessary, there will be minor adjustment in the cable alignment by divers in case corals are encountered near the landing site at TKO to avoid direct impacts to the corals. All these measures will ensure that no adverse impacts to the corals and marine mammals will result from cable installation works or any future maintenance/ repair work that might be required.

The monitoring details for water quality and marine mammals are presented in ***Appendix F***.

APPENDIX C REVIEW ON POTENTIAL IMPACTS TO FISHERIES RESOURCES AND FISHING OPERATIONS

CONTENTS

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1. INTRODUCTION

This **Appendix** presents existing information on the fisheries resources/ production and fishing operations within and adjacent to the proposed cable corridor (including grounding system) and evaluates the potential for direct and indirect impacts to them during construction and operation (including maintenance) of the Hong Kong section of the proposed Sihanoukville-Hong Kong Submarine Cable ("SHV-HK Cable System") (hereafter referred to as the Project). The cable system is unlikely to be damaged by fishing activity as it will be buried to a depth of up to 5 m under the seabed for the majority of the cable corridor. The burial depth will be increased to 6 m below the seabed at the submarine cable section that overlaps with the Tathong Channel Traffic Separation Scheme and toward inshore to avoid potential impact to the submarine cable due to the high traffic flow, such as emergency anchoring within the Channel. The seabed will be reinstated to the before-work level and condition very shortly. During operation, there may be a potential requirement for maintenance work (i.e. cable maintenance/ repairing at particular fault location due to unexpected damage) to be carried out. These works will be similar in nature to cable installation works, using similar, if not smaller scale, equipment and methods but for a shorter duration and are also considered in this **Appendix**.

2. RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The criteria for evaluating fisheries impacts are laid out in *Annex 17* of *Environmental Impact Assessment Ordinance (Cap. 499. S.16)* and the *Technical Memorandum on EIA Process (EIAO-TM)* and *Annex 9* of the *EIAO-TM* recommends some general criteria that can be used for evaluating fisheries impacts. Other legislation which applies to fisheries resources/ production include: the *Fisheries Protection Ordinance (Cap. 171)* which provides for the conservation of fish and other aquatic life and regulates fishing practices; and the *Marine Fish Culture Ordinance (Cap. 353)* which regulates and protects marine fish culture and other related activities.

3. DESCRIPTION OF THE ENVIRONMENT

In Hong Kong, the commercial marine fishing industry is divided into capture and culture fisheries. However, there are no gazetted Fish Culture Zones (FCZs) within 500 m of the proposed cable corridor. While FCZ is considered as water quality sensitive receiver and the associated potential impacts are evaluated in **Appendix A**. As such, culture fisheries are considered unlikely to be affected by the Project and they will thus only be discussed briefly. The following baseline information is focusing on capture fisheries and briefly describing the nearest culture fisheries. The baseline has been derived from the information of Port Survey 2021 published by the Agriculture, Fisheries and Conservation Department (AFCD) [(1)]. Information from other relevant studies were also reviewed in order to determine if the waters of the proposed cable corridor are important spawning grounds or nursery areas for commercial fisheries [(2)].

3.1 Fisheries

3.1.1 Capture Fishing Operations

In Port Survey 2021, an interview programme collecting information from local fishermen about their fishing operations and fisheries production in Hong Kong waters was carried out. Based on the information and data collected, figures generally showing the geographical distribution and estimated levels of fishing operations and fisheries production in Hong Kong waters were produced. The numbers of fishing vessels around the proposed cable route were mainly unspecified or low (>0 – 50

(1) AFCD (2022). Port Survey 2021. Hong Kong SAR Government.

(2) ERM-Hong Kong, Limited (1998). Fisheries Resources and Operations in Hong Kong Water. Final Report prepared for AFCD.

vessels to >100 – 200 vessels), except for three grids with moderate numbers of fishing vessels (>200 – 400 vessels) operating in the waters to the east of Cape D'Aguilar and to the north of Sung Kong, and one grid which had higher numbers of fishing vessels (>400 – 600 vessels) operating in waters near northeast of Po Toi Island (***Figure C1***). The major type of fishing vessels along the cable route are mostly sampans among all types of fishing vessels (***Figures C2*** and ***C3***).

3.1.2 Capture Fisheries Resources / Production

Levels of adult fisheries production [(3)] from the grids traversed by the cable corridor were unspecified or low to moderate (>0 – 50 kg per hectare to >300 – 400 kg per hectare). Fisheries production in waters traversed by the cable corridor was recorded as the highest in waters to the northeast of Po Toi Island (>300 – 400 kg per hectare), and to the north of Sung Kong with moderate productions (>200 – 300 kg per hectare) (***Figure C4***).

The top ten families/ groups of fish catch production recorded in Port Survey 2021 throughout Hong Kong waters (in terms of weight), are presented in ***Table C3.1***. Main Commercial Families of Fisheries Resources in South-Eastern Water of Hong Kong recorded in *Report on Survey of Fisheries Resources in Hong Kong (2010-2015),* are presented in ***Table C3.2*** and ***Table C3.3***. Other families/groups of common fish catch include Platycephalidae (flathead), Muraenesocidae (conger-pike eel), mixed shrimp and Scombridae (mackerel), etc.

Table C3.1 The Top Ten Families / Groups of Fish Catch in Hong Kong Waters

Rank	Family / Group	Common Name
1	Clupeidae	Sardine, Shad
2	Mugilidae	Mullet
3	Sciaenidae	Croaker
4	Carangidae	Scad, Jack
5	Siganidae	Rabbitfish
6	Sparidae	Seabream
7	Mixed crab	Crab
8	Mixed squid	Squid
9	Polynemidae	Threadfin
10	Scorpaenidae	Scorpionfish, Common rockfish

Source: AFCD Port Survey 2021
Notes:
[1] Ranking is based on the estimated weight of production of each family/group of fish catch.

Table C3.2 Main Commercial Families of Fisheries Resources in South-Eastern Water of Hong Kong from Shrimp Trawl Surveys

Rank	Family / Group
1	Leiognathidae
2	Platycephalidae
3	Sparidae
4	Portunidae
5	Sciaenidae
6	Polynemidae
7	Cynoglossidae

(3) In Port Survey 2021, production related to fish fry collection was found negligible.

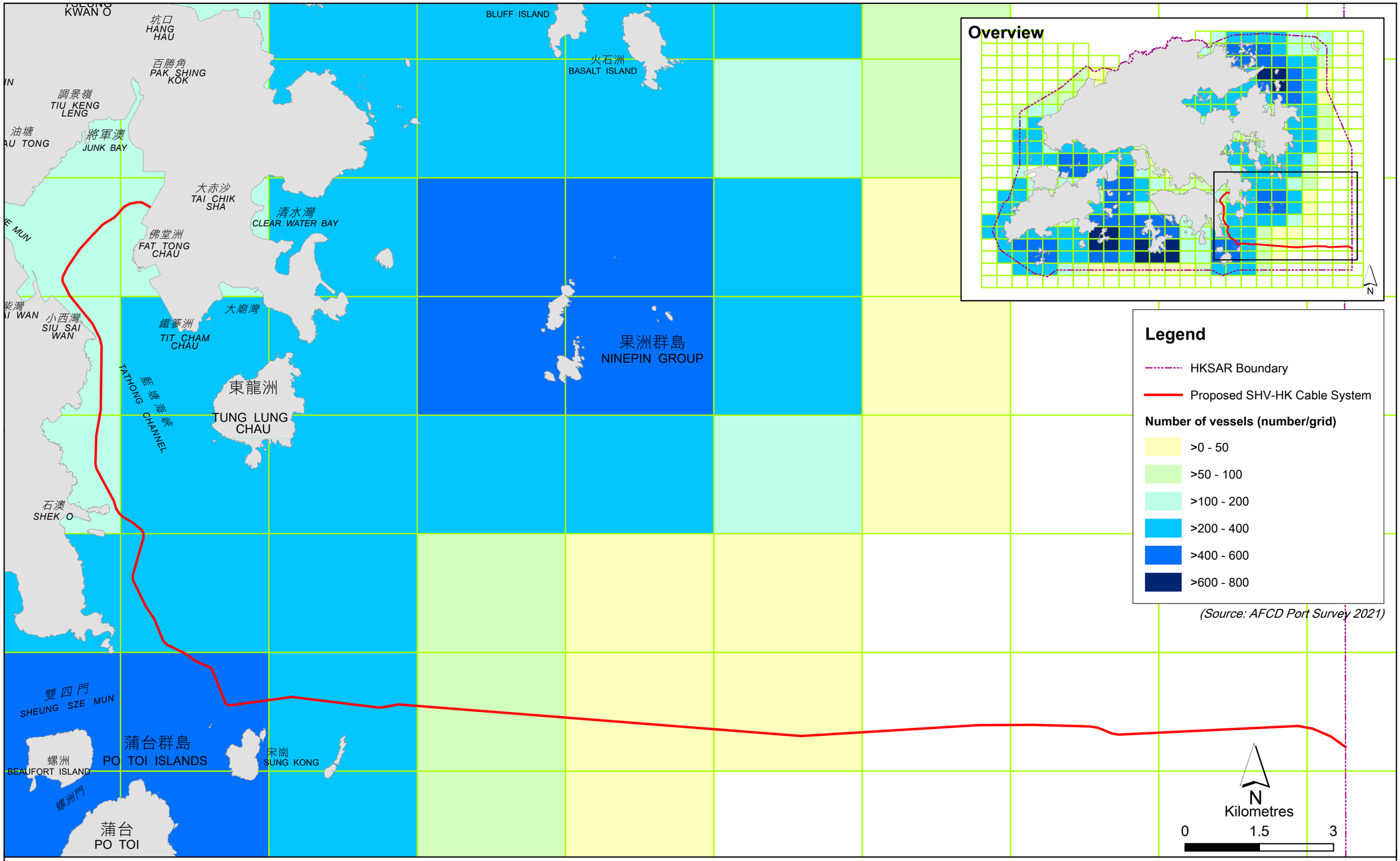

Figure C1

Geographical Distribution of Fishing Operations (Overall) near the Project in 2021

ERM

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Date: 8/11/2024

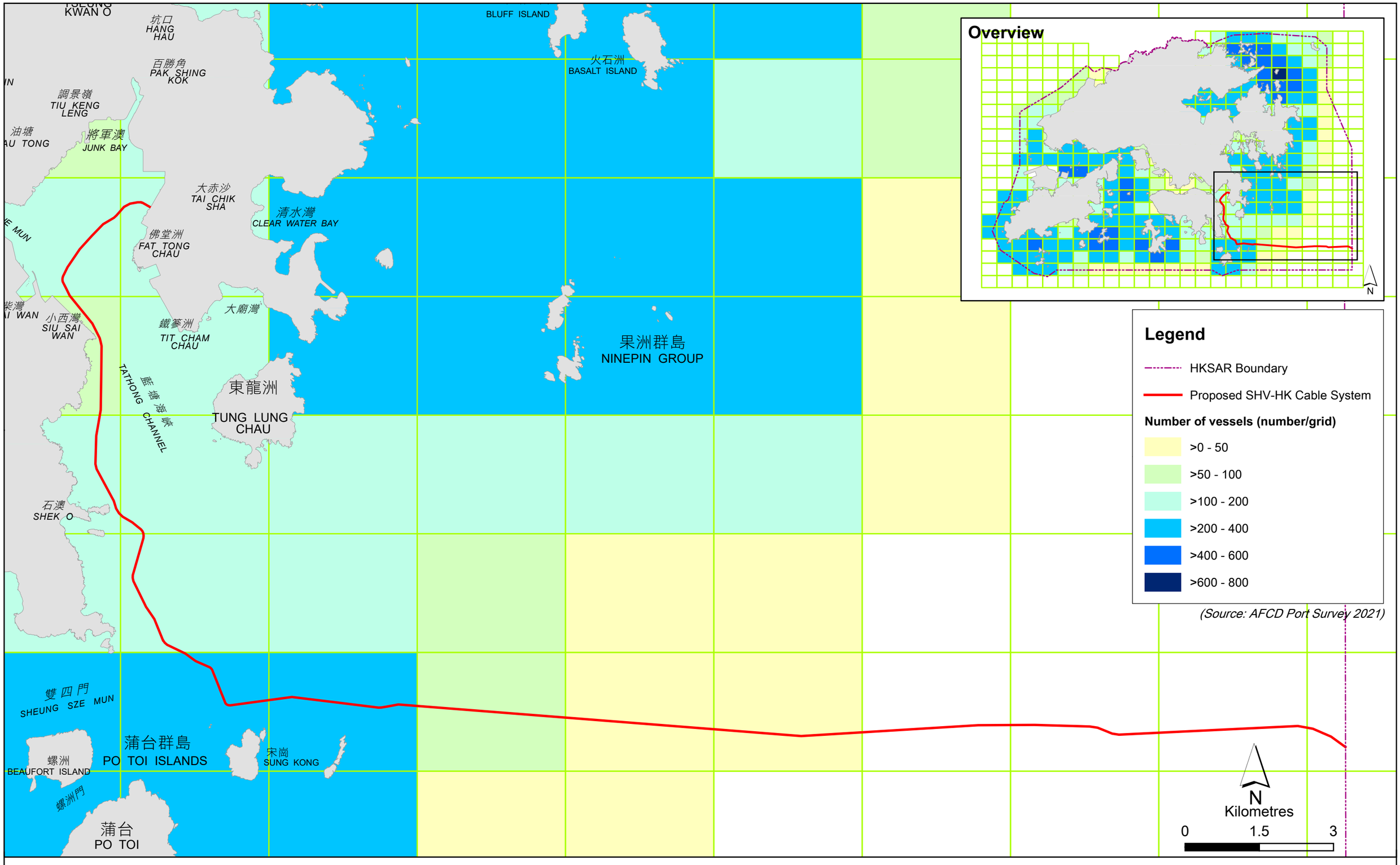

Figure C2

Geographical Distribution of Fishing Operations (Sampan) near the Project in 2021

ERM

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Date: 8/11/2024

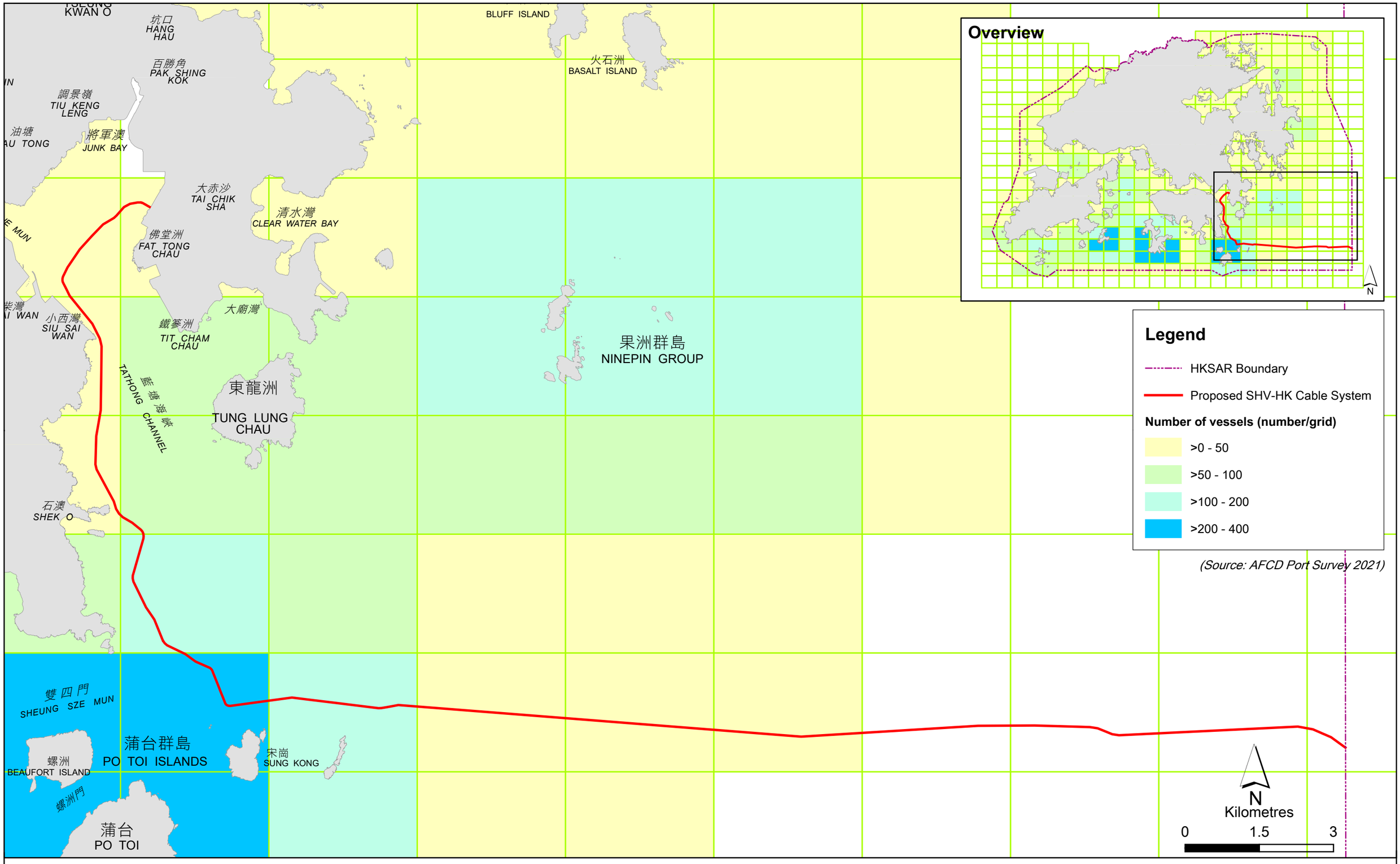

Figure C3

Geographical Distribution of Fishing Operations (Other Types of Fishing Vessels) near the Project in 2021

ERM

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Date: 8/11/2024

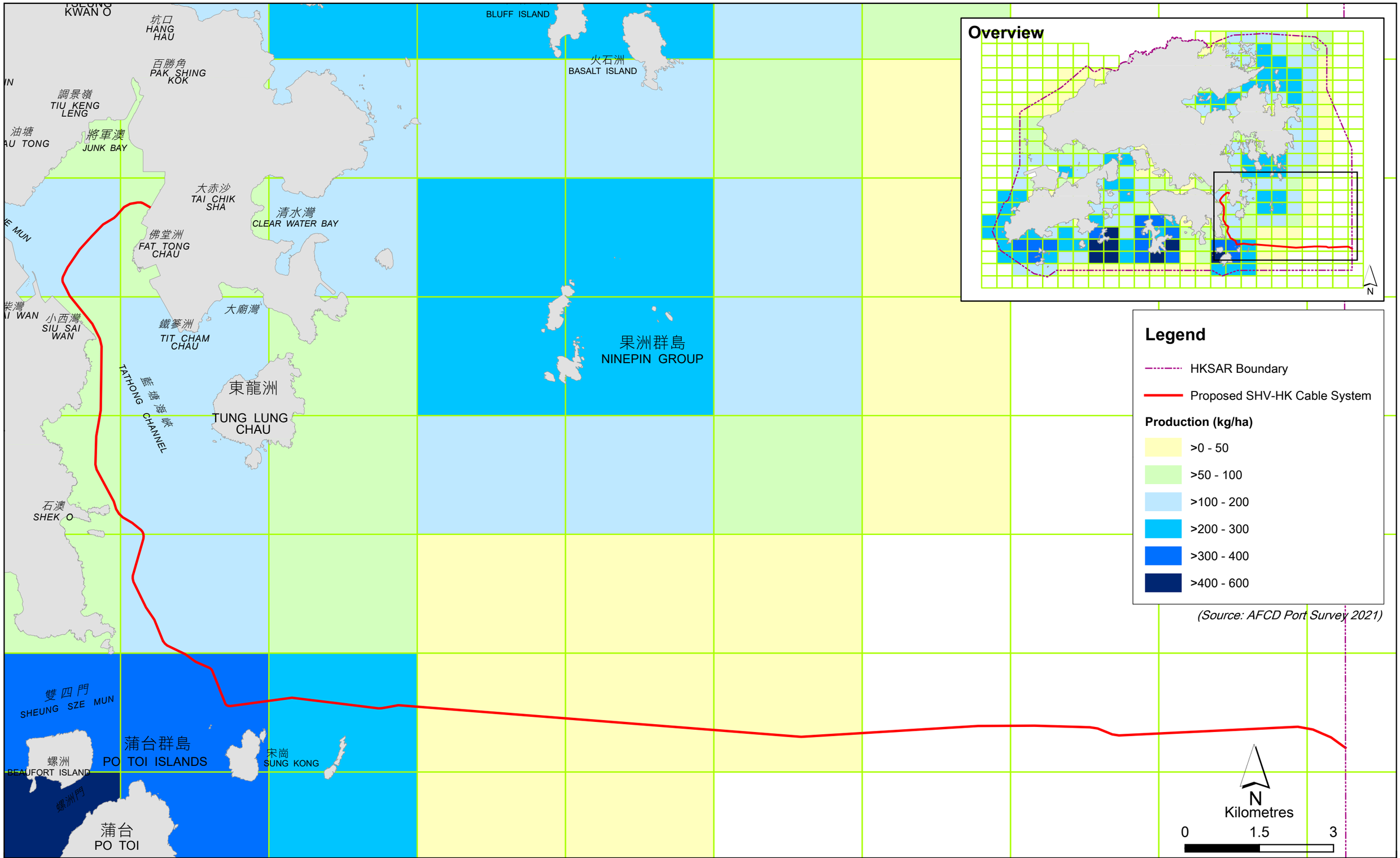

Figure C4

Geographical Distribution of Fisheries Production (Overall) near the Project in 2021

File: T:\GIS\CONTRACT\0619471\mxd\Port_Survey\0619471_Fisheries_Production_(Overall).mxd
Date: 8/11/2024

Rank	Family / Group
8	Penaeidae
9	Terapontidae
10	Synodontidae

Notes:
[1] Based on the results of the "*Report on Survey of Fisheries Resources in Hong Kong (2010-2015)*".
[2] Consolidated tanking based on the biomass of each family collected in the surveys.

Table C3.3 Main Commercial Families of Fisheries Resources in South-Eastern Water of Hong Kong from SternTrawl Surveys

Rank	Family / Group
1	Leiognathidae
2	Sparidae
3	Carangidae
4	Clupeidae
5	Engraulidae
6	Sciaenidae
7	Trichiuridae
8	Stromateidae
9	Nemipteridae
10	Synodontidae

Notes:
[1] Based on the results of the "*Report on Survey of Fisheries Resources in Hong Kong (2010-2015)*".
[2] Consolidated tanking based on the biomass of each family collected in the surveys.

3.1.3 Culture Fisheries

There are no gazetted FCZ within 500 m of the proposed cable corridor. The closest FCZ is Tung Lung Chau FCZ located ~2.5 km away from the cable system at its closest point. According to the water quality impact assessment in ***Appendix A***, the maximum travel distance of the sediment plume generated during cable installation is 180 m. As such, no water quality impact is expected on Tung Lung Chau FCZ due to the cable installation/ operation works. As Tung Lung Chau FCZ will not be affected by the proposed Project due to their relative remoteness from the alignment, it will not be discussed further.

3.1.4 Spawning and Nursery Areas

The fisheries study in 1998 reveals that the area traversed by the cable corridor was not being considered as an important nursery area for commercial fish species [(4)]. In AFCD Port Survey 2021 as well as AFCD Port Survey 2016/17 [(5)], fish fry collection was recorded to be negligible in all waters in Hong Kong, and distribution of fisheries production in Hong Kong waters was therefore not provided in a figure. The data is consistent with the previous Port Surveys in 2006 [(6)] which recorded fish fry production within grids and indicated that some grids with the lowest density (>0 – ≤50 tails/ha) are traversed by the proposed cable corridor (***Figure C5***). These data consistent with the finding in the 1998 study. However, the cable route passes through a recognised spawning ground in the

(4) ERM-Hong Kong, Limited (1998). Fisheries Resources and Operations in Hong Kong Water. Final Report prepared for AFCD.

(5) AFCD (2017). Port Survey 2016/17. Hong Kong SAR Government.

(6) AFCD (2006). Port Survey for year 2006. Hong Kong SAR Government.

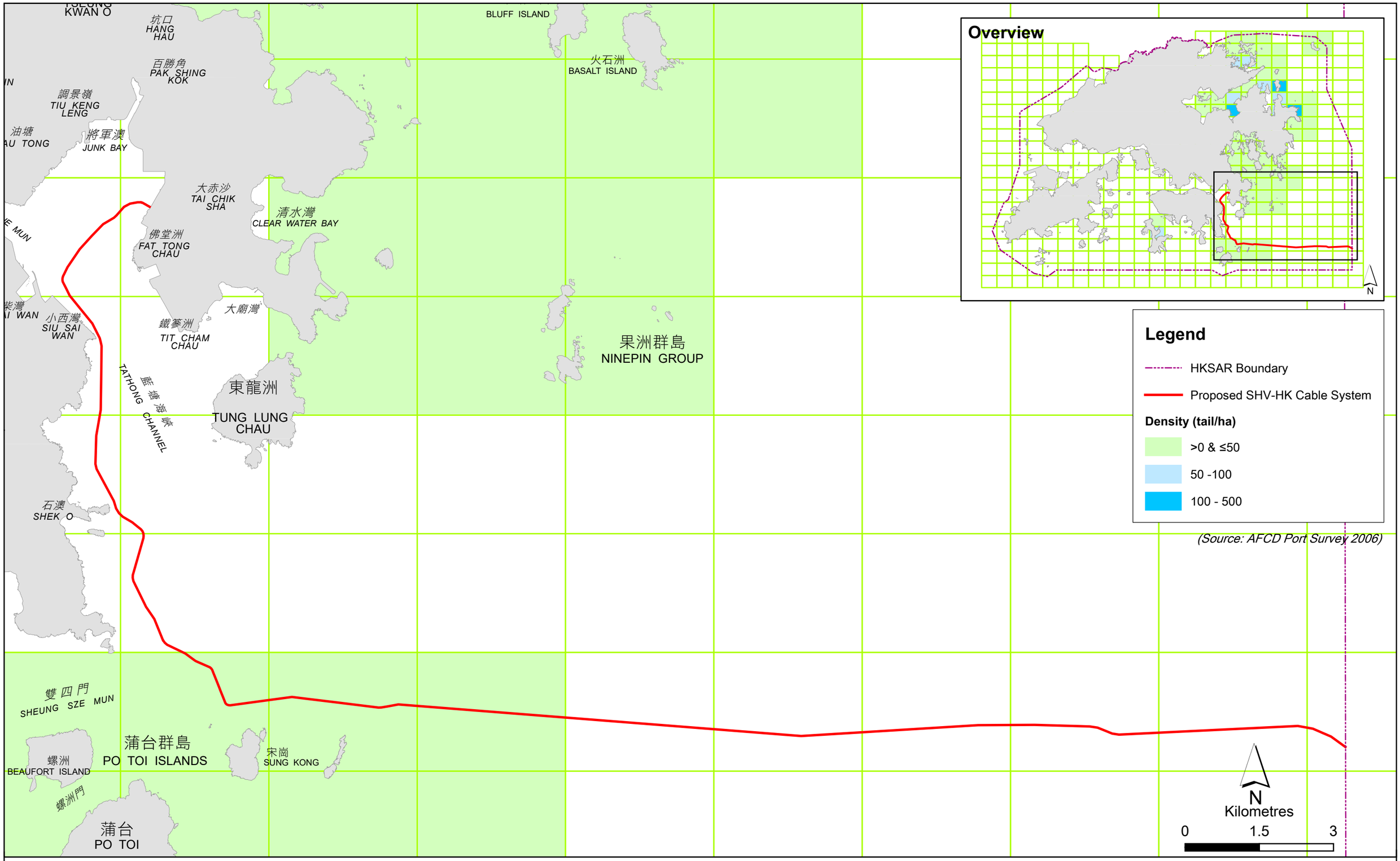

Figure C5

Geographical Distribution of Fisheries Production (Fish Fry) near the Project in 2006

File: T:\GIS\CONTRACT\0619471\mxd\Port_Survey\0619471_Fisheries_Production_(Fish_Fry_2006).mxd
Date: 8/11/2024

eastern waters of Hong Kong, which is a fisheries sensitive receiver of the Project (refer to ***Figure 3.1***).

3.1.5 Artificial Reef Deployment

Since 1996, AFCD has been implementing an artificial reef project to enhance fisheries resources, restore destructed habitats, protect important nursery and spawning grounds and marine protected areas; and improve the habitat quality of homogenous seabed [(7)].

Based on latest information, there is no existing or committed artificial reef deployment along the proposed SHV-HK cable system. The site of artificial reef deployment located closest to the proposed SHV-HK cable system is the one at Outer Port Shelter, which is >5.0 km (sea distance) away from the Project, and separated from the Project by the land of Tseung Kwan O. Considering the great distance and the physical separation, the Outer Port Shelter artificial reef deployment site will not be affected by the Project. Potential impacts from the Project to Outer Port Shelter artificial reefs will not be discussed further.

3.1.6 Fisheries Sensitive Receivers

As discussed above, Tung Lung Chau FCZ and Outer Port Shelter artificial reef deployment site are located ~2.5 km and >5.0 km from the Project, and will not be affected by the construction and operation activities of the Project due to their relative remoteness from the cable alignment.

The recognised spawning ground in eastern and southeastern Hong Kong waters is the only fisheries sensitive receiver located within the Project. Its location has been indicated in ***Figure 3.1***.

(7) AFCD (2023). About Us. Hong Kong Artificial Reef Project. Accessed 1 Jun 2023. https://www.artificial-reef.net/en/web/ar/about-us

4. IMPACT ASSESSMENT

4.1 Construction Phase

Impact due to Cable Laying

Although the cable laying works will traverse to waters with low to moderate capture fisheries production as indicated in Port Survey 2021, the proposed injection jetting technique of burial will only lead to localized disturbance of seabed sediments, and expected to result in short-term SS elevations in the immediate vicinity (within 180 m from the cable alignment as detailed in ***Appendix A***). Sediments that may be lost in suspension are likely to remain in the lower part of the water column and settle back onto the seabed within a short period of time (approximately 200 seconds as detailed in ***Appendix A***).

Impact due to Cable Burial

Minor interruptions to fishing operations are expected to occur only during the cable installation and potential maintenance/ repairing of the proposed Project. The proposed cable system will be submerged using injector/ sledge tool to a target depth of up to 6 m under the seabed. Through the employment of this burial technique, the seabed will be reinstated by resettlement of disturbed sediments and natural erosion from nearby seabed. Recolonisation of the sediments by benthic infauna is expected to occur, therefore providing food for bottom.

Indirect impacts may occur through elevation in suspended solids (SS) resulting from the disturbance of the seabed through the burial of the cable system, and other marine work activities. dwelling fisheries resources and the habitat will continue serve as spawning and nursery grounds.

Overall Impact

These disruptions are, however, expected to be minimal as the duration of time required for cable installation/ maintenance/ repairing works will be short (i.e. approximately 95 days for cable laying and duration of any cable maintenance/ repairing work during operation is anticipated to be of shorter duration) in Hong Kong waters and fishing vessels could continue to operate in nearby waters.

Therefore, no long-term direct impacts to fisheries resources or fishing operations are expected to occur aside from minor short-term disturbances to the seabed and spawning and nursery grounds in the immediate vicinity of cable system or near shore electrical earthing cable and anodes (acting as grounding) laying activities and short-term displacement of fishing activities from the works area. These disturbances are not predicted to affect either fisheries sensitive receivers, fisheries resources, spawning grounds or fishing operations in an unacceptable manner.

4.2 Operation Phase (including Maintenance Phase)

During operation, the cable system will be below the seabed and no impacts on fisheries are anticipated.

Any maintenance/ repairing works during operation are of smaller scale and are considered to take less time, are thus not predicted to cause unacceptable impacts to water quality and consequently unacceptable impacts to fisheries sensitive receivers.

5. FISHERIES IMPACT EVALUATION

The potential fisheries impact has been evaluated in accordance with the *EIAO-TM Annex 9* as presented below:

- **Nature of Impact:** The Project will involve the laying and operating of a submarine cable system connecting to Tseung Kwan O Industrial Estate (TKOIE) to the offshore southeast waters of the eastern boundary of Hong Kong, before entering the South China Sea. The proposed cable system will travel from TKOIE southward along Tathong Channel. After crossing Tathong Channel and near Cape Collinson, the cable system then runs approximately parallel to the Tathong Channel until north of Sung Kong Island where it then turns eastward to the boundary of Hong Kong waters, entering the South China Sea. The construction scale is small, and with injection jetting method, disturbance to the seabed is anticipated to be localised. The seabed will be reinstated by resettlement of disturbed sediments and natural erosion from nearby seabed shortly after the cable burial. The time required for cable installation/ maintenance/ repairing works will be short (*See **Section C4.1***). As such, impacts are considered to be temporary and reversible. No unacceptable impacts to fisheries resources, fisheries sensitive receivers and fishing operations are predicted to occur during the cable laying process or during operation.
- **Size of Affected Area:** The total length of the cable system in Hong Kong waters is approximately 35.401 km. The cable system will be deployed with the employment of the burial technique using injector/ sledge tool. The cable system will not affect culture fisheries, fisheries resources or fishing operations. The maximum works area occupied by the cable installation barge during operation will be approximately 100 m either side along the cable route. In view of the small area occupied by the cable installation barge during construction, potential adverse impacts on vessel transit and fishing activities along the cable alignment are not expected.
- **Loss of Fisheries Resources/ Production:** As discussed in ***Section C3.1.2***, the waters of the proposed cable alignment mainly supported low level of fisheries resources/ production, with the waters to the northeast of Po Toi Island and to the north of Sung Kong supported moderate to high level of fisheries resources/ production. During the construction phase, considering that the construction scale is relatively minor and the construction duration is short (95 days including contingency and buffer), with the employment of the burial technique using injector/ sledge tool, only localised and temporary disturbance to the seabed is anticipated. No unacceptable impact to fisheries resources/ production is anticipated. During the operation phase, as the proposed submarine cable system will be submerged under the seabed, no loss or disturbance to fisheries resources/ production is anticipated under operation. For emergency maintenance/ repairing works during the operation phase, comparing to the construction phase, shorter duration and smaller scale of the works would be required, thus, the magnitude of disturbance to the seabed is therefore anticipated to be even smaller.
- **Destruction and Disturbance of Spawning and Nursery Grounds:** The fish fry production along the proposed cable corridor was negligible, however, a section of the cable route passes through waters identified as spawning grounds of commercial fisheries resources as discussed in ***Section C3.1.4***. The submarine cable laying works are of relatively short duration in Hong Kong (approximately 95 days including contingency and buffer), and given that sediment will disperse a maximum of 180 m from the alignment and settle within a short period of time (approximately 200 seconds), the construction and operation of the proposed submarine cable system is not expected to result in unacceptable adverse impacts to nursery and spawning grounds in Hong Kong waters.
- **Impact on Fishing Activity:** The proposed cable corridor passes through fisheries operation areas which have mainly unspecified or low numbers of vessels and are fished mostly by sampans, as discussed in ***Section C3.1.1***. The submarine cable laying works will only last approximately 95 days (including contingency and buffer), with any maintenance/ repairing works considered to take less time. In addition, the disturbance on seabed is localized and the

seabed is expected to reinstate naturally to before-work level and condition very shortly. As such, impacts to fishing activities are not expected to occur. It should also be noted that the burial depth of the cable after inshore section is approximately 5 m below the seabed. The burial depth will be increased to 6 m below the seabed at the submarine cable section that overlaps with the Tathong Channel Traffic Separation Scheme and toward inshore. Damages to fishing gears /tools by the cable system are therefore not expected.

- **Impact on Mariculture Activity:** The closest FCZ is at Tung Lung Chau, which is ~2.5 km from the cable alignment at the closest point as discussed in ***Section C3.1.3***. The results of the water quality impact assessment (see ***Appendix A***) showed that no significant elevation of SS is expected at the FCZ and hence unacceptable impacts on aquaculture activity are not anticipated.

5.1 Mitigation Measures

Mitigation measures that have been recommended to reduce impacts to water quality and are also expected to control impacts to fisheries resources (refer to ***Section A4.4*** of ***Appendix A***).

For all marine works:

- The cable laying barge will typically operate at a speed of up to 0.2 km hr-1, with a maximum forward speed not exceeding 1 km hr-1 so that the amount of seabed sediment disturbed and dispersed during the cable laying process can be kept to a minimum.
- To protect the coral communities in Cape Collinson and Ngan Wan from the sediment plume from the cable installation works, mobile silt curtain will be installed between the coral communities in Cape Collinson and Ngan Wan and the works area prior to and during the cable laying works near Cape Collinson and Ngan Wan. The proposed location of the mobile silt curtain is indicated in **Figure A3.**
- Furthermore, with the implementation of good house-keeping practices, no unacceptable impacts to either water quality or fisheries resources are expected to occur from land-based activities.

Based on the above mitigation measures (refer to **Appendix A** for full water quality mitigation measures details) and short duration of submarine cable laying works for the whole alignment (i.e. last approximately 95 days), no compensation will be required as no unacceptable residual impacts to fisheries resources are predicted to occur.

5.2 Precautionary Measures

Water quality monitoring will be carried out as a precautionary measure, to verify that the Project works will not result in any unacceptable impacts to water quality, and consequently to fisheries sensitive receivers. The monitoring details for water quality are presented in ***Appendix F***.

6. SUMMARY AND CONCLUSION

Impact

A review of existing information on the fisheries resources/ production and fishing operations in the vicinity of the proposed cable corridor has identified the majority of the area as supporting low to moderate fishing operation and fisheries production. Given the short duration of works and localized, temporary sediment plume (within 180 m from the cable alignment, settling within approximately 200 seconds) arising from the cable system laying or maintenance/ repairing works, no unacceptable impacts have been predicted to occur to fisheries resources, fishing operations or fisheries sensitive receivers as a result of the Project.

Precautionary Measures

Nevertheless water quality monitoring will be carried out as a precautionary measure, to help verify that the Project works will not result in any unacceptable impacts to water quality, and consequently to fisheries sensitive receivers, as detailed in ***Appendix F***.

APPENDIX D REVIEW OF POTENTIAL NOISE IMPACTS

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1. INTRODUCTION

This **Appendix** describes and evaluates the potential noise impacts arising from the construction of the submarine cable installation (including the grounding system). There would be no construction works on land for the proposed cable landing site (CLS) at Tseung Kwan O Industrial Estate (TKOIE) in this Project as the beach manhole (BMH) is already constructed before the implementation of submarine cable works, and the construction of cable landing station is out of the scope of this Project.

Noise emissions are not expected from the operation of the proposed submarine cable system and thus will not be considered further.

2. RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The principal legislation relating to the control of construction noise in daytime (i.e. 0700 to 1900 hours) on any day not being a Sunday or general holiday is the *Environmental Impact Assessment Ordinance* (*EIAO*) (*Cap. 499*). The *Technical Memorandum on Environmental Impact Assessment Process* (*EIAO-TM*), issued under the *EIAO*, provides guidelines and noise criteria for evaluating noise impacts.

The *Noise Control Ordinance* (*Cap. 400*) (*NCO*) also provides means to assess construction noise impacts. Various Technical Memoranda (*TMs*), which stipulate control approaches and criteria, have been issued under the *NCO*. The following TMs are applicable to the control of noise impacts from construction activities:

- *Technical Memorandum on Noise from Construction Work other than Percussive Piling* (*GW-TM*); and
- *Technical Memorandum on Noise from Construction Work in Designated Areas* (*DA-TM*).

The construction works associated with the offshore submarine cable installation is expected to occur during non-restricted hours, i.e. 0700 to 1900 hours on any day not being a Sunday or public holiday. If works during restricted hours are later found to be necessary, a Construction Noise Permit (CNP) will be applied for.

Under the *EIAO*, noise impact arising from general construction works during non-restricted hours at openable windows of buildings are to be assessed in accordance with the noise criteria given in *EIAO-TM*. With reference to the *EIAO-TM*, the daytime noise standard for domestic premises is $L_{eq\ (30\ min)}$ 75 dB(A).

3. ASSESSMENT METHODOLOGY

The assessment of noise impact from the associated cable installation works was undertaken based on the procedure outlined in the *GW-TM*. In general, the procedure to undertake a construction noise assessment is as follows:

- locate representative noise sensitive receivers (NSRs) that may be affected by the works;
- determine construction plants for corresponding construction activities, based on available information;
- assign sound power level (SWL) to the powered mechanical equipment (PME) proposed based on the *GW-TM* or other sources;
- calculate the correction factors based on the shortest distance between the NSRs and the work sites;
- apply corrections such as potential screening effect and acoustic reflection, if any, in the calculations; and

- predict construction noise levels at NSRs.

4. POTENTIAL NOISE SOURCES

4.1 Construction Phase

In accordance with ***Section 2 of main report***, major construction activities which may give rise to construction noise impacts, are listed below:

- **Pre-lay Graphical Run (PLGR) and Route Clearance (RC)** – A barge would be deployed to tow a purpose-designed grapnel along the route to ensure the whole cable route is clear. The purpose-designed grapnel will be operated underwater, no unacceptable construction noise impact is anticipated from it. The movement of the barge will be the major source of noise during PLGR and RC. The PLGR and RC process will take approximately 35 working days;

- **Inshore (0 – 9 m water depth) works and connecting cable system to BMH** – Cable installation and connection to the BMH will be carried out by hand jetting by divers for inshore areas with water depth ≤9 m. Around 220 m of the alignment will be laid by hand jetting, as indicated as **S1** in ***Figure D1***. The hand jetting will be conducted underwater. Considering that no noisy PME will be utilized above water, no unacceptable construction noise impact is anticipated from the inshore works. The construction activities for inshore works and connecting cable system to BMH will take approximately 5 days;

- **Submarine cable main installation seaward (>9 m water depth)** – After the marine cable shore end landing, an installation barge will be deployed for cable installation. The cable system will be laid and buried simultaneously by injector burial tools/ jet sled tools. As the injector burial tools/ jet sled tools will be operated underwater, no unacceptable construction noise impact is anticipated from them. The installation works area is indicated as **S2** in ***Figure D1***. The movement of the installation barge will be the major source of noise during the submarine cable main installation seaward. The construction activities for submarine cable main installation seaward will take approximately 55 days; and

The overall construction would take 95 working days.

4.2 Operation Phase (including Maintenance)

Under operation, there will be no noise source from the Project.

It is considered unlikely that the submarine cable system will require maintenance during operation, however should a cable fault arise that necessitates this, repair operation will be required. As described in ***Section 4.10 of main report***, remotely operated vehicles (ROVs) equipped with injector tool, diver hand jetting and/or grapnels would be used for the maintenance work. The equipment will be deployed underwater, thus no unacceptable noise impact is anticipated from the maintenance work.

5. DESCRIPTION OF THE ENVIRONMENTAL & IDENTIFICATION OF NOISE SENSITIVE RECEIVERS

The existing environment of the proposed cable landing site is industrial, mainly with factories and data centers. The Study Area for the noise impact assessment covers a distance of 300 m from the proposed alignment of the cable system, as shown in ***Figure D1***.

While there is no NSR identified near the landing site, one NSR is identified in Siu San Wan, i.e. Island Resort. Only the first layer of NSRs having direct line of sight towards the cable alignment have been

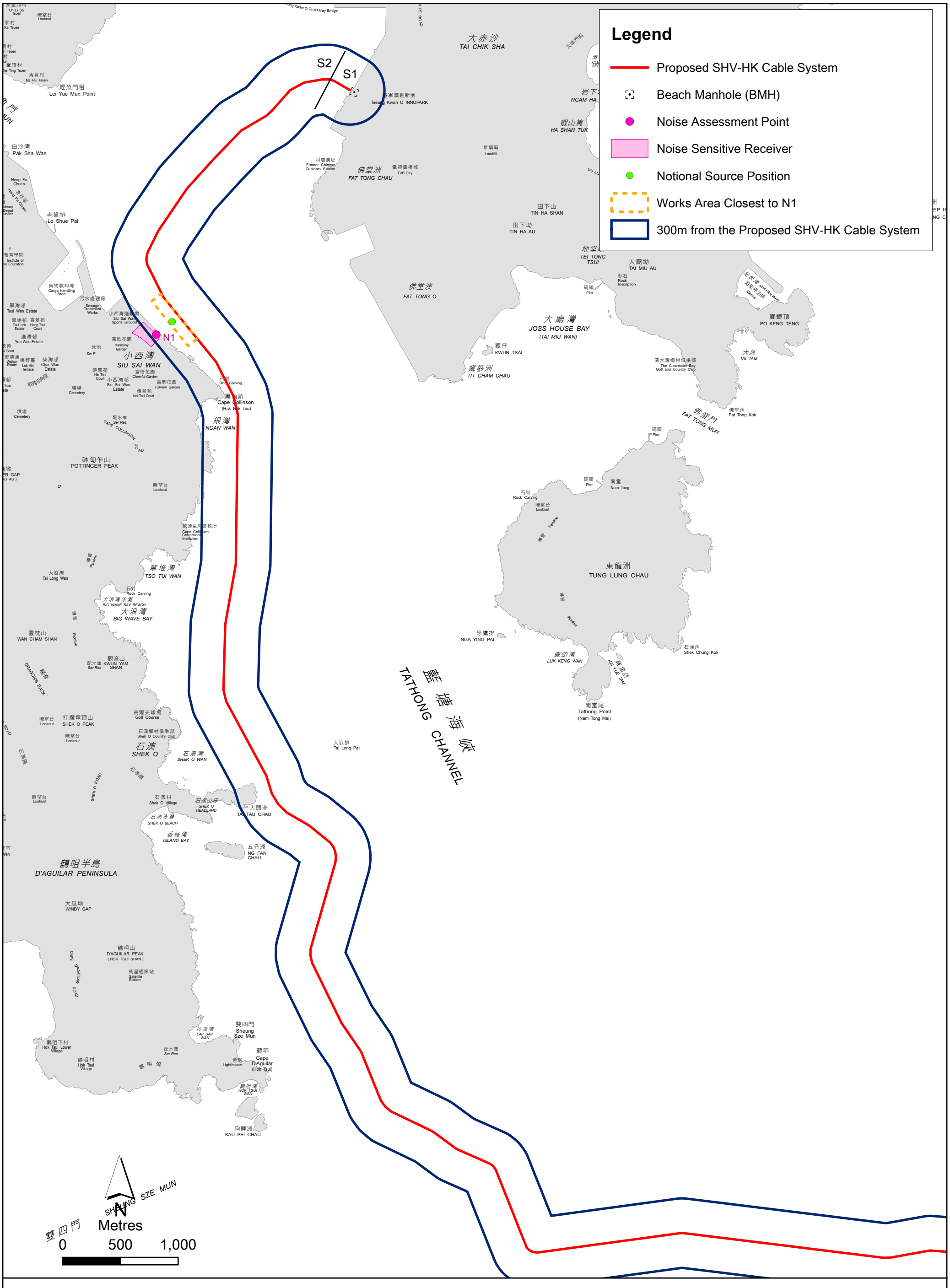

Figure D1

Noise Sensitive Receiver and Noise Assessment Point

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included in the assessment to assess the worst-case scenario. Other NSRs located further away or screened by the first layer are prone to lower noise impacts and have been excluded.

The location of identified NSR is shown in ***Figure D1***. Since Block 6 of Island Resort is nearest to the works area of the Project, it has been selected as the representative Noise Assessment Point (NAP) for assessment. Details of the identified NSR and representative NAP are presented in ***Table D5.1*** with photograph shown in ***Figure D2***. ***Table D5.1*** provides the type of use of the NSR, as well as the horizontal distance between the representative NAP and nearest notional source position of the works area. The maximum works area occupied by the barge during PLGR and RC, and submarine cable main installation seaward will be approximately 100 m either side along the cable route. The notional source position of part of the works area located closest to NAP N1, as indicated in ***Figure D1***, has been adopted for this assessment as the worst-case scenario. It should be noted that the durations for PLGR and RC, and submarine cable main installation seaward for the whole Project are approximately 35 days and 55 days, respectively, only. Therefore, the duration of the construction activities at the part of the works area located closest to NAP N1, of which NAP N1 is worst affected by the construction activities, is anticipated to be very short, around 1 to 2 days only.

Table D5.1 Noise Sensitive Receiver (NSR) and Representative Noise Assessment Point (NAP)

NSR	Representative NAP	Type of Use	Shortest Horizontal Distance from Notional Source Position, m
Island Resort	Block 6, Island Resort (N1)	Residential	178

Island Resort
藍灣半島

Figure D2
圖D2

Photograph of Noise Sensitive Receiver (NSR)
噪音敏感受體的照片

DATE: 15/11/2024

ERM

6. IMPACT ASSESSMENT

An assumed PME inventory has been established and is presented in ***Table D6.1***. The plant inventory was reviewed by the Design Engineer and was confirmed to be suitable for completing the Assignment.

Table D6.1 Construction Plant Inventory

PME	Identification Code [(a)]	No. of Units	Sound Power Levels (SWL), dB(A)
PLGR and RC			
Barge	CNP 061	1	104
Submarine cable main installation seaward			
Barge	CNP 061	1	104

Note: (a) PME Identification Codes and Sound Power Levels (SWLs) refer to those provided in EPD's GW-TM.

Noise levels at the representative NAP have been predicted based on the above construction plant inventory. The predicted noise level at the representative NAP is presented in ***Table D6.2***. Details of the calculation on construction noise impact assessment are given in ***Annex D1***.

Table D6.2 Predicted Construction Noise Levels at the Representative NAP

NAP	Predicted Construction Noise Level, dB(A)	Noise Criterion, dB(A)	Compliance
PLGR and RC			
N1	54	75	Yes
Submarine cable main installation seaward			
N1	54	75	Yes

The predicted construction noise level at N1 is 54 dB(A), and complies with the noise criterion. Noise mitigation measures are not required.

7. CONCLUSION

7.1 Noise Impact

A noise assessment was undertaken to describe and evaluate the potential noise impacts arising from the construction phase of the Project. It is predicted that noise exceedances would not occur at the identified noise sensitive receiver due to construction of the Project.

7.2 Mitigation Measures

Mitigation measure is therefore not required. For the operation phase, noise emissions are not expected from the operation of the proposed submarine cable system, as well as the maintenance works. No unacceptable noise impact is anticipated from both the construction and operation of the Project.

Cable installation at present is not expected to take place during restricted hours. If restricted hours works are later found to be necessary, a Construction Noise Permit (CNP) will be applied for under the Noise Control Ordinance.

ANNEX D1 CONSTRUCTION NOISE IMPACT ASSESSMENT

Annex D1 - Construction Noise Impact Assessment

Calculation of Façade Noise Levels at N1

	x	y
NAP: N1 - Block 6, Island Resort	843979	814161
Nearest Notional Source Position (NSP):		
PLGR & RC, and submarine cable main installation seaward	844117	814274

Powered Mechanical Equipment (PME)	Identification Code [1]	No. of PME	Unit SWL, dB(A)	Horizontal Distance form NSP, m	Correction, dB(A)				CNL of individual PME, dB(A) [2]	Overall CNL of each Group, dB(A) [2]	Criterion, dB(A)	Compliance
					No. of Plant	Cdist	Cfacade	Barrier				
Pre-lay Graphical Run (PLGR) and Route Clearance (RC)												
Barge	CNP 061	1	104	178	0	-53.0	3	0	54	54	**75**	**Yes**
Submarine cable main installation seaward												
Barge	CNP 061	1	104	178	0	-53.0	3	0	54	54	**75**	**Yes**

Remarks:

(1) PME Identification Codes and Sound Power Levels (SWLs) refer to Table 3 of EPD's *Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-*

(2) Corrected Noise Level (CNL), dB(A) = SWL + No.of PME correction + barrier correction+ distance correction + façade correction.

APPENDIX E REVIEW ON POTENTIAL IMPACTS TO CULTURAL HERITAGE

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1. INTRODUCTION

This **Appendix** presents a marine archaeological assessment as part of the cultural heritage impact assessment of the environmental assessments associated with the installation of the Hong Kong section of the proposed Sihanoukville-Hong Kong Submarine Cable system ("SHV-HK Cable system"), including the grounding system (hereafter referred to as the Project). This assessment includes a desktop study, available marine archaeological investigation results and establishment of archaeological potential and evaluates the potential for direct and indirect adverse impacts to these resources.

2. RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The following legislation is applicable to the assessment of archaeological and historic resources in Hong Kong.

2.1 Technical Memorandum on the Environmental Impact Assessment Process under the Environmental Impact Assessment Ordinance

The *Technical Memorandum on Environmental Impact Assessment Process* (*EIAO-TM*) *(Cap.499)*, *Annex 10* outlines the criteria for assessment of impact on sites of cultural heritage. The general presumption is in favour of the protection and conservation of all sites of cultural heritage. Also, adverse impacts on sites of cultural heritage shall be kept to the absolute minimum.

EIAO-TM, Annex 19 outlines the approaches required in investigating and assessing the impacts on sites of cultural heritage. There is no quantitative standard in deciding the relative importance of these sites, but in general, sites of unique archaeological, historical or architectural value will be considered as highly significant. Preservation in totality is preferred. If, due to site constraints and other factors, only preservation in part is possible, this must be fully justified with alternative proposals or layout designs, which confirm the impracticability of total preservation.

2.2 Antiquities and Monuments Ordinance (Cap.53)

The *Antiquities and Monuments Ordinance* (Cap. 53) (A&M Ordinance) provides statutory protection against the threat of development on declared monuments to enable their preservation for posterity. The A&M Ordinance also establishes the statutory procedures to be followed in making such a declaration.

Any person who discovers an antiquity, or supposed antiquity, is required to report the discovery to the Antiquities Authority.

2.3 Hong Kong Planning Standards and Guidelines

The Chapter 10, Conservation, of the Hong Kong Planning Standards and Guidelines (HKPSG) provides general guidelines and measures for the conservation of historical buildings, sites of archaeological interest and other antiquities.

2.4 Marine Archaeological Investigation Guidelines

Guidelines for marine archaeological investigation (MAI) (as at 4 May 2020) established by the Antiquities and Monuments Office (AMO) detail the standard practice, procedures and methodology which must be undertaken in determining marine archaeological potential, presence of archaeological artefacts and defining suitable mitigation measures. Baseline review, geophysical survey and establishing archaeological potential are considered the first stage of an MAI. Subject to results of the first stage MAI, further investigation may or may not be required.

3. ASSESSMENT METHODOLOGY

The methodology used in this assessment is in accordance with the Guidelines for MAI established by AMO and comprised the following tasks.

3.1 Establishing Baseline Conditions

- Implementing desktop review, comprising historical documents and United Kingdom Hydrographic Office (UKHO) 'Wreck' files, to establish the potential for marine archaeological sites in the marine archaeological assessment area; and
- Reviewing geophysical survey data including previous MAI results to identify the presence of any marine archaeological potential resources.

3.2 Establishing Archaeological Potential

The synthesis and analysis of the baseline conditions were used to establish if there were any marine archaeological deposits/sites in the marine archaeological assessment area.

3.3 Assessing Impact and Making Recommendation(s)

Based on the findings and analysis of the baseline conditions, an assessment was made of the potential impact of the Project on any marine archaeological deposits that might be present in the marine archaeological assessment area, and recommendations for mitigation should such impacts be identified.

4. DESKTOP RESEARCH

4.1 Terrestrial Cultural Heritage Sites

Desktop review identified one declared monument, one Grade 3 historic building and one Site of Archaeological Interest (SAI) within 500 m area from the proposed SHV-HK Cable system or a Beach Manhole (BMH) located at TKOIE as shown in ***Figure 3.2***. They are namely, the Rock Carving at Cape Collinson (declared monument) and the Cape Collinson Lighthouse (Grade 3 historic building) located 86 m and 104 m respectively from the proposed cable system. The Fat Tau Chau SAI is located 492 m from the BMH at TKOIE.

4.2 Marine Archaeological Resources

According to a database of the UKHO, one 'wreck' was found to be within the geophysical survey area of this Project (see ***Figure 3.2***) and details are listed in ***Table E4.1***.

Table E4.1 UKHO Wrecks in the Marine Archaeological Assessment Area

UKHO Wreck Number	Description	Status (HK Marine Survey Data)	Geographical Coordinates	Distance from the cable route (m)
57717	It is a modern ship sunk in 1999.	Live	22 11'.630 N 114 17'.738 E	183

Wreck No. 57717 is reported as 'live' i.e. still existing. It is a modern ship sunk in 1999 and therefore it is of no archaeological significance. See ***Annex E1*** for details.

4.3 Previous Reference Projects

The baseline review made reference to previous marine archaeological assessments/ surveys for submarine cable/utilities projects in the vicinity as detailed below. ***Figure 3.2*** shows the area coverage of marine archaeological assessment/ survey areas of these assessments/ surveys. The results are summarised in ***Table E4.2.***

Table E4.2 Summary Findings of Previous Marine Archaeological Assessments/Surveys Conducted in the Vicinity of the Project

DIR No. (Project Profile No.) / Approved Environmental Impact Assessment (EIA) Report Register No.	Summary of Previous Marine Archaeological Assessment/Survey Findings/Results
DIR-285/2021 (PP-626/2021) Asia Direct Cable System - Hong Kong Segment (ADC-HK) - Chung Hom Kok	The section of cable route from north of Sung Kong runs parallel to and at the south of the current Project and routes out of east Hong Kong waters. A cultural heritage assessment including an MAI was conducted. As part of the MAI, a geophysical survey was also conducted within a 50 m corridor of the proposed cable alignment. The MAI concluded to have no evidence of marine archaeological value in the surveyed area and hence no marine archaeological impacts are expected.
DIR-269/2019 (PP-595/2019) South East Asia - Japan 2 Cable System - Hong Kong Segment (SJC2-HK) - Chung Hom Kok	The section of cable route at the eastern end of Hong Kong waters runs into the geophysical survey area for this Project. A cultural heritage assessment including a MAI was conducted. As part of the MAI, a geophysical survey was conducted within a 50 m corridor of the proposed cable alignment. The MAI concluded to have no evidence of marine archaeological resources in the surveyed area.
DIR-268/2019 (PP-584/2019) TKO Connect Cable System	The section of cable route from the landing site to the marine area off Siu Sai Wan is similar to the current Project. The MAI including geophysical survey and diver survey were undertaken with a 50m corridor for this Project. Only modern waste were found and concluded to have no marine archaeological value within the Study Area.
DIR-265/2018 (PP-573/2018) HKA Submarine Cable - Chung Hom Kok	The middle section of this cable route from north of Sung Kong towards east of Hong Kong waters runs parallel to and at the north of the current Project. An assessment of potential impacts to marine archaeological resources was conducted including MAI and review of geophysical survey along the route alignment. It was concluded to have no sites or objects of marine archaeological significance identified.
DIR-255/2017 (PP-553/2017) Ultra Express Link	The link alignment between TKO and Siu Sai Wan is similar to the current Project. The MAI including geophysical survey for the Project concluded that no resources of marine archaeological value are located within the MAI study area.
DIR-254/2017 (PP-550/2017) Pacific Light Cable Network (PLCN)– Deep Water Bay	The section of cable route from north of Sung Kong generally runs parallel to the current Project and routes out of east Hong Kong waters. A cultural heritage assessment including a MAI was conducted. An assessment of potential impacts to marine archaeological resources was conducted and it was concluded that 'since the proposed cable will be laid in the proximity of the existing cables or pipelines, it is not expected to impinge upon resources of high marine archaeological importance.' i.e. the Project would not impact sites or objects of marine archaeological significance.
DIR-244/2016 (PP-533/2016) Asia-Africa-Europe-1 (AAE-1) Cable System	The section of cable route from off the landing site around Sung Kong to middle section of the cable is similar to the current Project. A MAI comprised of baseline review, geophysical survey, establishment of archaeological potential and dive survey was conducted. Results of the MAI only identified modern debris. It was concluded that no marine archaeological resources were located.

DIR No. (Project Profile No.) / Approved Environmental Impact Assessment (EIA) Report Register No.	Summary of Previous Marine Archaeological Assessment/Survey Findings/Results
DIR-243/2015 (PP-532/2015) Tseung Kwan O Express - Cable System	The section of cable route from the landing site to the marine area off Siu Sai Wan is similar to the current Project. The MAI including geophysical survey revealed that the seabed along the cable alignment had been heavily impacted from trawling and the dumping of materials. The survey also found the nature of the sediments to be coarse sediments in the area of the Tathong Channel and the Project area. No marine archaeological deposits identified.
DIR-233/2013 (PP-496/2013) Asia Pacific Gateway (APG) - Tseung Kwan O	The section of cable route from its landing site to east of Ng Fan Chau is similar to the current Project. MAI including geophysical survey covering a 650 m survey corridor centred on the proposed cable route had only identified modern debris. It was concluded that no marine archaeological resources were located.
DIR-213/2011 (PP-444/2011) South-East Asia Japan Cable System (SJC) Hong Kong Segment	The eastern end of the cable route runs across the current Project. MAI including a geophysical survey of the final route alignment was conducted. The desktop MAI result concluded that there were 'no features of archaeological value in the vicinity of the route.' The geophysical data review also showed that the cable did 'not traverse through any area of unknown features within the seabed' and although 50 sonar contacts were identified in the survey area, 'close examination of the data indicated these were all surface debris and therefore of no archaeological significance'. It was concluded that 'no features of archaeological values identified in the vicinity of the route and the impacts to marine archaeological will be insignificant.' Map showing the geophysical survey area coverage was not available. Form review of the distance information of the 50 sonar contacts from the alignment, the largest distance of the contact from the alignment is 318m, it is believed that the survey area shall at least cover 318m from the alignment. Therefore, an indicative geophysical survey area coverage of 318m from either side of the alignment is showed as "DIR-213/2011 Geophysical Survey Area" in **Figure 3.2**.
AEIAR-140/2009 Hong Kong Offshore Wind Farm in Southeastern Waters EIA Report	The section of the cable off Fat Tong Chau runs across the current Project at the section outside Tseung Kwan O Industrial Estate (TKOIE). As part of the cultural heritage impact assessment for the EIA for the proposed cable connection and the Wind Farm, MAI including geophysical survey involved the use of side-scan with survey lines generally arranged at 100 m spacing, except for the inshore section at Tseung Kwan O where a spacing of 50 m, was conducted (see "AEIAR-140/2009 Geophysical Survey Area" in ***Figure 3.2***). The surveyed area overlapped with the geophysical survey area for this current Project identified no marine archaeological interest.

The proposed SHV-HK Cable system is located within a disturbed marine area installed/ planned to install with numerous submarine cables and utilities. Desktop review revealed that the proposed SHV-HK Cable system mostly falls within areas that had been overlapped with previous marine archaeological assessment/ survey areas as shown in ***Figure 3.2*** and detailed in ***Table E4.2***. The results from the previous geophysical surveys conducted in this area have been examined for this project. All the identified contacts or anomalies from those previous geophysical surveys within 20m from the proposed cable for this current project have been investigated. All of the previously surveyed or assessed areas that overlapped with geophysical survey area for this Project concluded to have no marine archaeological interest. A geophysical survey was conducted for this Project. It generally covers a 700m corridor centred on the proposed cable route.

4.4 Results of Geophysical Survey

The geophysical survey for this Project was carried out between 3 May and 29 May 2023, which comprised multi beam echo sounder, sub-bottom profiler, side scan sonar and marine magnetometer. The geophysical survey area coverage is shown in **Figure 3.2** as "Geophysical Survey Area for this Project" and ***Annex E2***. The survey findings were reviewed by the qualified marine archaeologist, Dr

William Jeffery, who also conducted the impact assessment and recommendation of mitigation measures of this Project.

A total of 63 sonar contacts were identified in the surveyed area within HKSAR boundary (SC-064 was located outside of HKSAR boundary, therefore it was not included in this report). Of these: one (1) is interpreted as a wreck; thirty-six (36) are interpreted as debris; sixteen (16) are interpreted as tyres; one (1) is interpreted as possible debris or tyre; seven (7) are interpreted as possible fishing gear; and two (2) are interpreted as artificial/man-made objects. The two SC interpreted as artificial/man-made objects are SHV-HK-WH8-SC013 (SC013) and SHV-HK-WH8-SC029 (SC029) and are 171 m and 266 m off the cable route respectively.

The submarine cable laying process will involve minor marine works for a relatively short period of time. The seabed disturbance only involves a narrow trench of approximately 0.5 m wide at a target depth of up to around 6m below the seabed. After the cable system is laid, the seabed will return to its original profile. Given this minimal disturbance area, an assessment area of 20 m from both sides of the proposed cable route (see **Figure 3.2** for MAI Assessment Area for this Project) is sufficient to assess the marine archaeological impact caused by the proposed works, as a 0.5 m wide and up to around 6 m deep trench is relatively narrow and shallow, its impact will be localized and constrained to the immediate area of the trench itself. Therefore, an assessment area of 20 m from both sides of the proposed cable route is sufficient enough. A shortlist of one sonar contact (SC023) located within the MAI Assessment Area. SC023 was interpreted as debris and located 11.8 m away from the proposed cable system. It has been interpreted as having no marine archaeological value because it is a very small isolated object and has no magnetic value. It was deemed to be a natural feature (e.g. possible broken rock), similar to other nearby sonar contacts interpreted as debris that exhibits no cultural or man-made features. One sonar contact (SC036) was identified as a wreck and its location is identical to UKHO57717. It is located 183 m away from the proposed cable system and in 27.5 m depth of water. According to the database of UKHO, it is a modern ship sunk in 1999 and therefore it is of no archaeological significance. Details of the sonar contacts and their images are shown in **Table E4.3** and ***Figure E4.1*** to ***Figure E4.2***.

Table E4.3 Details of Shortlisted Sonar Contacts

Contact number	Latitude Longitude	Easting Northing	Water depth (m)	Distance from cable route (m)	Dimensions (m)	Description
SHV-HK-WH8-SC023	22° 13.309' N 114° 15.939' E	3456570.7E 7424941.8N	24.3	11.8	3 x <1 x <0.5	Debris
SHV-HK-WH8-SC036	22° 11.631' N 114° 17.723' E	3459754.1E 7421728.4N	27.5	183	30 x 10 x 0.9	Wreck

Note: nmb=no measurable height

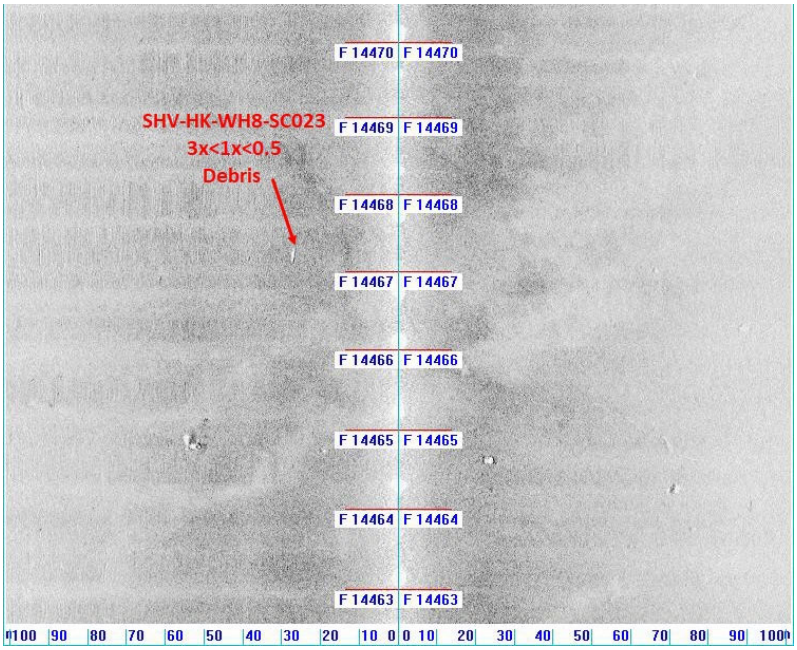

Figure E4.1 Rectified SSS data showing Sonar Contact Image of SC023

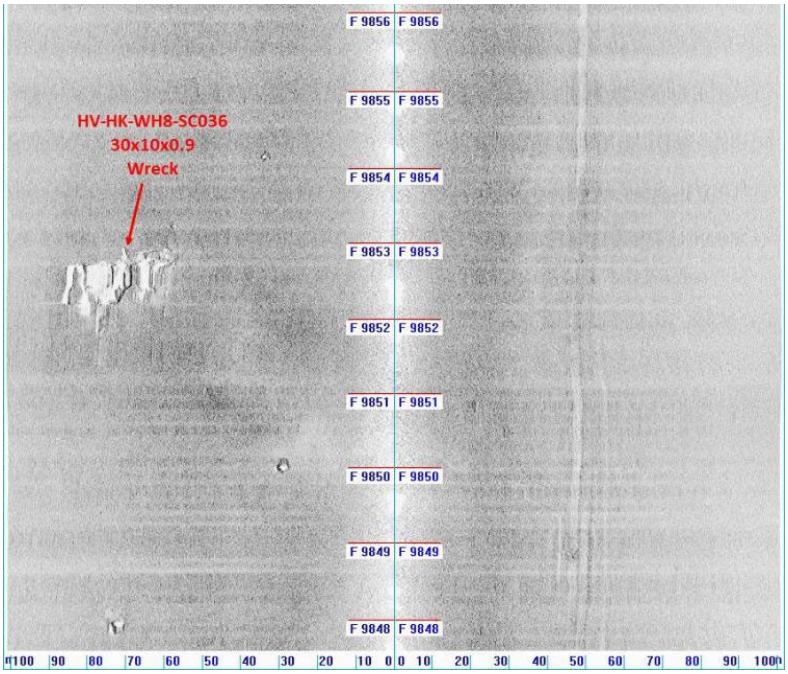

Figure E4.2 Rectified SSS data showing Sonar Contact Image of SC036

Moreover, a total of 226 magnetic contacts and 8 seismic contacts were identified in the surveyed area (their locations are shown in ***Annex E2***). Most of them are interpreted as submarine cables or pipelines. None of the magnetic (including 58 of the unknown magnetic contacts) and seismic contacts are located within 20 m from the proposed cable route in the information gap areas.

The geophysical survey highlighted that the seabed generally composed of thick very soft to soft clay/ silt and is highly disturbed with numerous anchor scars with scattered patches of dumped material,

scattered to numerous debris/boulders and scattered pockmarks/ depressions. A number of existing submarine cables are also identified in the survey areas. (Example see ***Figure E4.3*** and ***Figure E4.4***)

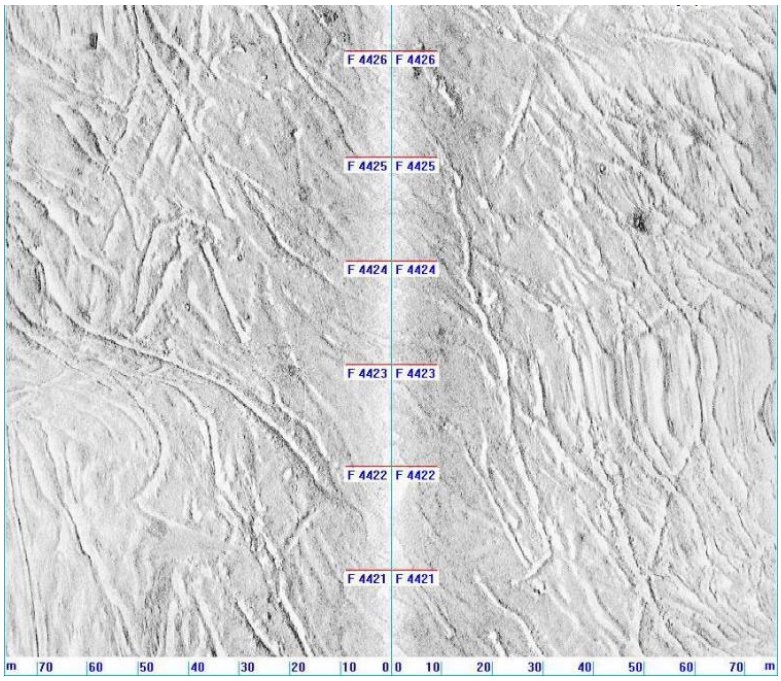

Figure E4.3 Rectified SSS data showing highly disturbed seabed with numerous anchor scars and scattered debris/boulders and dumped materials

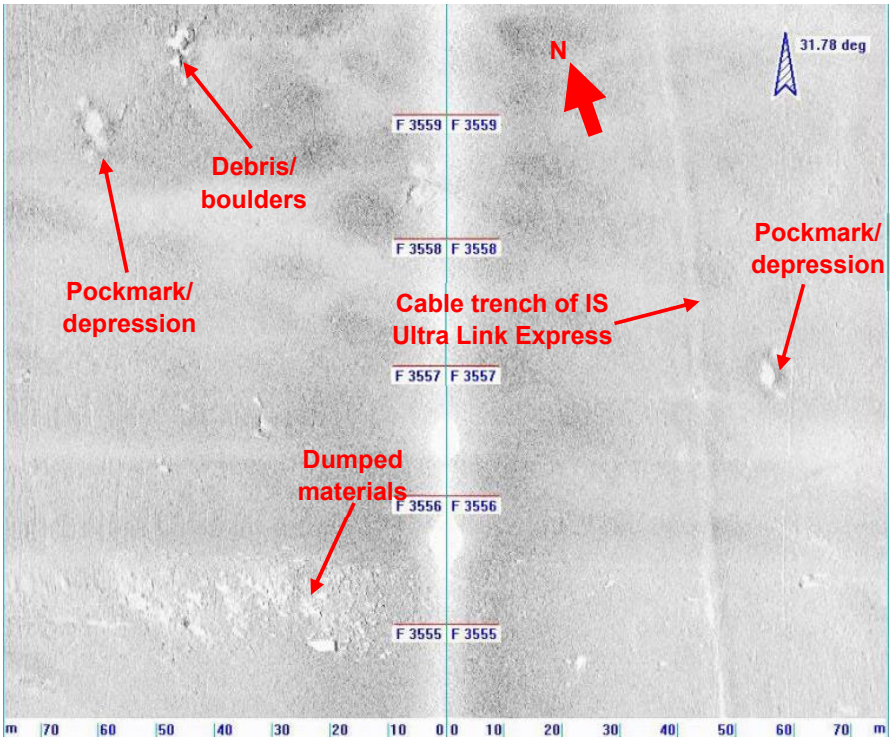

Figure E4.4 Rectified SSS data showing cable trench, dumped materials, debris/boulders and pockmarks/depressions

5. IMPACT ASSESSMENT

5.1 Construction Phase and Operation Phase (including Maintenance)

The Rock Carving at Cape Collinson (declared monument) and the Cape Collinson Lighthouse (Grade 3 historic building) are located 86 m and 104 m respectively from the proposed submarine cable system. The proposed cable installation works fall within the marine area of Hong Kong while the Rock Carving at Cape Collinson and the Cape Collinson Lighthouse are on land. No direct and indirect construction and operation impacts arising from the Project is anticipated.

The Fat Tau Chau SAI is located 492 m from the BMH at TKOIE. Due to its large separation distance from the BMH, and as the BMH and the land-based cable ducts connecting to the data centre will be constructed separately under other project. No major land-based earthworks will be involved in this Project. No direct and indirect construction and operation impact arising from the Project is anticipated.

One sonar contact (SC023) was identified in the MAI Assessment Area and was identified as debris. It has been interpreted as having no marine archaeological value because it is a small isolated object and contained no magnetic value. Therefore, it was deemed to be a natural feature (e.g. possible broken rock), similar to other nearby sonar contacts interpreted as debris that exhibits no cultural or man-made features. No impact to it is anticipated as the submarine cable laying process will involve minor marine works for a relatively short period of time and the seabed disturbance only involves a narrow trench of approximately 0.5 m wide at a target depth of up to around 6 m below the seabed.

Sonar contact (SC036) located 183 m away from the proposed cable system was identified as a modern ship (UKHO57717) sunk in 1999 according to the database of UKHO, therefore it is of no marine archaeological significance. Moreover, the wreck is far away from the proposed cable system, no impacts are anticipated. Therefore, no marine archaeological impact is anticipated due to the proposed works.

The two sonar contacts interpreted as artificial/man-made objects, SHV-HK-WH8-SC013 (SC013) and SHV-HK-WH8-SC029 (SC029), are 171 m and 266 m off the cable route respectively. They will not be impacted by the Project due to large separation distance.

None of the magnetic and seismic contacts are located within the MAI Assessment Area. Therefore, no impacts to those magnetic and seismic contacts are anticipated due to their sufficient separation distance from the proposed cable route.

6. CONCLUSION AND RECOMMENDATION

6.1 Impact and Mitigation Measures

The Rock Carving at Cape Collinson (declared monument) and the Cape Collinson Lighthouse (Grade 3 historic building) are located 86 m and 104m respectively from the proposed submarine cable system. The proposed cable installation works fall within the marine area of Hong Kong while the Rock Carving at Cape Collinson and the Cape Collinson Lighthouse are on land. No direct and indirection construction and operation impacts arising from the Project is anticipated. Therefore, no mitigation measure is required.

The Fat Tau Chau SAI is located 492 m from the BMH at TKOIE. Due to its large separation distance from the BMH, and as the BMH and the land-based cable ducts connecting to the data centre will be constructed separately under other project. No major land-based earthworks will be involved in this Project. No direct and indirect construction and operation impact arising from the Project is anticipated. Therefore, no mitigation measure is required.

One sonar contacts (SC023) was located within the MAI Assessment Area, and was identified as debris, which was of no marine archaeological value. No impact to it is anticipated as the submarine

cable laying process will involve minor marine works for a relatively short period of time and the seabed disturbance only involves a narrow trench of approximately 0.5 m wide at a target depth of up to around 6 m below the seabed. No mitigation measure is required.

Moreover, sonar contact (SC036) located 183 m away from the proposed cable system was identified as modern wreck (UKHO57717). No impacts are anticipated. Therefore, no mitigation measure is required. Furthermore, no impacts to the magnetic and seismic contacts are anticipated due to their sufficient separation distance from the proposed cable route, thus, no mitigation measure is required.

The two sonar contacts interpreted as artificial/man-made objects, SHV-HK-WH8-SC013 (SC013) and SHV-HK-WH8-SC029 (SC029), are 171 m and 266 m off the cable route respectively. They will not be impacted by the Project due to large separation distance. No mitigation measure is required.

Due to minor marine works of the Project and no marine archaeological resources identified in the vicinity of the Project, no marine archaeological impact arising from the construction and operation of the proposed cable system is anticipated. Thus, no mitigation measures are considered necessary.

7. REFERENCES

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12.
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ANNEX E1 UNITED KINGDOM HYDROGRAPHIC OFFICE WRECK DATA

Wreck Number 57717 **Classification =** Unclassified
Symbol WK 24.5 **Largest Scale Chart =** 4127
Charting Comments
Old Number
Category Dangerous wreck

WGS84 Position **Latitude =** 22 11’.630 N **Longitude =** 114 17’.738 E
WGS84 Origin Original
Horizontal Datum WGD WGS (1984)

Position Method
Position Quality Precisely known
Position Accuracy
Area at Largest Scale No

Depth 24.5 metres
Drying Height
Height
General Depth 26 metres
Vertical Datum Approximate lowest astronomical tide
Depth Method
Depth Quality Least depth known
Depth Accuracy
Conspic Visual NO **Conspic Radar** NO
Historic NO **Military** NO **Existence Doubtful** NO
Non Sub Contact NO

Last Amended 15/10/2008
Position Last Amended 15/10/2008
Position Last **Latitude =** 22 11’.652 N **Longitude =** 114 17’.747 E

Name SHAN MEI 11072
Type M FISHING
Flag CHINA
Dimensions **Length =** 26.0 metres **Beam =** 6.0 metres **Draught =** 3.0 metres
Tonnage
Cargo
Date Sunk 28/04/1999

Sonar Dimensions **Length =** **Width =** **Shadow Height =**
Orientation

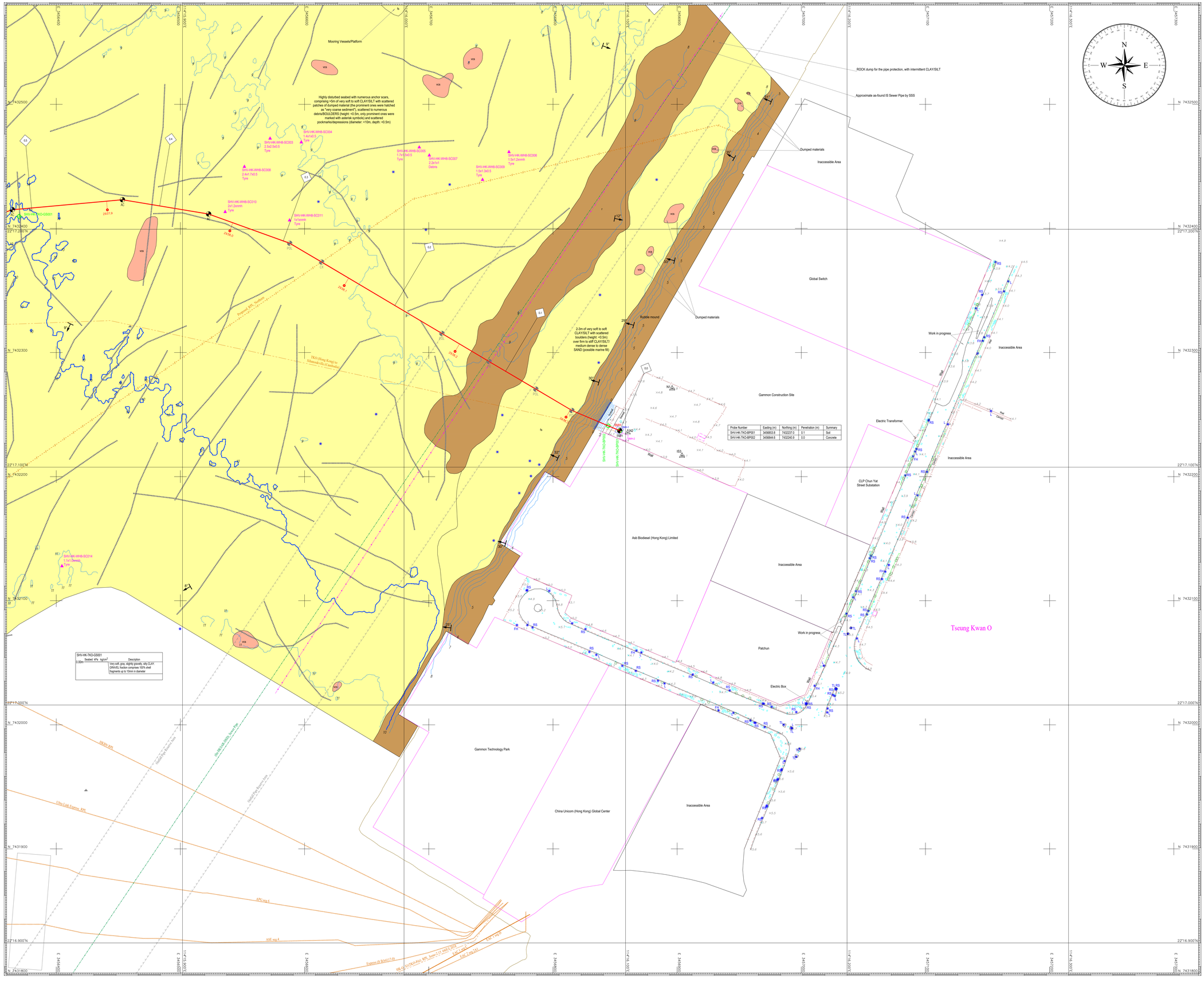
Magnetic Anomaly
Debris Field
Scour **Depth =** **Length =** **Orientation =**

Markers
General Comments

Circumstances of Loss
**SANK AFTER TAKING IN WATER.

Surveying Details
**HH550/412/02 14.9.99 LOCATED IN 2211.652N, 11417.747E [WGD]. LEAST E/S DEPTH 19.9 IN GEN DEPTH 26.5MTRS. WK IS UNLIKELY TO BE SALVAGED. (HONG KONG, CHINA, MARINE DEPT, FAX DTD 9.9.99). - NM 3794/99.
**HH550/412/02 19.11.99 WK 19.9MTRS IN 2211.652N, 11417.747E [WGD]. (MARINE DEPT NM 139/99). NFA.
**HH550/412/02 16.12.99 REPEAT OF ABOVE. (CHINESE NM 23/281/99) NFA.
**15.10.08 SHOWN AS WK 24.5MTRS IN 2211.630N, 11417.738E [WGD] ON HONG KONG 2502 [AUG ‘08 EDN, LARGEST SCALE ADOPTION]. NE 4127.
**HH550/434/01 28.10.08 NM ACTION FOR OTHER SCALES. - NM 6261/08.

ANNEX E2 GEOPHYSICAL SURVEY NORTH UP CHARTS



CARTOGRAPHIC SYMBOLS

- Post survey route with kilometre post and reverse kilometre post
- Adjacent route
- Beach manhole / Alter course / Branching Unit
- Point on line / Cable crossing / Pipeline crossing
- Coastline (from Admiralty charts)
- Chart matchline
- Telecommunications cable position, In-service/Out of service/Planned (as-found in magenta)
- Pipeline position, In-service/Out of service/Planned (as-found in magenta)
- Power cable position, In-service/Out of service/Planned (as-found in magenta)
- Maritime boundaries
- Restricted zones and special areas
- Concession block
- Submerged wreck / Exposed wreck / Obstruction / Well / Platform / Explosives dumping ground and symbol or line feature in grey, plotted from desk top study (as-found in magenta). (for general symbols and abbreviations refer to British Admiralty Chart)

BATHYMETRY

- Bathymetric contours in metres. Contour interval may be reduced to aid in clarity.
- Approximate limit of swath bathymetry coverage (shown only in areas of flat seabed)
- Downslope gradient in degrees (°) as measured over the shortest significant distance

TOPOGRAPHIC FEATURES

CB	Concrete block	LP	Lamp pole	SP	Sign pole
CO	Column	MH	Manhole	T	Manhole (telephone)
CS	Culvert	NB	Notice board	TB	Telephone box
EP	Electricity pole	PB	Post box	TL	Traffic light
FB	Flower bed	RB	Rubbish bin	TP	Telegraph pole
FH	Fire hydrant	RS	Road sign	TS	Temporary structure
FP	Footpath	SB	Sign board	WT	Water tap

- Features: General topographic features (with annotation)
- Features: General topographic boundary (with annotation)
- Road
- Path / Footpath
- Hand Railing / Fence / Hoarding
- Building (permanent)
- Building (temporary)
- BMH: Surveyed beach manhole
- Manhole / Gully / Valve
- Tree
- Pole
- Gate
- Control point
- Spot levels above/ below survey datum

- BP001: Beach probe (BP); Beach sample (BS) location with reference number
- DP001 / DS001: Diver probe (DP); Diver sample (DS) location with reference number
- TB001: Beach T-Bar (TB) location with reference number

Note: Contours and slope notations in this chart were derived from the optimized grid of bathymetry as per the actual data density. Seabed morphological analysis based on side-scan sonar images gives a complementary presentation for localized terrain features. Due to physical and operational limitations, resolution of this chart degrades with increasing water depths and some localized seabed features are not expected to be fully resolved. This chart serves the general purposes of route engineering and cable installation. Closer inspections are recommended for operations sensitive to small terrain features in deep waters.

CHART COMMENT:

BATHYMETRY	Along Final Route	Within Survey Corridor
Minimum depth (m)	5.4 (above LAT)	7.6 (above LAT)
Maximum depth (m)	10.0	11.6
Maximum gradient (°)	48 (over rubble mound seawall)	48 (over rubble mound seawall)

From the surveyed BMH, the route heads west-northwest and turns to a westerly direction at the western chart limit. The seabed is generally gentle off the very steep rubble mound seawall.

SEABED FEATURES

Rubble mound seawall is present along the coast.
Scattered boulders (height: <0.5m) and patches of dumped materials are present along the shore.
ROCK armor is present on the seabed along the IS Sewer Pipe from the northeast to the center of the chart.
Further westwards, the seabed is highly disturbed with numerous anchor scars, scattered patches of dumped material (only prominent ones were outlined in the chart), scattered to numerous debris/BOULDERS (height: <0.5m, only prominent ones were marked with asterisk symbols in the chart) and scattered pockmarks/depressions (diameter: <10m, depth: <0.5m).

Sonar Contacts: SHV-HK-WH8-SC003 to SC011 and SHV-HK-WH8-SC014.
Magnetometer Contacts: Nil.
Seismic Contacts: Nil.

SHALLOW GEOLOGY

Along the shore, the seabed consists of 2-3m of very soft to soft CLAY/SILT over firm to stiff CLAY/SILT/ medium dense to dense SAND (possible marine fill).
Further seawards, the seabed comprises >5m of very soft to soft CLAY/SILT.
Sediment Samples: SHV-HK-TKO-BP001 and BP002, SHV-HK-TKO-GS001
CPT: Nil.

ADDITIONAL INFORMATION

The route crosses an IS pipeline and a planned windfarm power cable in the chart.
The route runs inside the Hong Kong waters, Inshore Traffic Zone and Guangzhou VTS.

GENERAL NOTES

Survey vessel	Inshore and Shallow Water
Surface positioning system	MV Wing Hung 8
	NovAtel GNSS Position System
	Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Knudsen 320m SBES System
	R2Sonic Sonic 2024 MBES System
Morphology and stratigraphy	EdgeTech 4205 SSS System
	Innomar SES-2000 Medium-100 SBP System
	C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters
Descriptive Terms and Definitions: The criteria used for interpretations and descriptions are presented in survey reports

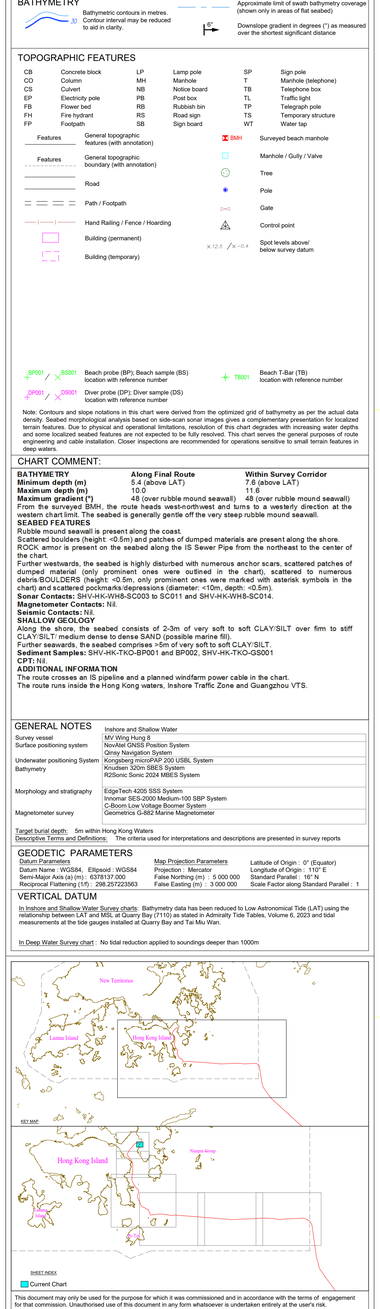
GEODETIC PARAMETERS

Datum Parameters	Map Projection Parameters	
Datum Name : WGS84 ; Ellipsoid : WGS84	Projection : - Mercator	Latitude of Origin : 0° (Equator)
Semi-Major Axis (a) (m) : 6378137.000	False Northing (m) : 5 000 000	Longitude of Origin : 110° E
Reciprocal Flattening (1/f) : 298.257223563	False Easting (m) : 3 000 000	Standard Parallel : 16° N
		Scale Factor along Standard Parallel : 1

VERTICAL DATUM

In Inshore and Shallow Water Survey charts: Bathymetry data has been reduced to Low Astronomical Tide (LAT) using the relationship between LAT and MSL at Quarry Bay (7110) as stated in Admiralty Tide Tables, Volume 6, 2023 and tidal measurements at the tide gauges installed at Quarry Bay and Tai Miu Wan.

In Deep Water Survey chart : No tidal reduction applied to soundings deeper than 1000m



Survey Date: May 2023

Scale : NATURAL SCALE 1 : 1,000 at 16° N

(At mid-latitude of chart)
TRUE SCALE 1 : 962.81

0 20 40 60 80 100 m

Purchaser : Contractor : Surveyor :

Project Name: Sihanoukville-Hong Kong Submarine Cable Project (SHV-HK)
- Hong Kong Waters
Marine Route Survey

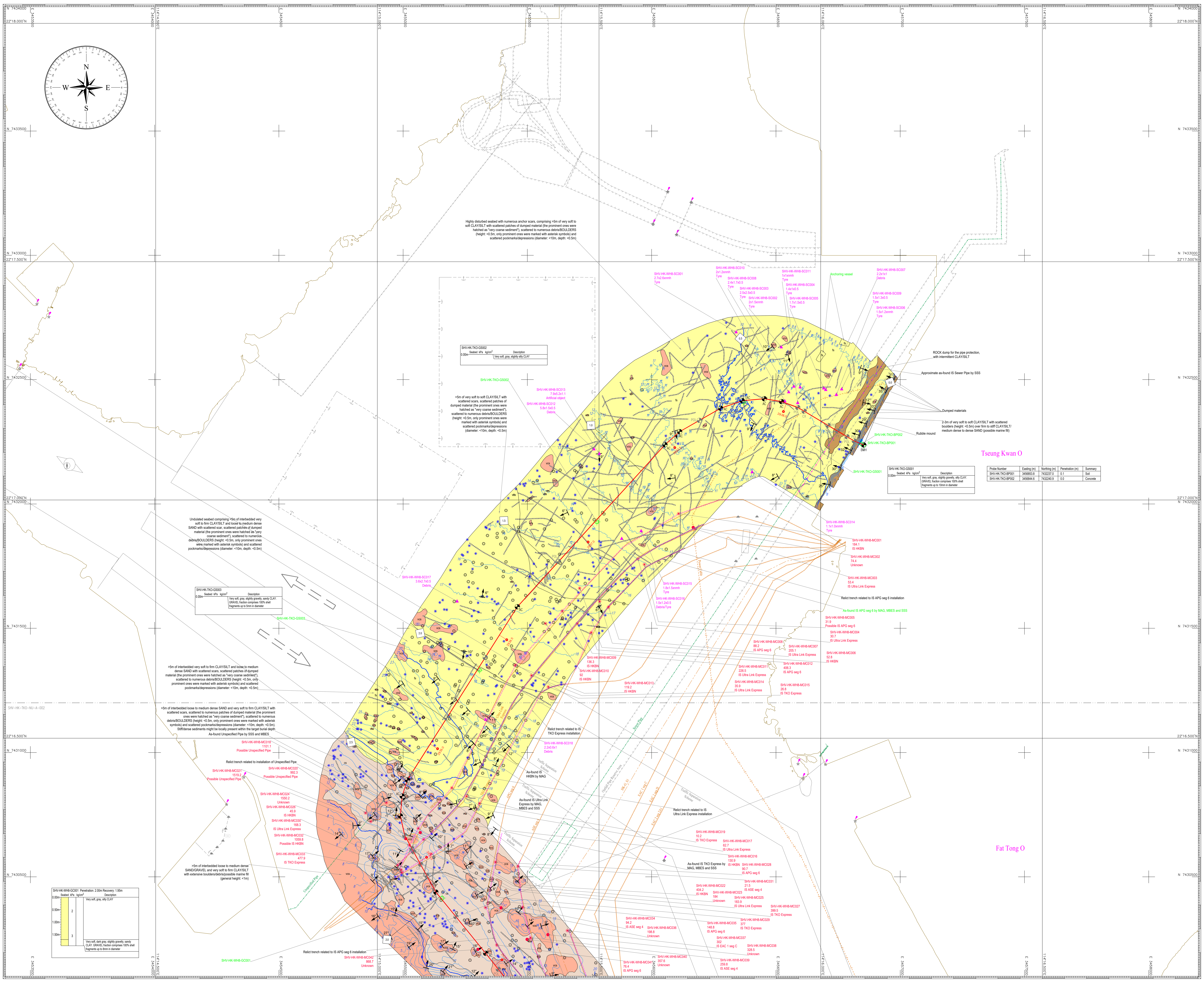
Document Title:
TKO (Hong Kong) to Sihanoukville (Cambodia)
NORTH UP CHART
CHART NO. 001 OF 001
(KP 0.00 - KP 0.52)

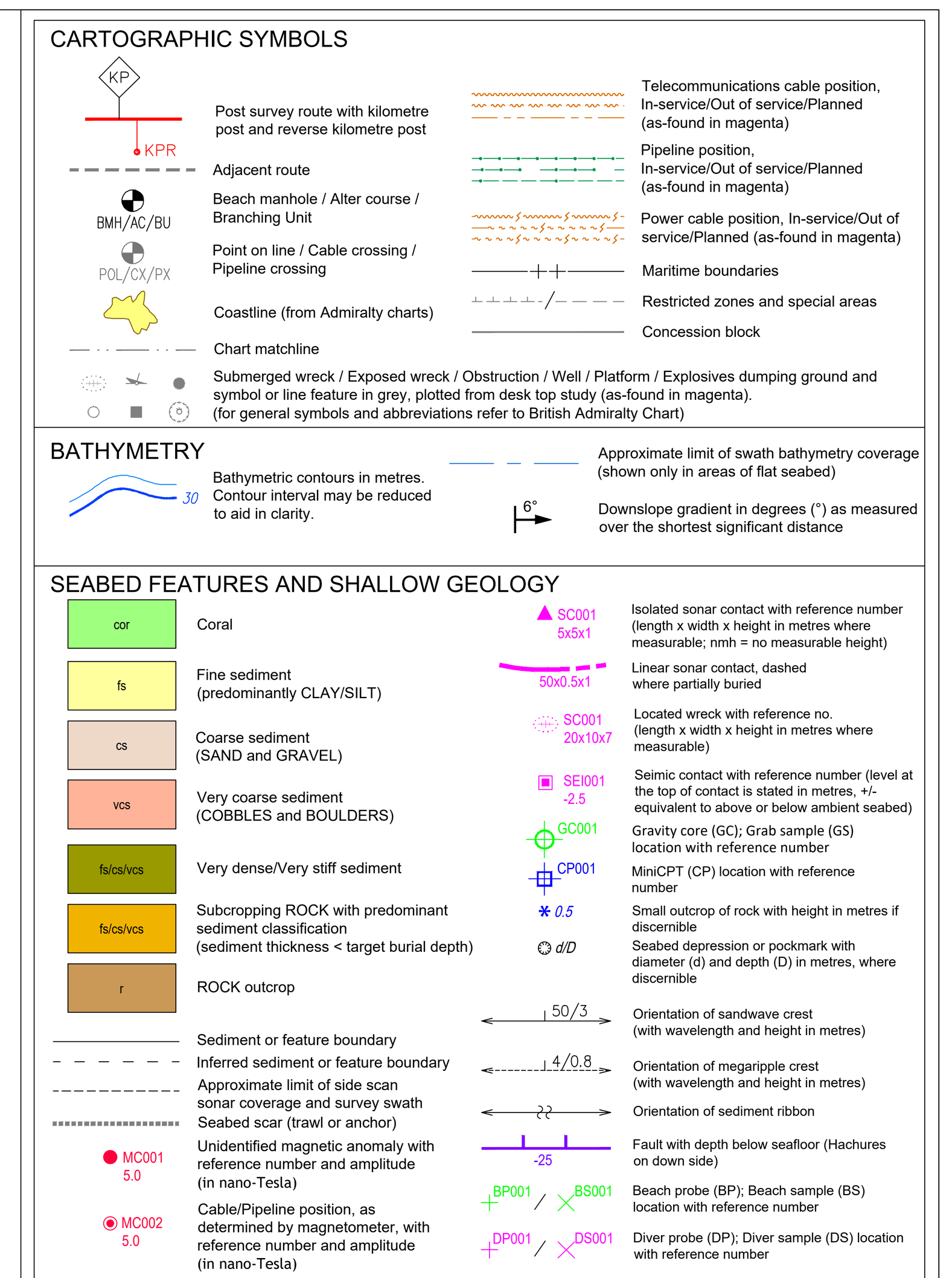
Rev	Date	Prepared by	Checked by	Approved by
0	June 2023	Chester Quek	Margie Chen	Even Mak

Preliminary

Route Based Upon: HMN_TKO (hong kong) to Sihanoukville (cambodia)_Revision_1-01 20230415.xls

File Name: SHV-HK-NU-TKO-001





Note: Contours and slope notations in this chart were derived from the optimized grid of bathymetry as per the actual data density. Seabed morphological analysis based on side-scan sonar images gives a complementary presentation for localized terrain features. Due to physical and operational limitations, resolution of this chart degrades with increasing water depths and some localized seabed features are not expected to be fully resolved. This chart serves the general purposes of route engineering and cable installation. Closer inspections are recommended for operations sensitive to small terrain features in deep waters.

CHART COMMENT:

BATHYMETRY	Along Final Route	Within Survey Corridor
Minimum depth (m)	5.4 (above LAT)	7.6 (above LAT)
Maximum depth (m)	23.0	26.0
Maximum gradient (°)	48 (over rubble mound seawall)	48 (over rubble mound seawall)

From the surveyed BMH, the route heads briefly west-northwest and gradually curves to southwest. It then progressively diverts to southeast towards the southern chart limit. The seabed is generally gentle off the very steep rubble mound seawall. Moderate slopes are locally present in the central chart and in the vicinity of the Traffic Separation Scheme where the seabed is dredged. Moderate to locally very steep slopes are common in the southern chart, associated with the widespread patches of dumped materials.

SEABED FEATURES

Rubble mound seawall is present along the coast.
Scattered boulders (height: <0.5m) and patches of dumped materials are present along the shore.
ROCK armor is present on the seabed along the IS Sewer Pipe from the northeast to the center of the chart.
Immediately off the shore, the seabed is highly disturbed with numerous anchor scars. Scars become scattered towards the south of the chart.
Scattered to numerous patches of dumped material (only prominent ones were outlined in the chart), scattered to numerous debris/BOULDERS (height: <0.5m, only prominent ones were marked with asterisk symbols in the chart) and scattered pockmarks/depressions (diameter: <10m, depth: <0.5m) are widely present in the chart.
Relict trenches related to IS cable installation are found in places.
Sonar Contacts: SHV-HK-WH8-SC001 to SC018.
Magnetometer Contacts: SHV-HK-WH8-MC001 to MC042.
Seismic Contacts: Nil.

SHALLOW GEOLOGY

Along the shore, the seabed consists of 2-3m of very soft to soft CLAY/SILT over firm to stiff CLAY/SILT/ medium dense to dense SAND (possible marine fill).
Further seawards, the seabed comprises >5m of very soft to soft CLAY/SILT, and then transits to be interbedded very soft to firm CLAY/SILT and loose to medium dense SAND. Stiff/dense sediments might be locally present within the target burial depth towards the southern chart limit.
Sediment Samples: SHV-HK-TKO-BP001 and BP002, SHV-HK-TKO-GS001 to GS003, SHV-HK-WH8-GC001
CPT: Nil.

ADDITIONAL INFORMATION

The route in the chart crosses an IS pipeline, a planned windfarm power cable and 3 IS cables.
The route crosses the Traffic Separation Scheme in the south of the chart.
A charted anchorage area is partially within the survey corridor in the north of the chart.
The route runs inside the Hong Kong waters, Inshore Traffic Zone and Guangzhou VTS.

GENERAL NOTES

	Inshore and Shallow Water
Survey vessel	MV Wing Hung 8
Surface positioning system	NovAtel GNSS Position System Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Knudsen 320m SBES System R2Sonic Sonic 2024 MBES System
Morphology and stratigraphy	EdgeTech 4205 SSS System Innomar SES-2000 Medium-100 SBP System C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters
Descriptive Terms and Definitions: The criteria used for interpretations and descriptions are presented in survey reports

GEODETIC PARAMETERS

Datum Parameters
Datum Name : WGS84, Ellipsoid : WGS84
Semi-Major Axis (a) (m) : 6378137.000
Reciprocal Flattening (1/f) : 298.257223563

Map Projection Parameters
Projection : Mercator
False Northing (m) : 5 000 000
False Easting (m) : 3 000 000

Latitude of Origin : 0° (Equator)
Longitude of Origin : 110° E
Standard Parallel : 16° N
Scale Factor along Standard Parallel : 1

VERTICAL DATUM

In Inshore and Shallow Water Survey charts: Bathymetry data has been reduced to Low Astronomical Tide (LAT) using the relationship between LAT and MSL at Quarry Bay (7110) as stated in Admiralty Tide Tables, Volume 6, 2023 and tidal measurements at the tide gauges installed at Quarry Bay and Tai Miu Wan.

In Deep Water Survey chart : No tidal reduction applied to soundings deeper than 1000m

SHEET INDEX

Current Chart

Survey Date: May 2023

Scale : NATURAL SCALE 1 : 5,000 at 16° N

(At mid-latitude of chart)
TRUE SCALE 1 : 4814.13

0 100 200 300 400 500 m

Purchaser : China unicom 中国联通
Contractor : HMN TECH
Surveyor : EGS EARTH SCIENCES & SURVEYING

EGS JOB NO.: HK268023

Project Name: Sihanoukville-Hong Kong Submarine Cable Project (SHV-HK) - Hong Kong Waters Marine Route Survey

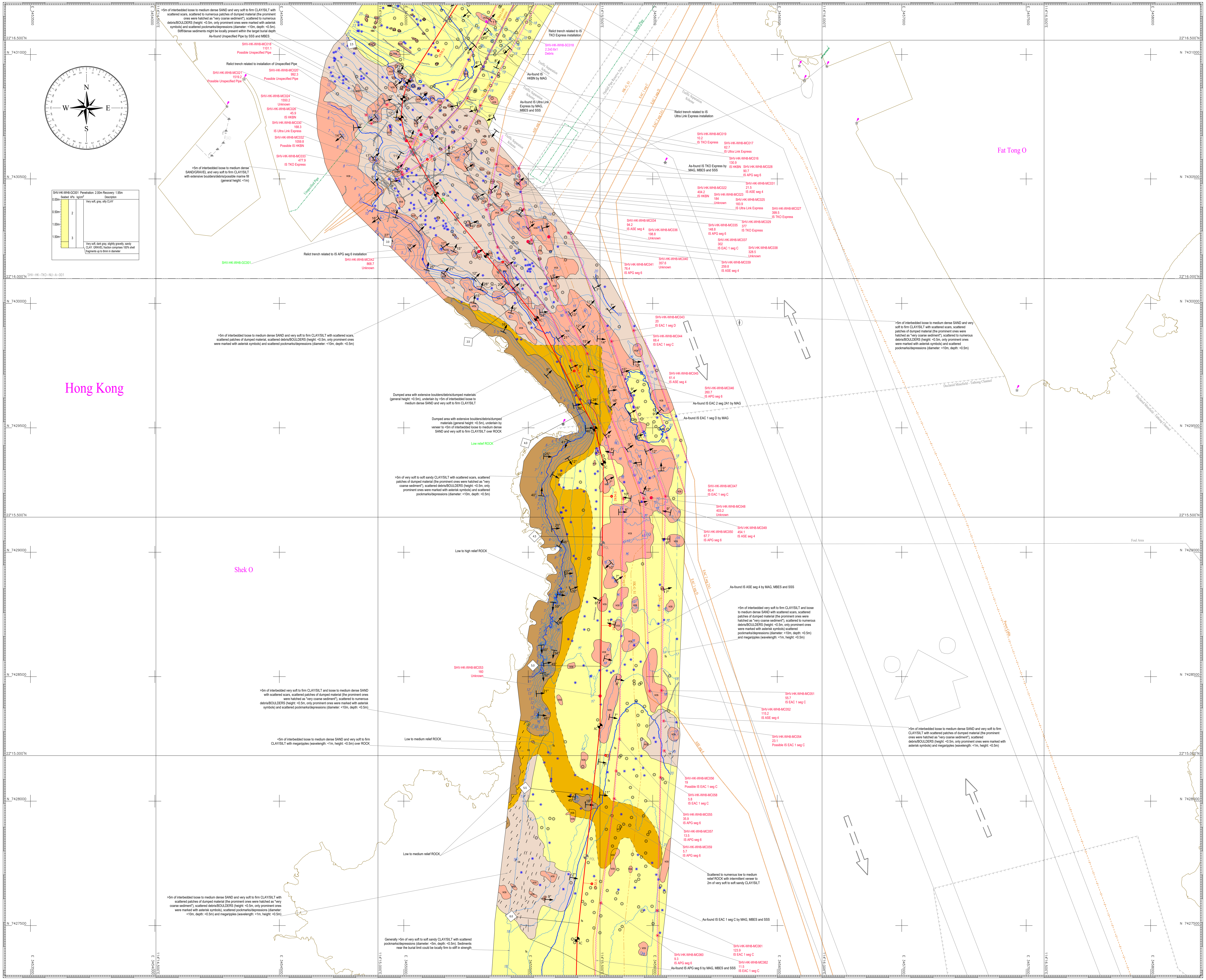
Document Title: TKO (Hong Kong) to Sihanoukville (Cambodia)
NORTH UP CHART
CHART NO. 001 OF 002
(KP 0.00 - KP 3.40)

Rev	Date	Prepared by	Checked by	Approved by
0	June 2023	Chester Quek	Margie Chen	Even Mak

Preliminary

Route Based Upon: HMN_TKO (hong kong) to Sihanoukville (cambodia)_Revision_1-01 20230415.xls

File Name: SHV-HK-TKO-NU-A-001



CARTOGRAPHIC SYMBOLS

- Post survey route with kilometre post and reverse kilometre post
- Adjacent route
- Beach manhole / Alter course / Branching Unit
- Point on line / Cable crossing / Pipeline crossing
- Coastline (from Admiralty charts)
- Chart matchline
- Submerged wreck / Exposed wreck / Obstruction / Well / Platform / Explosives dumping ground and symbol or line feature in grey, plotted from desk top study (as-found in magenta). (for general symbols and abbreviations refer to British Admiralty Chart)
- Telecommunications cable position, In-service/Out of service/Planned (as-found in magenta)
- Pipeline position, In-service/Out of service/Planned (as-found in magenta)
- Power cable position, In-service/Out of service/Planned (as-found in magenta)
- Maritime boundaries
- Restricted zones and special areas
- Concession block

BATHYMETRY

- Bathymetric contours in metres. Contour interval may be reduced to aid in clarity.
- Approximate limit of swath bathymetry coverage (shown only in areas of flat seabed)
- Downslope gradient in degrees (°) as measured over the shortest significant distance

SEABED FEATURES AND SHALLOW GEOLOGY

- Coral
- Fine sediment (predominantly CLAY/SILT)
- Coarse sediment (SAND and GRAVEL)
- Very coarse sediment (COBBLES and BOULDERS)
- Very dense/Very stiff sediment
- Subcropping ROCK with predominant sediment classification (sediment thickness < target burial depth)
- ROCK outcrop
- Sediment or feature boundary
- Inferred sediment or feature boundary
- Approximate limit of side scan sonar coverage and survey swath
- Seabed scar (trawl or anchor)
- MC001 5.0 — Unidentified magnetic anomaly with reference number and amplitude (in nano-Tesla)
- MC002 5.0 — Cable/Pipeline position, as determined by magnetometer, with reference number and amplitude (in nano-Tesla)
- Isolated sonar contact with reference number (length x width x height in metres where measurable; nmh = no measurable height)
- Linear sonar contact, dashed where partially buried
- Located wreck with reference no. (length x width x height in metres where measurable)
- Seismic contact with reference number (level at the top of contact is stated in metres, +/- equivalent to above or below ambient seabed)
- Gravity core (GC); Grab sample (GS) location with reference number
- MiniCPT (CP) location with reference number
- Small outcrop of rock with height in metres if discernible
- Seabed depression or pockmark with diameter (d) and depth (D) in metres, where discernible
- Orientation of sandwave crest (with wavelength and height in metres)
- 4/0.8 — Orientation of megaripple crest (with wavelength and height in metres)
- Orientation of sediment ribbon
- -25 — Fault with depth below seafloor (Hachures on down side)
- BP001 / BS001 — Beach probe (BP); Beach sample (BS) location with reference number
- DP001 / DS001 — Diver probe (DP); Diver sample (DS) location with reference number

Note: Contours and slope notations in this chart were derived from the optimized grid of bathymetry as per the actual data density. Seabed morphological analysis based on side-scan sonar images gives a complementary presentation for localized terrain features. Due to physical and operational limitations, resolution of this chart degrades with increasing water depths and some localized seabed features are not expected to be fully resolved. This chart serves the general purposes of route engineering and cable installation. Closer inspections are recommended for operations sensitive to small terrain features in deep waters.

CHART COMMENT:

BATHYMETRY	Along Final Route	Within Survey Corridor
Minimum depth (m)	9.2	4.1
Maximum depth (m)	23.0	25.8
Maximum gradient (°)	24	60

The route heads initially southwest and progressively curves to southeast. It then alters to a southerly direction from the chart center. Other than the very steep rocky coast along the western survey limit, the seabed is generally gentle, undulating in place due to the presence of dumped materials.

SEABED FEATURES

ROCK outcrops are present along the coast from the center to the south of the chart.

Scattered to numerous patches of dumped material (only prominent ones were outlined in the chart), scattered to numerous debris/BOULDERS (height: <0.5m, only prominent ones were marked with asterisk symbols in the chart) and scattered pockmarks/depressions (diameter: <10m, depth: <0.5m) are widely present in the chart.

Scattered scars are observed in the chart.

Megaripples (wavelength: <1m, height: <0.5m) are locally present along both limits of survey corridor in the south of the chart.

Relict trenches related to IS cable installation are found in places in the north of the chart.

Sonar Contacts: SHV-HK-WH8-SC018.

Magnetometer Contacts: SHV-HK-WH8-MC016 to MC062.

Seismic Contacts: Nil.

SHALLOW GEOLOGY

The seabed throughout the chart generally comprises >5m of interbedded very soft to firm CLAY/SILT and loose to medium dense SAND, overlain by dumped materials in places. Stiff/dense sediments might be locally present within the target burial depth in the northern chart.

Outcropping and subcropping ROCK are mapped along the western survey limit, protruding to almost intercept the survey corridor near the southern survey limit.

Sediment Samples: SHV-HK-WH8-GC001

CPT: Nil.

ADDITIONAL INFORMATION

The route in the chart crosses 3 IS cables.

The route crosses the Traffic Separation Scheme, Foul Area and Declared Minefield - Tathong Channel in the chart.

The route runs inside the Hong Kong waters, Inshore Traffic Zone and Guangzhou VTS.

GENERAL NOTES

	Inshore and Shallow Water
Survey vessel	MV Wing Hung 8
Surface positioning system	NovAtel GNSS Position System Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Knudsen 320m SBES System R2Sonic Sonic 2024 MBES System
Morphology and stratigraphy	EdgeTech 4205 SSS System Innomar SES-2000 Medium-100 SBP System C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters

Descriptive Terms and Definitions: The criteria used for interpretations and descriptions are presented in survey reports

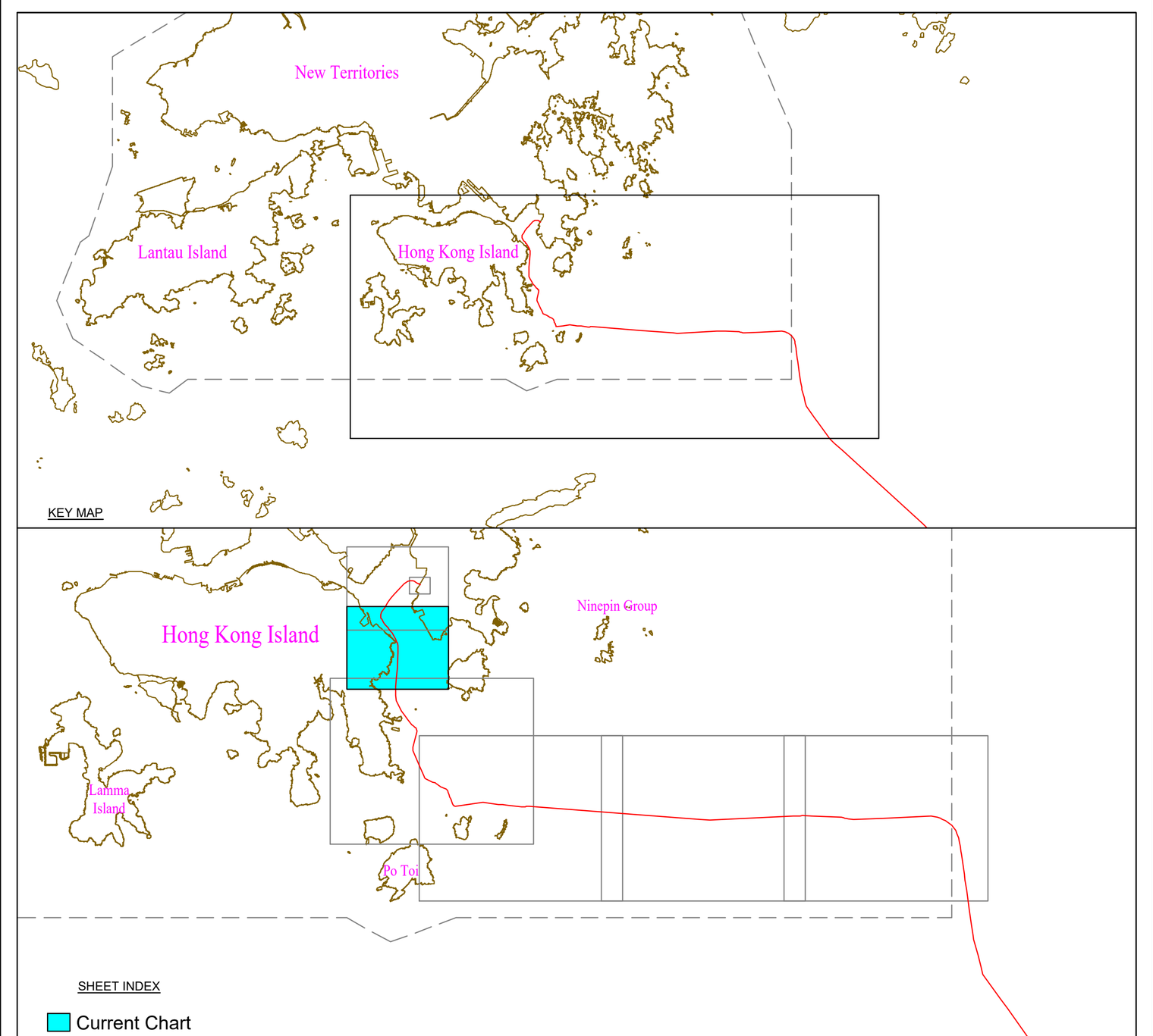
GEODETIC PARAMETERS

Datum Parameters	Map Projection Parameters	
Datum Name : WGS84, Ellipsoid : WGS84	Projection : Mercator	Latitude of Origin : 0° (Equator)
Semi-Major Axis (a) (m) : 6378137.000	False Northing (m) : 5 000 000	Longitude of Origin : 110° E
Reciprocal Flattening (1/f) : 298.257223563	False Easting (m) : 3 000 000	Standard Parallel : 16° N
		Scale Factor along Standard Parallel : 1

VERTICAL DATUM

In Inshore and Shallow Water Survey charts: Bathymetry data has been reduced to Low Astronomical Tide (LAT) using the relationship between LAT and MSL at Quarry Bay (7110) as stated in Admiralty Tide Tables, Volume 6, 2023 and tidal measurements at the tide gauges installed at Quarry Bay and Tai Miu Wan.

In Deep Water Survey chart : No tidal reduction applied to soundings deeper than 1000m



Survey Date: May 2023

Scale : NATURAL SCALE 1 : 5,000 at 16° N

(At mid-latitude of chart) TRUE SCALE 1 : 4814.97

0 100 200 300 400 500 m

Purchaser : China Unicom 中国联通

Contractor : HMN TECH

Surveyor : EGS Earth Sciences & Surveying

EGS JOB NO.: HK268023

Project Name: Sihanoukville-Hong Kong Submarine Cable Project (SHV-HK) - Hong Kong Waters Marine Route Survey

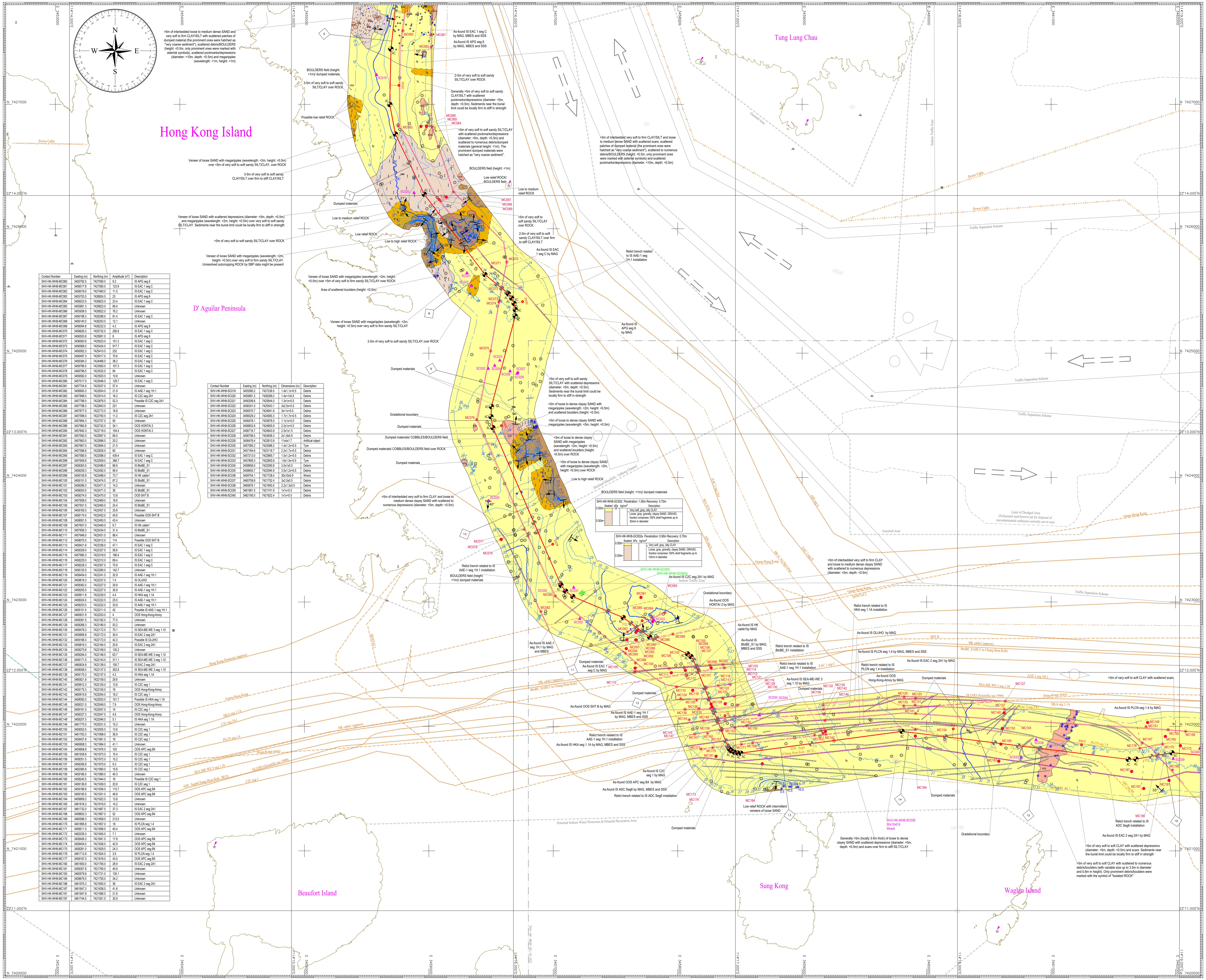
Document Title: TKO (Hong Kong) to Sihanoukville (Cambodia) NORTH UP CHART CHART NO. 002 OF 002 (KP 2.15 - KP 6.20)

Rev	Date	Prepared by	Checked by	Approved by
0	June 2023	Chester Quek	Margie Chen	Even Mak

Preliminary

Route Based Upon: HMN_TKO (hong kong) to Sihanoukville (cambodia)_Revision_1-01 20230415.xls

File Name: SHV-HK-TKO-NU-A-002



Contact Number	Easting (m)	Northing (m)	Amplitude (nT)	Description
SHV-HK-WH8-MC060	3455792.0	7427590.5	9.3	IS APG seg 6
SHV-HK-WH8-MC061	3456017.8	7427560.0	123.9	IS EAC 1 seg C
SHV-HK-WH8-MC062	3456019.0	7427460.0	11.5	IS EAC 1 seg C
SHV-HK-WH8-MC063	3455753.5	7426824.5	23	IS APG seg 6
SHV-HK-WH8-MC064	3456023.5	7426823.5	23.4	IS EAC 1 seg C
SHV-HK-WH8-MC065	3455981.3	7426823.0	69.4	Unknown
SHV-HK-WH8-MC066	3455936.5	7426822.0	76.2	Unknown
SHV-HK-WH8-MC067	3456198.3	7426296.0	81.4	IS EAC 1 seg C
SHV-HK-WH8-MC068	3456140.5	7426253.5	12.1	Unknown
SHV-HK-WH8-MC069	3456094.8	7426222.0	4.3	IS APG seg 6
SHV-HK-WH8-MC070	3456626.3	7425732.5	256.8	IS EAC 1 seg C
SHV-HK-WH8-MC071	3456503.8	7425691.0	8	IS APG seg 6
SHV-HK-WH8-MC072	3456583.8	7425523.5	151.3	IS EAC 1 seg C
SHV-HK-WH8-MC073	3456568.5	7425424.0	917.7	IS EAC 1 seg C
SHV-HK-WH8-MC074	3456562.3	7425410.5	232	IS EAC 1 seg C
SHV-HK-WH8-MC075	3456497.3	7425017.5	70.6	IS EAC 1 seg C
SHV-HK-WH8-MC076	3456384.3	7424466.0	38.2	IS EAC 1 seg C
SHV-HK-WH8-MC077	3456766.5	7423583.5	107.3	IS EAC 1 seg C
SHV-HK-WH8-MC078	3456796.5	7423532.0	94	IS EAC 1 seg C
SHV-HK-WH8-MC079	3456582.0	7423503.5	10.8	Unknown
SHV-HK-WH8-MC080	3457017.0	7423048.5	129.7	IS EAC 1 seg C
SHV-HK-WH8-MC081	3457704.5	7423037.0	57.4	Unknown
SHV-HK-WH8-MC082	3456900.3	7422924.0	21.9	IS AAE-1 seg 1H.1
SHV-HK-WH8-MC083	3457898.0	7422914.5	16.2	IS C2C seg 2A1
SHV-HK-WH8-MC084	3457788.5	7422876.5	52.3	Possible IS C2C seg 2A1
SHV-HK-WH8-MC085	3457798.3	7422843.0	221	Unknown
SHV-HK-WH8-MC086	3457677.0	7422772.5	18.8	Unknown
SHV-HK-WH8-MC087	3457596.0	7422760.5	11.2	IS C2C seg 2A1
SHV-HK-WH8-MC088	3457664.3	7422757.5	50	Unknown
SHV-HK-WH8-MC089	3457960.8	7422742.5	34.1	OOS HONTAI 2
SHV-HK-WH8-MC090	3457840.3	7422718.0	154.4	OOS HONTAI 2
SHV-HK-WH8-MC091	3457592.0	7422697.0	69.5	Unknown
SHV-HK-WH8-MC092	3457663.0	7422696.0	20.2	Unknown
SHV-HK-WH8-MC093	3457667.0	7422694.0	21.5	Unknown
SHV-HK-WH8-MC094	3457586.8	7422626.0	65	Unknown
SHV-HK-WH8-MC095	3457580.5	7422588.0	439.4	IS EAC 1 seg C
SHV-HK-WH8-MC096	3457659.8	7422509.0	388.7	IS EAC 1 seg C
SHV-HK-WH8-MC097	3458363.5	7422496.5	88.6	IS BtoBE_S1
SHV-HK-WH8-MC098	3458259.3	7422492.0	56.4	IS BtoBE_S1
SHV-HK-WH8-MC099	3458155.8	7422488.0	73.7	IS HK cable1
SHV-HK-WH8-MC100	3458151.0	7422474.5	87.2	IS BtoBE_S1
SHV-HK-WH8-MC101	3458268.3	7422471.0	14.2	Unknown
SHV-HK-WH8-MC102	3458053.0	7422471.0	38	IS BtoBE_S1
SHV-HK-WH8-MC103	3458374.0	7422470.0	13.8	OOS SHT B
SHV-HK-WH8-MC104	3457658.0	7422469.0	18.6	Unknown
SHV-HK-WH8-MC105	3457931.5	7422465.5	24.4	IS BtoBE_S1
SHV-HK-WH8-MC106	3458165.5	7422457.5	33.6	Unknown
SHV-HK-WH8-MC107	3458174.0	7422452.0	45.6	Possible OOS SHT B
SHV-HK-WH8-MC108	3458061.5	7422450.5	43.4	Unknown
SHV-HK-WH8-MC109	3457657.0	7422445.0	6.7	IS HK cable1
SHV-HK-WH8-MC110	3457656.3	7422434.5	31.4	IS BtoBE_S1
SHV-HK-WH8-MC111	3457948.0	7422431.0	96.4	Unknown
SHV-HK-WH8-MC112	3458075.5	7422412.0	114	Possible OOS SHT B
SHV-HK-WH8-MC113	3458421.8	7422336.0	47.1	IS EAC 1 seg C
SHV-HK-WH8-MC114	3458326.0	7422327.5	58.6	IS EAC 1 seg C
SHV-HK-WH8-MC115	3457990.3	7422318.5	196.4	IS EAC 1 seg C
SHV-HK-WH8-MC116	3458225.0	7422312.0	69.4	IS EAC 1 seg C
SHV-HK-WH8-MC117	3458228.3	7422307.5	70.9	IS EAC 1 seg C
SHV-HK-WH8-MC118	3458120.5	7422290.5	142.7	Unknown
SHV-HK-WH8-MC119	3458454.0	7422241.5	32.9	IS AAE-1 seg 1H.1
SHV-HK-WH8-MC120	3459819.3	7422237.0	7.4	IS OLUHO
SHV-HK-WH8-MC121	3458362.5	7422227.0	29.9	IS AAE-1 seg 1H.1
SHV-HK-WH8-MC122	3458255.5	7422227.0	30.9	IS AAE-1 seg 1H.1
SHV-HK-WH8-MC123	3459911.8	7422226.0	4.4	IS HKA seg 1.1A
SHV-HK-WH8-MC124	3458024.0	7422222.5	25.5	IS AAE-1 seg 1H.1
SHV-HK-WH8-MC125	3458253.5	7422222.0	33.9	IS AAE-1 seg 1H.1
SHV-HK-WH8-MC126	3458151.0	7422211.0	42	Possible IS AAE-1 seg 1H.1
SHV-HK-WH8-MC127	3460631.9	7422203.0	4	OOS Hong-Kong-Amoy
SHV-HK-WH8-MC128	3458381.5	7422182.5	77.5	Unknown
SHV-HK-WH8-MC129	3458268.3	7422180.0	53.2	Unknown
SHV-HK-WH8-MC130	3458478.3	7422172.5	70.1	IS SEA-ME-WE 3 seg 1.10
SHV-HK-WH8-MC131	3459906.8	7422172.0	30.4	IS EAC 2 seg 2A1
SHV-HK-WH8-MC132	3459168.3	7422172.0	42.3	Possible IS OLUHO
SHV-HK-WH8-MC133	3459816.3	7422164.5	20.6	IS EAC 2 seg 2A1
SHV-HK-WH8-MC134	3458275.8	7422158.0	130.2	Unknown
SHV-HK-WH8-MC135	3458264.0	7422146.5	63.7	IS SEA-ME-WE 3 seg 1.10
SHV-HK-WH8-MC136	3458171.0	7422143.0	311.1	IS SEA-ME-WE 3 seg 1.10
SHV-HK-WH8-MC137	3460624.8	7422138.0	100.7	IS EAC 2 seg 2A1
SHV-HK-WH8-MC138	3458058.0	7422137.5	352.8	IS SEA-ME-WE 3 seg 1.10
SHV-HK-WH8-MC139	3459170.3	7422137.0	4.2	IS HKA seg 1.1A
SHV-HK-WH8-MC140	3460621.8	7422109.5	29.6	Unknown
SHV-HK-WH8-MC141	3459912.3	7422105.0	13.6	IS C2C seg 1
SHV-HK-WH8-MC142	3459175.3	7422100.5	16	OOS Hong-Kong-Amoy
SHV-HK-WH8-MC143	3460615.8	7422054.0	18.2	IS C2C seg 1
SHV-HK-WH8-MC144	3458092.0	7422053.5	151.7	Possible IS HKA seg 1.1A
SHV-HK-WH8-MC145	3458321.5	7422049.5	7.9	OOS Hong-Kong-Amoy
SHV-HK-WH8-MC146	3459181.5	7422047.5	14	IS C2C seg 1
SHV-HK-WH8-MC147	3458327.3	7422047.5	4.6	OOS Hong-Kong-Amoy
SHV-HK-WH8-MC148	3458207.5	7422046.5	5.1	IS HKA seg 1.1A
SHV-HK-WH8-MC149	3461775.5	7422031.5	15.2	Unknown
SHV-HK-WH8-MC150	3458552.5	7422005.5	13.6	IS C2C seg 1
SHV-HK-WH8-MC151	3461763.3	7421998.0	36.9	IS C2C seg 1
SHV-HK-WH8-MC152	3458457.8	7421991.0	16	IS C2C seg 1
SHV-HK-WH8-MC153	3460608.3	7421984.0	41.1	Unknown
SHV-HK-WH8-MC154	3459908.8	7421976.5	103	OOS APC seg B4
SHV-HK-WH8-MC155	3461939.8	7421973.5	15.4	IS C2C seg 1
SHV-HK-WH8-MC156	3458351.5	7421972.0	10.2	IS C2C seg 1
SHV-HK-WH8-MC157	3458356.8	7421970.0	9.3	IS C2C seg 1
SHV-HK-WH8-MC158	3462080.8	7421960.0	15.8	IS C2C seg 1
SHV-HK-WH8-MC159	3459186.5	7421960.0	40.3	Unknown
SHV-HK-WH8-MC160	3458240.5	7421944.0	16	Possible IS C2C seg 1
SHV-HK-WH8-MC161	3458136.8	7421939.5	20.8	IS C2C seg 1
SHV-HK-WH8-MC162	3459188.8	7421936.5	115.7	OOS APC seg B4
SHV-HK-WH8-MC163	3459100.5	7421931.0	49.8	OOS APC seg B4
SHV-HK-WH8-MC164	3459909.3	7421922.5	13.8	Unknown
SHV-HK-WH8-MC165	3461918.3	7421919.5	14.2	Unknown
SHV-HK-WH8-MC167	3461732.0	7421867.5	37.3	IS EAC 2 seg 2A1
SHV-HK-WH8-MC168	3458602.3	7421867.0	52	OOS APC seg B4
SHV-HK-WH8-MC169	3460596.3	7421858.0	213.5	Unknown
SHV-HK-WH8-MC170	3461895.8	7421857.0	18	IS PLCN seg 1.4
SHV-HK-WH8-MC171	3458511.5	7421856.0	40.4	OOS APC seg B4
SHV-HK-WH8-MC172	3462039.3	7421845.5	7.1	Unknown
SHV-HK-WH8-MC173	3458406.3	7421841.5	17.8	OOS APC seg B4
SHV-HK-WH8-MC174	3458404.0	7421836.5	42.9	OOS APC seg B4
SHV-HK-WH8-MC175	3458281.0	7421829.5	24.3	OOS APC seg B4
SHV-HK-WH8-MC176	3461712.8	7421824.5	3.9	IS PLCN seg 1.4
SHV-HK-WH8-MC177	3458187.0	7421818.5	43.5	OOS APC seg B4
SHV-HK-WH8-MC180	3461850.0	7421765.0	28.9	IS EAC 2 seg 2A1
SHV-HK-WH8-MC181	3458307.8	7421760.0	40.9	Unknown
SHV-HK-WH8-MC183	3460579.8	7421721.0	130.1	Unknown
SHV-HK-WH8-MC184	3458679.5	7421700.0	34.2	Unknown
SHV-HK-WH8-MC186	3461975.3	7421650.5	36	IS EAC 2 seg 2A1
SHV-HK-WH8-MC187	3461647.3	7421638.5	41.6	Unknown
SHV-HK-WH8-MC191	3461947.8	7421566.5	21.8	Unknown
SHV-HK-WH8-MC197	3461744.5	7421501.5	35.9	Unknown

Contact Number	Easting (m)	Northing (m)	Dimensions (m)	Description
SHV-HK-WH8-SC019	3455580.2	7427236.5	1.4x1.1x<0.5	Debris
SHV-HK-WH8-SC020	3455881.2	7426289.2	1.4x<1x0.5	Debris
SHV-HK-WH8-SC021	3456306.6	7425644.0	1.3x1x<0.5	Debris
SHV-HK-WH8-SC022	3456341.0	7425543.1	3x2.5x<0.5	Debris
SHV-HK-WH8-SC023	3456570.7	7424941.8	3x<1x<0.5	Debris
SHV-HK-WH8-SC024	3456529.2	7424900.3	1.7x1.7x<0.5	Debris
SHV-HK-WH8-SC025	3456478.1	7424876.0	1.1x1x<0.5	Debris
SHV-HK-WH8-SC026	3456652.8	7424855.9	2.2x1x<0.5	Debris
SHV-HK-WH8-SC027	3456716.7	7424843.9	2.5x1x1.5	Debris
SHV-HK-WH8-SC028	3456708.5	7424836.3	2x1.8x0.8	Debris
SHV-HK-WH8-SC029	3456478.4	7423813.9	11x4x1.7	Artificial object
SHV-HK-WH8-SC030	3457085.2	7423088.2	1.4x1.2x<0.5	Tyre
SHV-HK-WH8-SC031	3457164.6	7423116.7	2.2x1.7x<0.5	Debris
SHV-HK-WH8-SC032	3457213.0	7422865.7	1.5x1.2x<0.5	Debris
SHV-HK-WH8-SC033	3457809.3	7422855.8	1.6x1.5x<0.5	Tyre
SHV-HK-WH8-SC034	3458656.0	7422090.8	3.5x1x0.5	Debris
SHV-HK-WH8-SC035	3458655.7	7422094.9	3.5x1.2x<0.5	Debris
SHV-HK-WH8-SC036	3459754.1	7421728.4	30x10x0.9	Wreck
SHV-HK-WH8-SC037	3460759.8	7421752.4	3x2.5x0.5	Debris
SHV-HK-WH8-SC038	3460879.1	7421893.0	2.2x1.3x0.5	Debris
SHV-HK-WH8-SC039	3461981.5	7421741.9	1x1x<0.5	Debris
SHV-HK-WH8-SC040	3462195.0	7421822.4	1x1x<0.5	Debris

CARTOGRAPHIC SYMBOLS

- Post survey route with kilometre post and reverse kilometre post (KP, KPR)
- Adjacent route
- Beach manhole / Alter course / Branching Unit (BMH/AC/BU)
- Point on line / Cable crossing / Pipeline crossing (POL/CX/PX)
- Coastline (from Admiralty charts)
- Chart matchline
- Submerged wreck / Exposed wreck / Obstruction / Well / Platform / Explosives dumping ground and symbol or line feature in grey, plotted from desk top study (as-found in magenta). (for general symbols and abbreviations refer to British Admiralty Chart)
- Telecommunications cable position, In-service/Out of service/Planned (as-found in magenta)
- Pipeline position, In-service/Out of service/Planned (as-found in magenta)
- Power cable position, In-service/Out of service/Planned (as-found in magenta)
- Maritime boundaries
- Restricted zones and special areas
- Concession block

BATHYMETRY

- Bathymetric contours in metres. Contour interval may be reduced to aid in clarity.
- Approximate limit of swath bathymetry coverage (shown only in areas of flat seabed)
- Downslope gradient in degrees (°) as measured over the shortest significant distance

SEABED FEATURES AND SHALLOW GEOLOGY

- cor — Coral
- fs — Fine sediment (predominantly CLAY/SILT)
- cs — Coarse sediment (SAND and GRAVEL)
- vcs — Very coarse sediment (COBBLES and BOULDERS)
- fs/cs/vcs — Very dense/Very stiff sediment
- fs/cs/vcs — Subcropping ROCK with predominant sediment classification (sediment thickness < target burial depth)
- r — ROCK outcrop
- Sediment or feature boundary
- Inferred sediment or feature boundary
- Approximate limit of side scan sonar coverage and survey swath
- Seabed scar (trawl or anchor)
- MC001 5.0 — Unidentified magnetic anomaly with reference number and amplitude (in nano-Tesla)
- MC002 5.0 — Cable/Pipeline position, as determined by magnetometer, with reference number and amplitude (in nano-Tesla)
- SC001 5x5x1 — Isolated sonar contact with reference number (length x width x height in metres where measurable; nmh = no measurable height)
- 50x0.5x1 — Linear sonar contact, dashed where partially buried
- SC001 20x10x7 — Located wreck with reference no. (length x width x height in metres where measurable)
- SEI001 -2.5 — Seimic contact with reference number (level at the top of contact is stated in metres, +/- equivalent to above or below ambient seabed)
- GC001 — Gravity core (GC); Grab sample (GS) location with reference number
- CP001 — MiniCPT (CP) location with reference number
- 0.5 — Small outcrop of rock with height in metres if discernible
- d/D — Seabed depression or pockmark with diameter (d) and depth (D) in metres, where discernible
- 50/3 — Orientation of sandwave crest (with wavelength and height in metres)
- 4/0.8 — Orientation of megaripple crest (with wavelength and height in metres)
- Orientation of sediment ribbon
- -25 — Fault with depth below seafloor (Hachures on down side)
- BP001 / BS001 — Beach probe (BP); Beach sample (BS) location with reference number
- DP001 / DS001 — Diver probe (DP); Diver sample (DS) location with reference number

Note: Contours and slope notations in this chart were derived from the optimized grid of bathymetry as per the actual data density. Seabed morphological analysis based on side-scan sonar images gives a complementary presentation for localized terrain features. Due to physical and operational limitations, resolution of this chart degrades with increasing water depths and some localized seabed features are not expected to be fully resolved. This chart serves the general purposes of route engineering and cable installation. Closer inspections are recommended for operations sensitive to small terrain features in deep waters.

CHART COMMENT:

BATHYMETRY	Along Final Route	Within Survey Corridor
Minimum depth (m)	20.3	7.0
Maximum depth (m)	32.1	34.6
Maximum gradient (°)	11	60

The route heads south to southeast from the north to the central portion of the chart, with plenty of alter courses. It then turns to an easterly direction.
The seabed is generally gentle, undulating in place due to the presence of dumped materials. Moderate to steep slopes are occasionally present. Steep to very steep slopes are observed in places associated with rocky seabed.

SEABED FEATURES
Patches of dumped material, debris/BOULDERS (height: <0.5m), pockmarks/depressions (diameter: <10m, depth: <0.5m) and scars are scattered in the chart.
ROCK outcrops are present in places in the chart.
Megaripples (wavelength: <2m, height: <0.5m) are locally present in the northern and central portions of the chart.
An area of scattered to numerous debris/boulders (with variable size up to 3.5m in diameter and 0.6m in height) is mapped in the east of the chart, occupying the most of the survey corridor.
Relict trenches related to IS cable installation are found in places.
Sonar Contacts: SHV-HK-WH8-SC019 to SC040.
Magnetometer Contacts: SHV-HK-WH8-MC060 to MC165, MC167 to MC177, MC180 to MC187, MC191 and MC197.
Seismic Contacts: Nil.

SHALLOW GEOLOGY
The seabed comprises >5m of interbedded very soft to firm CLAY/SILT and loose to medium dense SAND at the northern beginning and the central portion of the chart.
In the rest of the survey corridor, the seabed is generally covered with >5m of very soft to soft sandy SILT/CLAY. Firm to stiff SILT/CLAY might be locally present within the target burial depth in places.
To the north of the island of Sung Kong in the southern chart, the seabed is characterized by generally >5m (locally 3-5m thick) of loose to dense clayey SAND over firm to stiff SILT/CLAY.
ROCK outcrops and subcrops are locally mapped in the chart.
Sediment Samples: SHV-HK-WH8-GC002 and GC002a
CPT: Nil.

ADDITIONAL INFORMATION
Two wrecks are charted within the survey corridor in the southern chart. The southern one is observed during the survey.
The route in the chart makes 12 crossing with IS cables, 8 crossings with OOS cables and 1 crossing with a planned cable.
The route exits the Declared Minefield - Tathong Channel and Inshore Traffic Zone in the south of the chart.
The route runs inside the Hong Kong waters and Guangzhou VTS.

GENERAL NOTES

	Inshore and Shallow Water
Survey vessel	MV Wing Hung 8
Surface positioning system	NovAtel GNSS Position System Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Knudsen 320m SBES System R2Sonic Sonic 2024 MBES System
Morphology and stratigraphy	EdgeTech 4205 SSS System Innomar SES-2000 Medium-100 SBP System C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters
Descriptive Terms and Definitions: The criteria used for interpretations and descriptions are presented in survey reports

GEODETIC PARAMETERS

Datum Parameters
Datum Name : WGS84, Ellipsoid : WGS84
Semi-Major Axis (a) (m) : 6378137.000
Reciprocal Flattening (1/f) : 298.257223563

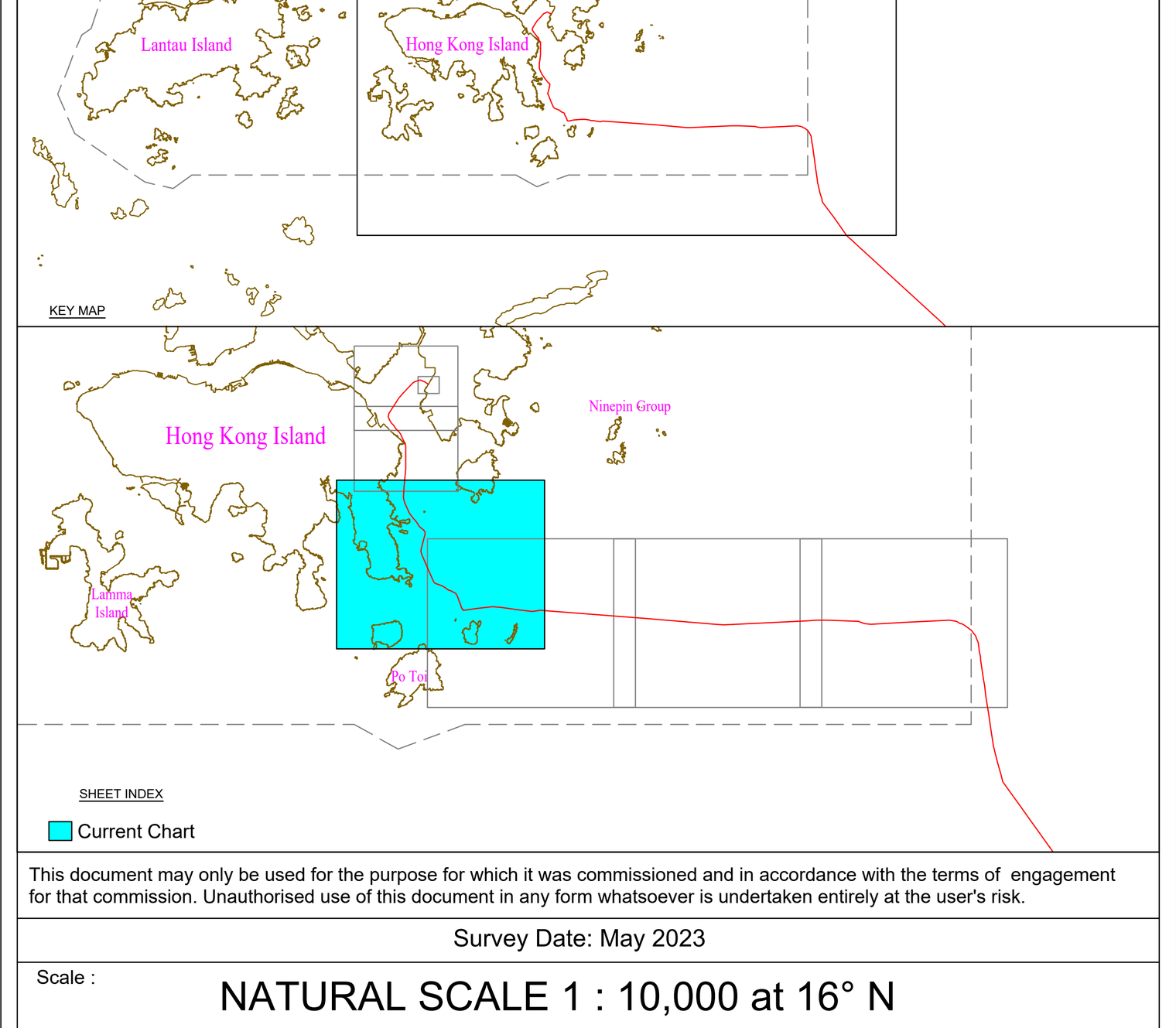
Map Projection Parameters
Projection : Mercator
False Northing (m) : 5 000 000
False Easting (m) : 3 000 000

Latitude of Origin : 0° (Equator)
Longitude of Origin : 110° E
Standard Parallel : 16° N
Scale Factor along Standard Parallel : 1

VERTICAL DATUM

In Inshore and Shallow Water Survey charts: Bathymetry data has been reduced to Low Astronomical Tide (LAT) using the relationship between LAT and MSL at Quarry Bay (7110) as stated in Admiralty Tide Tables, Volume 6, 2023 and tidal measurements at the tide gauges installed at Quarry Bay and Tai Miu Wan.

In Deep Water Survey chart : No tidal reduction applied to soundings deeper than 1000m



Survey Date: May 2023

Scale : NATURAL SCALE 1 : 10,000 at 16° N
(At mid-latitude of chart) TRUE SCALE 1 : 9633.11
0.0 0.2 0.4 0.6 0.8 1.0 km

Purchaser : 中国联通 China unicom
Contractor : HMN TECH
Surveyor : EGS EARTH SCIENCES & SURVEYING
EGS JOB NO.: HK268023

Project Name: Sihanoukville-Hong Kong Submarine Cable Project (SHV-HK) - Hong Kong Waters Marine Route Survey

Document Title: TKO (Hong Kong) to Sihanoukville (Cambodia) NORTH UP CHART CHART NO. 001 OF 004 (KP 5.72 - KP 16.28)

Rev	Date	Prepared by	Checked by	Approved by
0	June 2023	Chester Quek	Margie Chen	Even Mak

Preliminary

Route Based Upon: HMN_TKO (hong kong) to Sihanoukville (cambodia)_Revision_1-01 20230415.xls
File Name: SHV-HK-WH8-NU-B-001

CARTOGRAPHIC SYMBOLS

- KP1 — Post survey route with kilometre post and reverse kilometre post
- KP# — Adjacent route
- BM/AC/BJ — Beach manhole / Alter course / Branching Unit
- PO/CV/PX — Point on line / Cable crossing / Pipeline crossing
- Coastline (from Admiralty charts)
- Chart matchline
- Submerged wreck / Exposed wreck / Obstruction / Well / Platform / Explosives dumping ground and symbol or line feature in grey, plotted from desk top study (as-found in magenta). (for general symbols and abbreviations refer to British Admiralty Chart)
- Telecommunications cable position, In-service/Out of service/Planned (as-found in magenta)
- Pipeline position, In-service/Out of service/Planned (as-found in magenta)
- Power cable position, In-service/Out of service/Planned (as-found in magenta)
- Maritime boundaries
- Restricted zones and special areas
- Concession block

BATHYMETRY

- 20 — Bathymetric contours in metres. Contour interval may be reduced to aid in clarity.
- Approximate limit of swath bathymetry coverage (shown only in areas of flat seabed)
- 6° — Downslope gradient in degrees (°) as measured over the shortest significant distance

SEABED FEATURES AND SHALLOW GEOLOGY

- cor — Coral
- fs — Fine sediment (predominantly CLAY/SILT)
- cs — Coarse sediment (SAND and GRAVEL)
- vcs — Very coarse sediment (COBBLES and BOULDERS)
- fvc/s/c/s — Very dense/Very stiff sediment
- fvc/s/c/s — Subcropping ROCK with predominant sediment classification (sediment thickness < target burial depth)
- r — ROCK outcrop
- Isolated sonar contact with reference number (length x width x height in metres where measurable; mnh = no measurable height) SO001 5x5x1
- Linear sonar contact, dashed where partially buried SO001 20x10x1
- Located wreck with reference no. (length x width x height in metres where measurable) SO001 20x10x1
- Seimic contact with reference number (level at the top of contact is stated in metres, +/- equivalent to above or below ambient seabed) SE0001 -2.5
- Gravity core (GC); Grab sample (GS) location with reference number GC001
- MiniCPT (CP) location with reference number CP001
- Small outcrop of rock with height in metres if discernible 0.5
- Seabed depression or pockmark with diameter (d) and depth (D) in metres, where discernible d/D
- Sediment or feature boundary
- Inferred sediment or feature boundary
- Approximate limit of side scan sonar coverage and survey swath
- Seabed scar (trawl or anchor)
- Unidentified magnetic anomaly with reference number and amplitude (in nano-Tesla) MC001 5.0
- Cable/Pipeline position, as determined by magnetometer, with reference number and amplitude (in nano-Tesla) MC002 5.0
- 50 / 3 — Orientation of sandwave crest (with wavelength and height in metres)
- 400 / 8 — Orientation of megaripple crest (with wavelength and height in metres)
- N — Orientation of sediment ribbon
- Fault with depth below seafloor (Hachures on down side) 25
- BP001 / BS001 — Beach probe (BP); Beach sample (BS) location with reference number
- DP001 / DS001 — Diver probe (DP); Diver sample (DS) location with reference number

Note: Contours and slope notations in this chart were derived from the optimized grid of bathymetry as per the actual data density. Seabed morphological analysis based on side-scan sonar images gives a complementary presentation for localized terrain features. Due to physical and operational limitations, resolution of this chart degrades with increasing water depths and some localized seabed features are not expected to be fully resolved. This chart serves the general purposes of route engineering and cable installation. Closer inspections are recommended for operations sensitive to small terrain features in deep waters.

CHART COMMENT:

	Along Final Route	Within Survey Corridor
BATHYMETRY		
Minimum depth (m)	25.5	9.8
Maximum depth (m)	32.1	34.6
Maximum gradient (°)		57

The route heads initially south-southeast in general and then turns to an easterly direction.
The seabed is generally very gentle to gentle, with localized moderate slopes. Steep to very steep slopes are locally present at the northwestern survey limit.

SEABED FEATURES
ROCK outcrops are present at the northwestern survey limit. Another small rocky area is observed at the southern survey limit towards the island of Sung Kong, in the vicinity of which scattered boulders are found.
An area of scattered to numerous debris/boulders (with variable size up to 3.5m in diameter and 0.6m in height) is mapped near the chart center, occupying the most of the survey corridor.
Patches of dumped materials are occasionally present in the chart.
Depressions (diameter: <10m, depth: <0.5m) and scars are scattered in the chart.
Relict trenches related to IS cable installation are found in places.

Sonar Contacts: SHV-HK-WH8-SC030 to SC047.
Magnetometer Contacts: SHV-HK-WH8-MC080 to MC187, MC191, MC194, MC197, MC199 and MC204.
Seismic Contacts: Nil.
SHALLOW GEOLOGY
ROCK outcrops and subcrops are mapped at the northwestern survey limit.
The seabed initially comprises >5m of interbedded very soft to firm CLAY and loose to medium dense clayey SAND at the western beginning of the chart, and changes to be generally >5m (locally 3-5m thick) of loose to dense clayey SAND over firm to stiff SILT/CLAY to the north of Sung Kong.
The seabed is then characterized by >5m of very soft to soft sandy SILT/CLAY, while firm to stiff SILT/CLAY might be locally present within the target burial depth near the chart center.
Sediment Samples: SHV-HK-WH8-GC002 and GC002a.
CPT: Nil.

ADDITIONAL INFORMATION
Two wrecks are charted within the survey corridor in the western chart. The southern one is observed during the survey.
The route in the chart makes 11 crossing with IS cables, 8 crossings with OOS cables and 1 crossing with a planned cable.
The route exits the Declared Minefield - Taitung Channel and Inshore Traffic Zone near the western chart limit.
The route runs inside the Hong Kong waters and Guangzhou VTS.

GENERAL NOTES

	Inshore and Shallow Water
Survey vessel	MV Wing Hung 8
Surface positioning system	NovAtel GNSS Position System Qinay Navigation System
Underwater positioning System	Kongsberg mircoRAP 200 USBL System
Bathymetry	Knudsen 320m SBES System R2Sonic Sonic 2024 MBES System
Morphology and stratigraphy	EdgeTech 4205 SSS System Innomar SES-2000 Medium-100 SBP System C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters
Descriptive Terms and Definitions: The criteria used for interpretations and descriptions are presented in survey reports

GEODETIC PARAMETERS

Datum Parameters
Datum Name : WGS84, Ellipsoid : WGS84
Semi-Major Axis (a) (m) : 6378137.000
Reciprocal Flattening (1/f) : 298.257223563

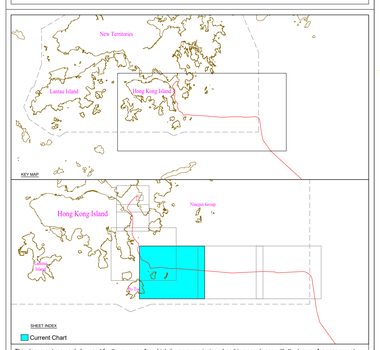
Map Projection Parameters
Projection : Mercator
False Northing (m) : 5 000 000
False Easting (m) : 3 000 000

Latitude of Origin : 0° (Equator)
Longitude of Origin : 110° E
Standard Parallel : 16° N
Scale Factor along Standard Parallel : 1

VERTICAL DATUM

In Inshore and Shallow Water Survey charts: Bathymetry data has been reduced to Low Astronomical Tide (LAT) using the relationship between LAT and MSL at Quarry Bay (T110) as stated in Admiralty Tide Tables, Volume 6, 2023 and tidal measurements at the tide gauges installed at Quarry Bay and Tai Miu Wan.

In Deep Water Survey chart : No tidal reduction applied to soundings deeper than 1000m



Survey Date: May 2023

Scale : NATURAL SCALE 1 : 10,000 at 16° N
(At mid-latitude of chart)
TRUE SCALE 1 : 9634.71
0.0 0.2 0.4 0.6 0.8 1.0 km

Purchaser : Contractor : Surveyor :

EGS JOB NO.: HK386023

Project Name: Sihanoukville-Hong Kong Submarine Cable Project (SHV-HK)
- Hong Kong Waters
Marine Route Survey

Document Title: TKO (Hong Kong) to Sihanoukville (Cambodia)
NORTH UP CHART
CHART NO. 002 OF 004
(KP 10.02 - KP 20.34)

Rev	Date	Prepared by	Checked by	Approved by
0	June 2023	Chester Quek	Margie Chen	Even Mak

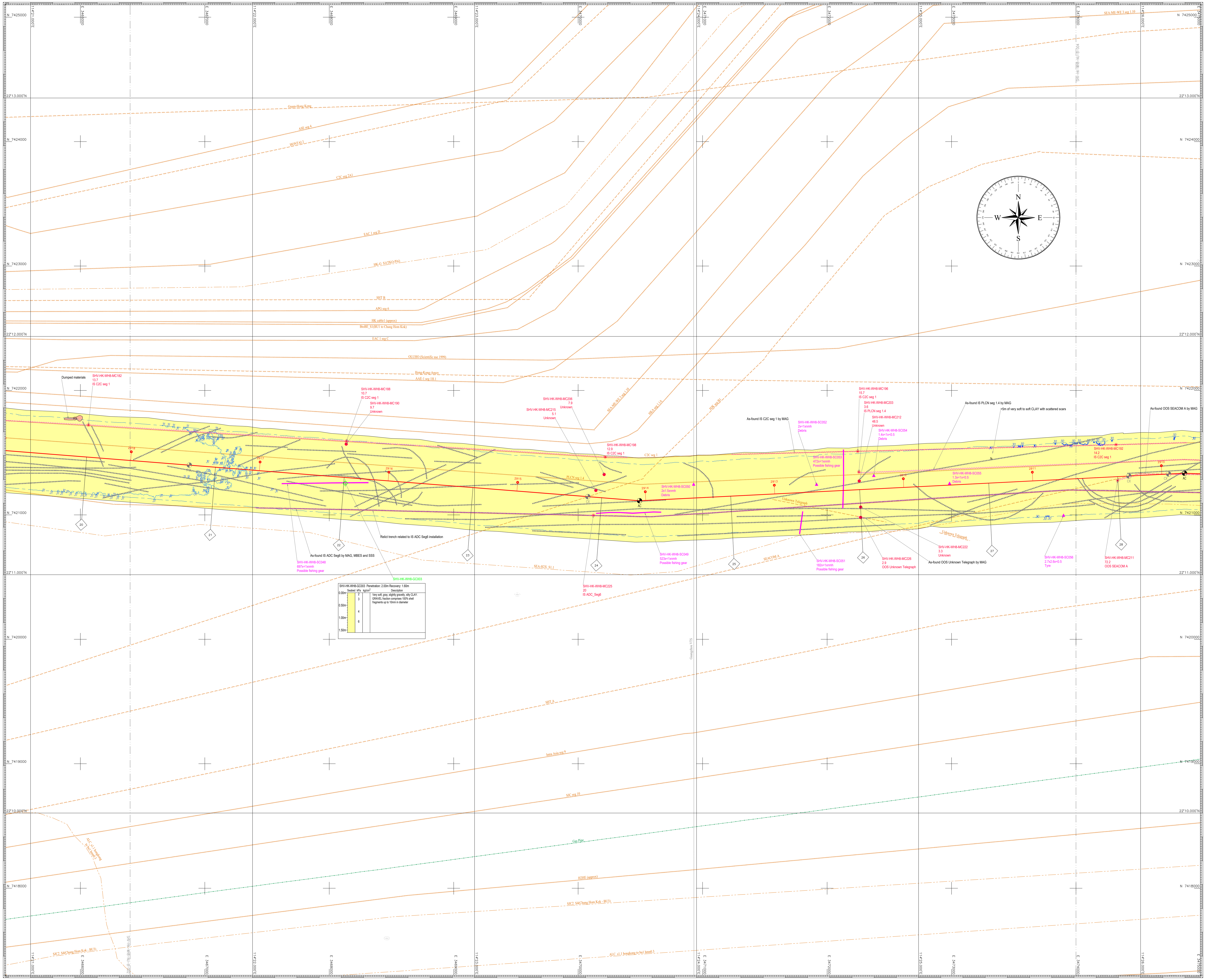
Preliminary

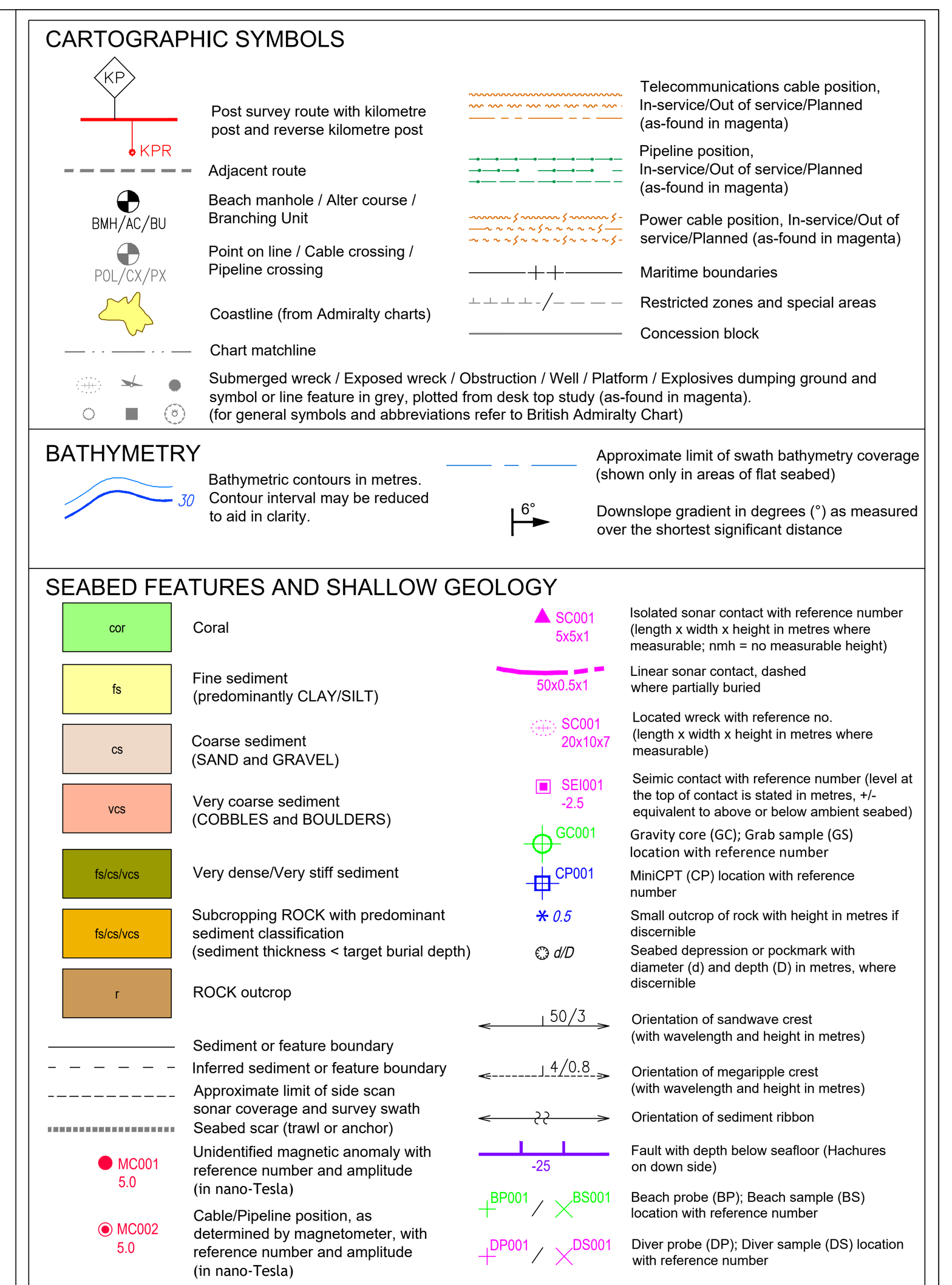
Route Based Upon: HMN_TKO (hong kong) to Sihanoukville (cambodia)_Revision_1-01 20230415.xls
File Name: SHV-HK-WH8-NU-B-002

Contact Number	Easting (m)	Northing (m)	Amplitude (nT)	Description
SHV-HK-WH8-MC080	3457017.0	7423048.5	129.7	IS EAC 1 seg C
SHV-HK-WH8-MC081	3457734.5	7423037.0	57.4	Unknown
SHV-HK-WH8-MC082	3458950.3	7422924.0	21.9	IS AAE-1 seg 1H.1
SHV-HK-WH8-MC083	3457898.0	7420914.5	16.2	IS C2C seg 2A1
SHV-HK-WH8-MC084	3457788.5	7420878.5	52.3	Possible IS C2C seg 2A1
SHV-HK-WH8-MC085	3457798.3	7422084.0	221	Unknown
SHV-HK-WH8-MC086	3457677.0	7422772.5	18.8	Unknown
SHV-HK-WH8-MC087	3457596.0	7423760.5	11.2	IS C2C seg 2A1
SHV-HK-WH8-MC088	3457564.3	7423757.5	50	Unknown
SHV-HK-WH8-MC089	3457960.8	7423742.5	34.1	OOS HONTAI 2
SHV-HK-WH8-MC090	3457940.3	7423719.0	154.4	OOS HONTAI 2
SHV-HK-WH8-MC091	3457582.0	7423897.0	69.5	Unknown
SHV-HK-WH8-MC092	3457603.1	7423896.0	20.2	Unknown
SHV-HK-WH8-MC093	3457667.0	7424094.0	21.5	Unknown
SHV-HK-WH8-MC094	3457586.8	7424026.0	65	Unknown
SHV-HK-WH8-MC095	3457590.5	7423588.0	439.4	IS EAC 1 seg C
SHV-HK-WH8-MC096	3457559.8	7423509.0	388.7	IS EAC 1 seg C
SHV-HK-WH8-MC097	3458353.5	7424496.5	80.6	IS BtoBE_S1
SHV-HK-WH8-MC098	3458259.3	7424492.0	56.4	IS BtoBE_S1
SHV-HK-WH8-MC099	3459155.8	7424488.5	73.7	IS HK cable1
SHV-HK-WH8-MC100	3458151.0	7424374.5	87.2	IS BtoBE_S1
SHV-HK-WH8-MC101	3458268.3	7424471.0	14.2	Unknown
SHV-HK-WH8-MC102	3458053.0	7424471.0	38	IS BtoBE_S1
SHV-HK-WH8-MC103	3458374.0	7424370.0	13.8	OOS SHT B
SHV-HK-WH8-MC104	3457558.0	7423489.0	18.6	Unknown
SHV-HK-WH8-MC105	3457931.5	7423485.5	24.4	IS BtoBE_S1
SHV-HK-WH8-MC106	3458165.5	7423467.5	33.6	Unknown
SHV-HK-WH8-MC107	3458174.0	7423452.0	45.6	Possible OOS SHT B
SHV-HK-WH8-MC108	3458691.5	7423450.5	43.4	Unknown
SHV-HK-WH8-MC109	3457657.0	7423445.0	6.7	IS HK cable1
SHV-HK-WH8-MC110	3457658.3	7423434.5	31.4	IS BtoBE_S1
SHV-HK-WH8-MC111	3457948.0	7423431.0	86.4	Unknown
SHV-HK-WH8-MC112	3458075.5	7423412.0	114	Possible OOS SHT B
SHV-HK-WH8-MC113	3458421.8	7423338.0	47.1	IS EAC 1 seg C
SHV-HK-WH8-MC114	3458326.0	7423327.5	58.6	IS EAC 1 seg C
SHV-HK-WH8-MC115	3457990.3	7423318.5	196.4	IS EAC 1 seg C
SHV-HK-WH8-MC116	3458225.0	7423312.0	69.4	IS EAC 1 seg C
SHV-HK-WH8-MC117	3458228.3	7423307.5	70.9	IS EAC 1 seg C
SHV-HK-WH8-MC118	3458120.5	7423290.5	142.7	Unknown
SHV-HK-WH8-MC119	3458454.0	7423241.5	32.9	IS AAE-1 seg 1H.1
SHV-HK-WH8-MC120	3458619.3	7423227.0	7.4	IS OLUHO
SHV-HK-WH8-MC121	3458392.5	7423227.0	29.9	IS AAE-1 seg 1H.1
SHV-HK-WH8-MC122	3458255.5	7423227.0	30.9	IS AAE-1 seg 1H.1
SHV-HK-WH8-MC123	3459111.8	7423226.0	4.4	IS HKA seg 1.1A
SHV-HK-WH8-MC124	3458324.0	7423222.5	25.5	IS AAE-1 seg 1H.1
SHV-HK-WH8-MC125	3458253.5	7423222.0	33.9	IS AAE-1 seg 1H.1
SHV-HK-WH8-MC126	3458151.0	7423211.0	42	Possible IS AAE-1 seg 1H.1
SHV-HK-WH8-MC127	3460831.9	7423203.0	4	OOS Hong-Kong-Amoy
SHV-HK-WH8-MC128	3458381.5	7423182.5	77.5	Unknown
SHV-HK-WH8-MC129	3458098.3	7423180.0	53.2	Unknown
SHV-HK-WH8-MC130	3458478.3	7423172.5	70.1	IS SEA-ME-WE 3 seg 1.10
SHV-HK-WH8-MC131	3459956.8	7423173.0	30.4	IS EAC 2 seg 2A1
SHV-HK-WH8-MC132	3459198.3	7423172.0	42.3	Possible IS OLUHO
SHV-HK-WH8-MC133	3459816.3	7423164.5	20.6	IS EAC 2 seg 2A1
SHV-HK-WH8-MC134	3458275.8	7423158.0	130.2	Unknown
SHV-HK-WH8-MC135	3458264.0	7423146.5	63.7	IS SEA-ME-WE 3 seg 1.10

Contact Number	Easting (m)	Northing (m)	Amplitude (nT)	Description
SHV-HK-WH8-MC136	3458171.0	7423143.0	311.1	IS SEA-ME-WE 3 seg 1.10
SHV-HK-WH8-MC137	3460924.8	7423138.0	100.7	IS EAC 2 seg 2A1
SHV-HK-WH8-MC138	3458058.0	7423137.5	352.8	IS SEA-ME-WE 3 seg 1.10
SHV-HK-WH8-MC139	3459170.3	7423137.0	4.2	IS HKA seg 1.1A
SHV-HK-WH8-MC140	3460921.6	7423126.5	29.6	Unknown
SHV-HK-WH8-MC141	3459912.3	7423100.0	13.6	IS C2C seg 1
SHV-HK-WH8-MC142	3459175.3	7423100.5	16	OOS Hong-Kong-Amoy
SHV-HK-WH8-MC143	3460918.8	7423054.0	18.2	IS C2C seg 1
SHV-HK-WH8-MC144	3460892.0	7423053.5	151.7	Possible IS HKA seg 1.1A
SHV-HK-WH8-MC145	3458321.5	7423048.5	7.9	OOS Hong-Kong-Amoy
SHV-HK-WH8-MC146	3459181.0	7423047.5	14	IS C2C seg 1
SHV-HK-WH8-MC147	3459327.3	7423047.5	4.6	OOS Hong-Kong-Amoy
SHV-HK-WH8-MC148	3458257.5	7423046.5	5.1	IS HKA seg 1.1A
SHV-HK-WH8-MC149	3461775.5	7423031.5	15.2	Unknown
SHV-HK-WH8-MC150	3458532.5	7422005.5	13.6	IS C2C seg 1
SHV-HK-WH8-MC151	3461763.3	7421998.0	36.9	IS C2C seg 1
SHV-HK-WH8-MC152	3459457.8	7421991.0	16	IS C2C seg 1
SHV-HK-WH8-MC153	3460938.3	7421984.0	41.1	Unknown
SHV-HK-WH8-MC154	3459908.8	7421976.5	103	OOS APC seg B4
SHV-HK-WH8-MC155	3461939.8	7421973.5	15.4	IS C2C seg 1
SHV-HK-WH8-MC156	3458351.5	7421972.0	10.2	IS C2C seg 1
SHV-HK-WH8-MC157	3458356.8	7421970.0	9.3	IS C2C seg 1
SHV-HK-WH8-MC158	3460390.8	7421960.0	15.8	IS C2C seg 1
SHV-HK-WH8-MC159	3459186.5	7421960.0	40.3	Unknown
SHV-HK-WH8-MC160	3458340.5	7421944.0	16	Possible IS C2C seg 1
SHV-HK-WH8-MC161	3459138.8	7421938.5	20.8	IS C2C seg 1
SHV-HK-WH8-MC162	3459188.8	7421936.5	115.7	OOS APC seg B4
SHV-HK-WH8-MC163	3459100.5	7421931.0	49.8	OOS APC seg B4
SHV-HK-WH8-MC164	3459909.3	7421922.5	13.8	Unknown
SHV-HK-WH8-MC165	3461918.3	7421919.5	14.2	Unknown
SHV-HK-WH8-MC166	3460361.3	7421901.5	14.4	IS C2C seg 1
SHV-HK-WH8-MC167	3461732.0	7421897.5	37.3	IS EAC 2 seg 2A1
SHV-HK-WH8-MC168	3458602.3	7421867.0	52	OOS APC seg B4
SHV-HK-WH8-MC169	3460598.3	7421858.0	213.5	Unknown
SHV-HK-WH8-MC170	3461895.8	7421857.0	18	IS PLCN seg 1.4
SHV-HK-WH8-MC171	3458511.5	7421856.0	40.4	OOS APC seg B4
SHV-HK-WH8-MC172	3460339.3	7421845.5	7.1	Unknown
SHV-HK-WH8-MC173	3458406.3	7421841.5	17.8	OOS APC seg B4
SHV-HK-WH8-MC174	3458404.0	7421836.5	42.9	OOS APC seg B4
SHV-HK-WH8-MC175	3458281.0	7421829.5	24.3	OOS APC seg B4
SHV-HK-WH8-MC176	3461712.8	7421824.5	3.9	IS PLCN seg 1.4
SHV-HK-WH8-MC177	3459187.0	7421818.5	43.5	OOS APC seg B4
SHV-HK-WH8-MC178	3463467.3	7421809.0	16.1	IS C2C seg 1
SHV-HK-WH8-MC179	3464413.3	7421806.5	13.8	IS C2C seg 1
SHV-HK-WH8-MC180	3461850.3	7421785.0	28.9	IS EAC 2 seg 2A1
SHV-HK-WH8-MC181	3458307.8	7421760.0	40.9	Unknown
SHV-HK-WH8-MC182	3460065.8	7421723.0	13.7	IS C2C seg 1
SHV-HK-WH8-MC183	3460579.8	7421721.0	130.1	Unknown
SHV-HK-WH8-MC184	3458579.5	7421700.0	34.2	Unknown
SHV-HK-WH8-MC185	3464342.3	7421674.0	10.5	Possible IS PLCN seg 1.4
SHV-HK-WH8-MC186	3461975.3	7421650.5	36	IS EAC 2 seg 2A1
SHV-HK-WH8-MC187	3461947.3	7421638.5	41.6	Unknown
SHV-HK-WH8-MC191	3461947.8	7421596.5	21.8	Unknown
SHV-HK-WH8-MC194	3463033.3	7421536.5	5.8	Unknown
SHV-HK-WH8-MC197	3461744.5	7421501.5	35.9	Unknown
SHV-HK-WH8-MC199	3464309.0	7421461.0	24	Unknown
SHV-HK-WH8-MC204	3464344.8	7421344.5	4	IS ADC_Seg8

Contact Number	Easting (m)	Northing (m)	Dimensions (m)	Description
SHV-HK-WH8-SO030	3457085.2	7423088.2	1.4x1.2x0.5	Tyre
SHV-HK-WH8-SO031	3457164.6	7423116.7	2.2x1.7x0.5	Debris
SHV-HK-WH8-SO032	3457213.0	7423895.7	1.5x1.2x0.5	Debris
SHV-HK-WH8-SO033	3457809.3	7420855.8	1.6x1.5x0.5	Tyre
SHV-HK-WH8-SO034	3458959.0	7422090.8	3.5x1x0.5	Debris
SHV-HK-WH8-SO035	3458655.7	7420994.9	3.5x1.2x0.5	Debris
SHV-HK-WH8-SO036	3459754.1	7421728.4	30x10x0.9	Wreck
SHV-HK-WH8-SO037	3460759.8	7421782.4	3x2.5x0.5	Debris
SHV-HK-WH8-SO038	3460879.1	7421893.0	2.2x1.3x0.5	Debris
SHV-HK-WH8-SO039	3461981.5	7421741.9	1x1x0.5	Debris
SHV-HK-WH8-SO040	3462195.0	7421822.4	1x1x0.5	Debris
SHV-HK-WH8-SO041	3462595.1	7421731.4	1.2x1x0.5	Debris
SHV-HK-WH8-SO042	3462835.6	7421529.5	5x1.5x0.5	Debris
SHV-HK-WH8-SO043	3462750.2	7421515.8	1.4x1x0.5	Debris
SHV-HK-WH8-SO044	3464275.1	7421445.5	1.1x1x0.5	Debris
SHV-HK-WH8-SO045	3464459.1	7421823.9	1.3x1.2x0.5	Tyre
SHV-HK-WH8-SO046	3464642.7	7421490.7	1.3x1x0.5	Debris
SHV-HK-WH8-SO047	3465215.5	7421704.8	1x1x0.5	Debris





Note: Contours and slope notations in this chart were derived from the optimized grid of bathymetry as per the actual data density. Seabed morphological analysis based on side-scan sonar images gives a complementary presentation for localized terrain features. Due to physical and operational limitations, resolution of this chart degrades with increasing water depths and some localized seabed features are not expected to be fully resolved. This chart serves the general purposes of route engineering and cable installation. Closer inspections are recommended for operations sensitive to small terrain features in deep waters.

CHART COMMENT:

BATHYMETRY	Along Final Route	Within Survey Corridor
Minimum depth (m)	30.0	29.9
Maximum depth (m)	31.4	31.5
Maximum gradient (°)	<1	<5

The route heads east over a very gentle seabed.

SEABED FEATURES

Scattered scars are present throughout the chart.
A patch of dumped materials is mapped near the western chart limit.
Relict trench related to IS ADC S6 installation is found in the southern survey corridor.
Sonar Contacts: SHV-HK-WH8-SC048 to SC056.
Magnetometer Contacts: SHV-HK-WH8-MC182, MC188, MC190, MC182, MC196, MC198, MC203, MC206, MC211, MC212, MC215, MC222, MC225 and MC226.
Seismic Contacts: Nil.

SHALLOW GEOLOGY

The seabed throughout the chart is covered with >5m of very soft to soft CLAY.
Sediment Samples: SHV-HK-WH8-GC003
CPT: Nil.

ADDITIONAL INFORMATION

Several linear sonar contacts are mapped in the chart, which are possibly associated with fishing gears.
The route in the chart makes 3 crossings with OOS cables.
The route exits the Guangzhou VTS in the chart center.
The route runs inside the Hong Kong waters.

GENERAL NOTES

	Inshore and Shallow Water
Survey vessel	MV Wing Hung 8
Surface positioning system	NovAtel GNSS Position System Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Knudsen 320m SBES System R2Sonic Sonic 2024 MBES System
Morphology and stratigraphy	EdgeTech 4205 SSS System Innomar SES-2000 Medium-100 SBP System C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters
Descriptive Terms and Definitions: The criteria used for interpretations and descriptions are presented in survey reports

GEODETIC PARAMETERS

Datum Parameters
Datum Name : WGS84, Ellipsoid : WGS84
Semi-Major Axis (a) (m) : 6378137.000
Reciprocal Flattening (1/f) : 298.257223563

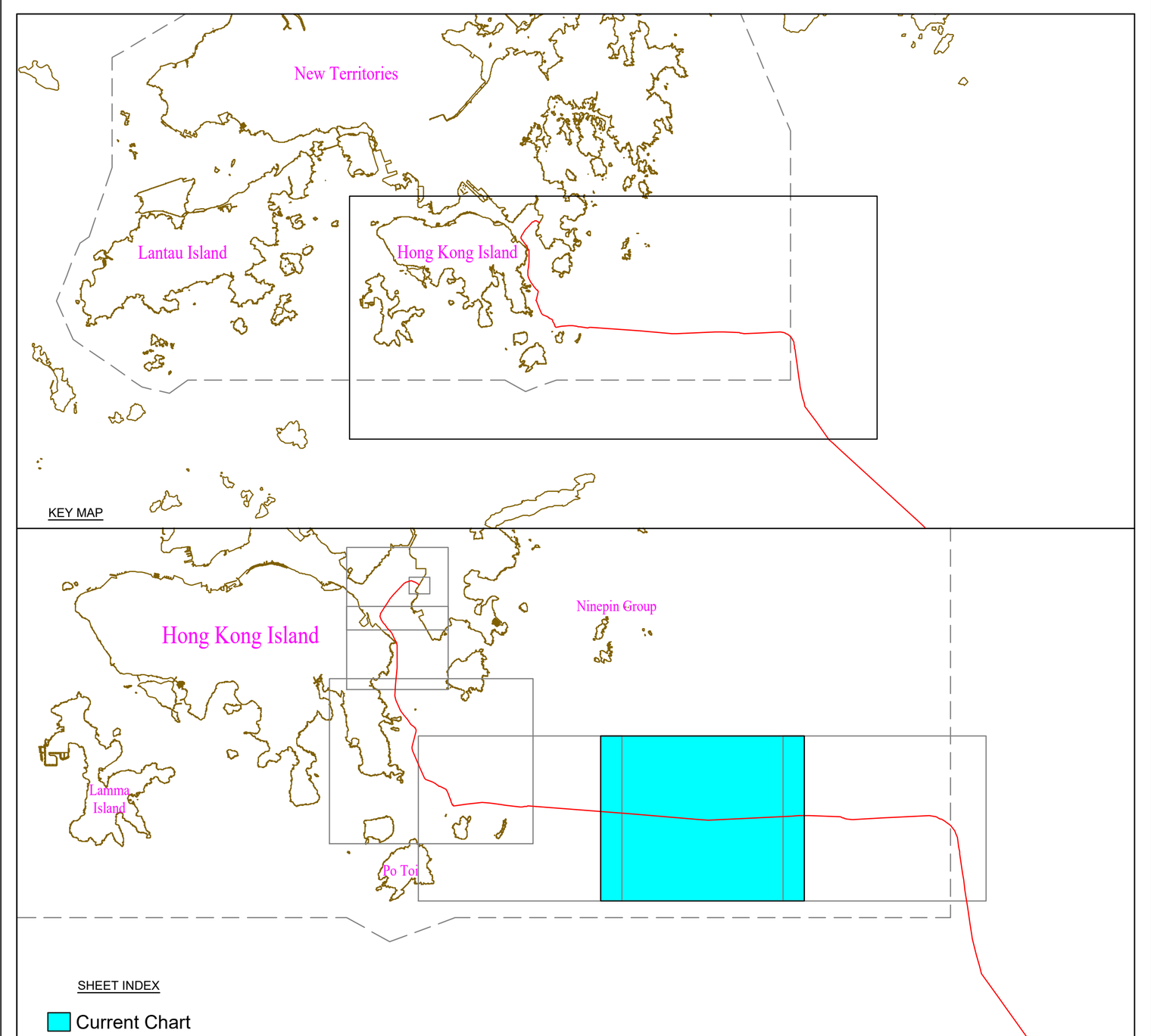
Map Projection Parameters
Projection : Mercator
False Northing (m) : 5 000 000
False Easting (m) : 3 000 000

Latitude of Origin : 0° (Equator)
Longitude of Origin : 110° E
Standard Parallel : 16° N
Scale Factor along Standard Parallel : 1

VERTICAL DATUM

In Inshore and Shallow Water Survey charts: Bathymetry data has been reduced to Low Astronomical Tide (LAT) using the relationship between LAT and MSL at Quarry Bay (7110) as stated in Admiralty Tide Tables, Volume 6, 2023 and tidal measurements at the tide gauges installed at Quarry Bay and Tai Miu Wan.

In Deep Water Survey chart : No tidal reduction applied to soundings deeper than 1000m



Survey Date: May 2023

Scale : NATURAL SCALE 1 : 10,000 at 16° N

(At mid-latitude of chart)
TRUE SCALE 1 : 9634.71

0.0 0.2 0.4 0.6 0.8 1.0 km

Purchaser : 中国联通 China unicom

Contractor : HMNTECH

Surveyor : EGS EARTH SCIENCES & SURVEYING

EGS JOB NO.: HK268023

Project Name: Sihanoukville-Hong Kong Submarine Cable Project (SHV-HK) - Hong Kong Waters Marine Route Survey

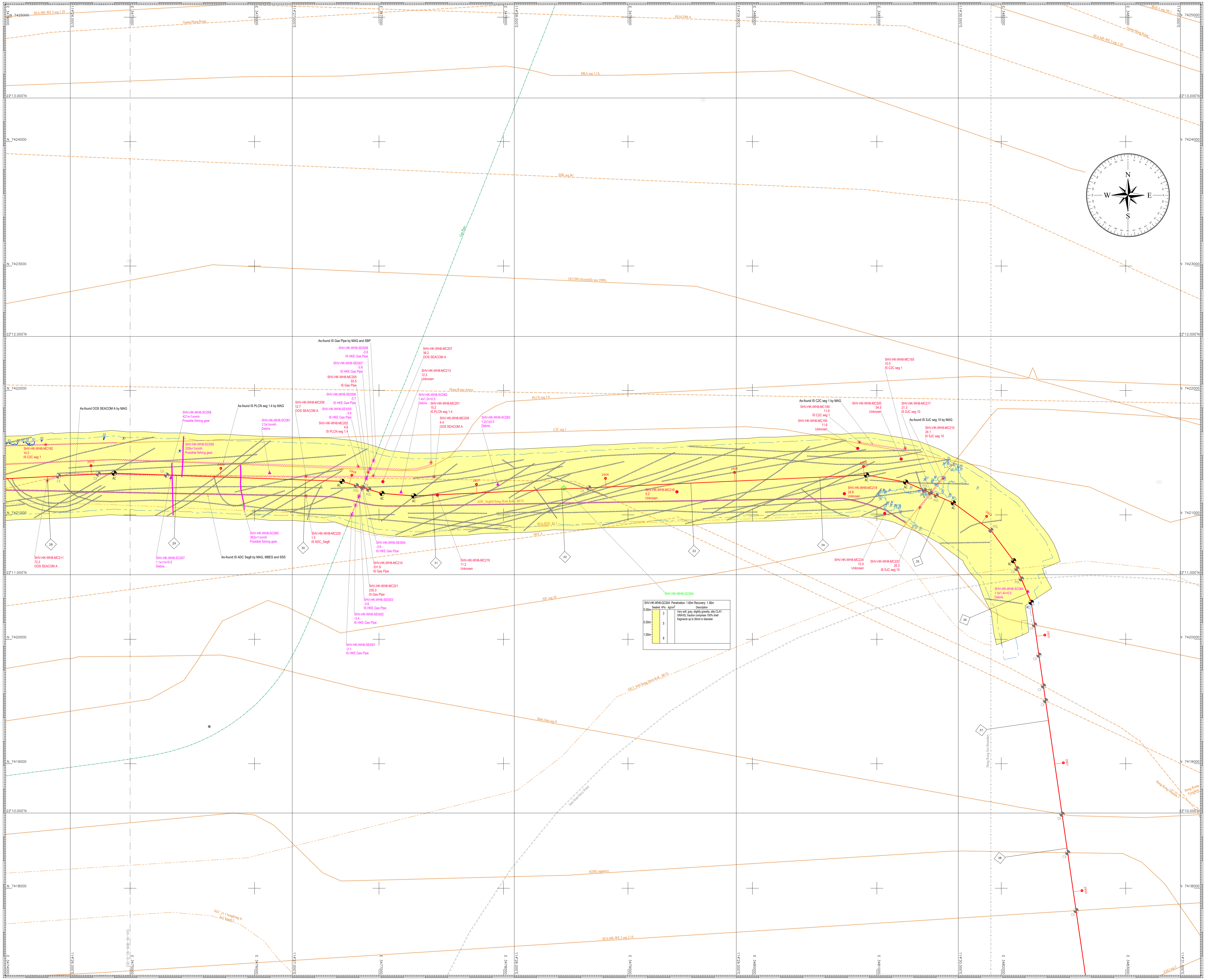
Document Title: TKO (Hong Kong) to Sihanoukville (Cambodia)
NORTH UP CHART
CHART NO. 003 OF 004
(KP 19.37 - KP 28.64)

Rev	Date	Prepared by	Checked by	Approved by
0	June 2023	Chester Quek	Margie Chen	Even Mak

Preliminary

Route Based Upon: HMN_TKO (hong kong) to Sihanoukville (cambodia)_Revision_1-01 20230415.xls

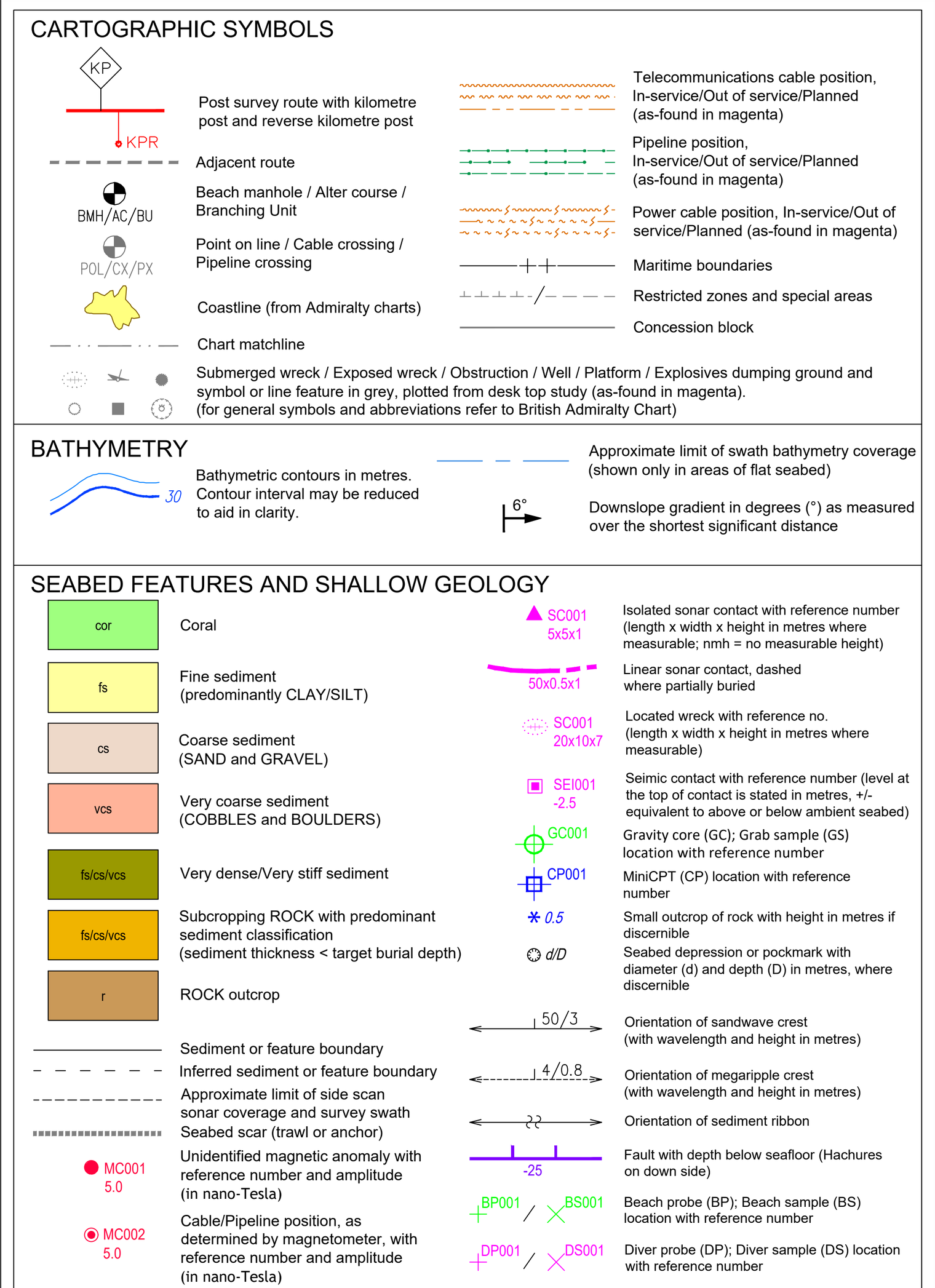
File Name: SHV-HK-WH8-NU-B-003



CARTOGRAPHIC SYMBOLS

BATHYMETRY

SEABED FEATURES AND SHALLOW GEOLOGY



Note: Contours and slope notations in this chart were derived from the optimized grid of bathymetry as per the actual data density. Seabed morphological analysis based on side-scan sonar images gives a complementary presentation for localized terrain features. Due to physical and operational limitations, resolution of this chart degrades with increasing water depths and some localized seabed features are not expected to be fully resolved. This chart serves the general purposes of route engineering and cable installation. Closer inspections are recommended for operations sensitive to small terrain features in deep waters.

CHART COMMENT:

BATHYMETRY	Along Final Route	Within Survey Corridor
Minimum depth (m)	30.0	29.9
Maximum depth (m)	31.6	31.8
Maximum gradient (°)	<1	<5

The route heads generally east and diverts to south leaving the Hong Kong waters. The seabed remains very gentle.

SEABED FEATURES

Scattered scars are present throughout the chart.

Sonar Contacts: SHV-HK-WH8-SC057 to SC064.

Magnetometer Contacts: SHV-HK-WH8-MC189, MC192, MC193, MC195, MC200 to MC202, MC205, MC207 to MC211, MC213, MC214, MC216 to MC224.

Seismic Contacts: Nil.

SHALLOW GEOLOGY

The seabed throughout the chart is covered with >5m of very soft to soft CLAY.

Sediment Samples: SHV-HK-WH8-GC004

CPT: Nil.

ADDITIONAL INFORMATION

The geophysical survey ended near the eastern chart limit, where the route exits the Hong Kong waters.

Several linear sonar contacts are mapped in the chart, which are possibly associated with fishing gears.

The route in the chart makes 1 crossing with a gas pipe, 1 crossing with an IS cable and 4 crossings with OOS cables.

GENERAL NOTES

	Inshore and Shallow Water
Survey vessel	MV Wing Hung 8
Surface positioning system	NovAtel GNSS Position System Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Knudsen 320m SBES System R2Sonic Sonic 2024 MBES System
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Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters

Descriptive Terms and Definitions: The criteria used for interpretations and descriptions are presented in survey reports

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VERTICAL DATUM

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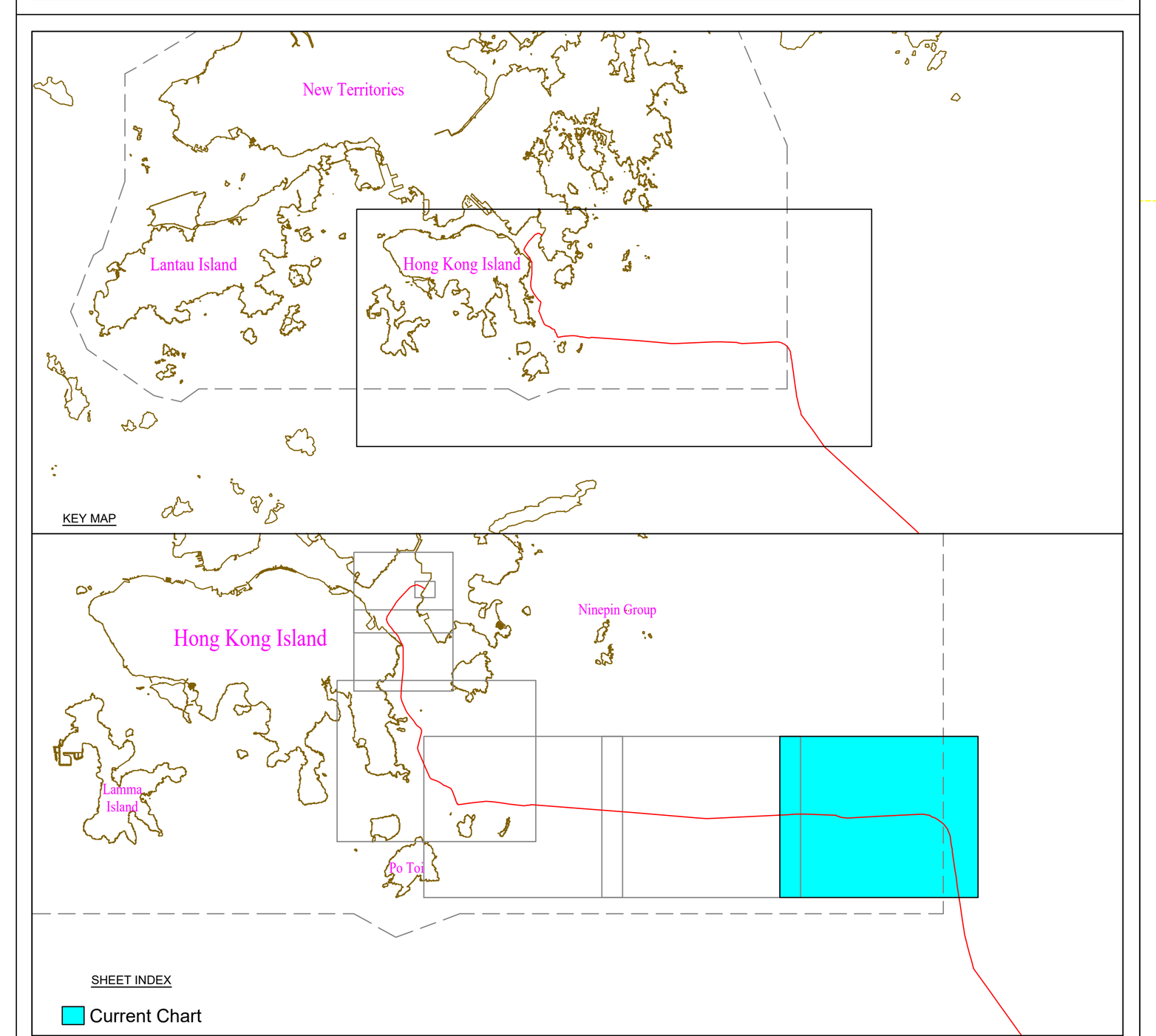
In Deep Water Survey chart : No tidal reduction applied to soundings deeper than 1000m



Survey Date: May 2023

Scale : NATURAL SCALE 1 : 10,000 at 16° N

(At mid-latitude of chart)
TRUE SCALE 1 : 9634.71

0.0 0.2 0.4 0.6 0.8 1.0 km

Purchaser : China Unicom 中国联通

Contractor : HMN TECH

Surveyor : EGS Earth Sciences & Surveying

EGS JOB NO.: HK268023

Project Name: Sihanoukville-Hong Kong Submarine Cable Project (SHV-HK) - Hong Kong Waters Marine Route Survey

Document Title: TKO (Hong Kong) to Sihanoukville (Cambodia)
NORTH UP CHART
CHART NO. 004 OF 004
(KP 27.68 - KP 36.08)

Rev	Date	Prepared by	Checked by	Approved by
0	June 2023	Chester Quek	Margie Chen	Even Mak

Preliminary

Route Based Upon: HMN_TKO (hong kong) to Sihanoukville (cambodia)_Revision_1-01 20230415.xls

File Name: SHV-HK-WH8-NU-B-004

APPENDIX F ENVIRONMENTAL MONITORING & AUDIT PROGRAMME

CONTENTS

List of Tables

List of Figures

1. EM&A PROGRAMME

This *Environmental Monitoring and Audit Programme* section has been prepared to:

- outline the responsibilities of the Project Proponent, Environmental Team (ET) and Independent Environment Checker (IEC) with respect to the environmental monitoring and audit requirements during the course of the project;
- verify whether the monitoring results are in line with the predicted impact;
- monitor the implementation and effectiveness of the control measures employed during the Project works;
- verify that the Project works are not resulting in any adverse impacts to water quality, especially at water sensitive receivers, and to marine mammals; and
- ensure that any adverse impacts are detected during the cable laying process/ works and that appropriate action is undertaken in the event that impacts are identified to sensitive receivers and are found to be associated with the cable works.

1.1 The Project Proponent & Contractor

As noted in the Project Profile main report, the Project Proponent and Contractor will engage an Environmental Team (ET) to carry out the Environmental Monitoring & Audit (EM&A) requirements as set out fully in this **Appendix**.

The duties and responsibilities of this personnel are:

- implement the recommendations and requirements of the Project Profile;
- provide assistance to ET in carrying out monitoring;
- submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event and Action Plans;
- implement measures to reduce impact where Action and Limit levels are exceeded until the events are resolved;
- accompany joint site inspection undertaken by the ET; and
- adhere to the procedures for carrying out complaint investigation.

1.2 Environmental Team (ET)

The ET shall not be in an associated body of the Project Proponent, any works contractors or the Independent Environmental Checker (IEC). The ET shall be headed by an ET Leader who has at least 7 years of experience in EM&A or environmental management.

The duties and responsibilities of the ET are:

- monitor various environmental parameters as required in this Appendix;
- analyse the environmental monitoring and audit data and review the success of EM&A programme to cost-effectively confirm the adequacy of mitigation measures implemented and the validity of the predictions and to identify any adverse environmental impacts arising;
- audit and prepare monitoring and audit reports on the environmental monitoring data and site environmental conditions;
- report on the environmental monitoring and audit results to the IEC, Contractor and EPD or its delegated representative;
- recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans;

- advice to the Contractor on environmental improvement, awareness, enhancement matters, etc. on site;
- timely submission of the EM&A report to the Project Proponent and the EPD; and
- adhere to the procedures for carrying out complaint investigation in accordance with **Section 4** in this **Appendix**

1.3 Independent Environmental Checker (IEC)

In addition to the ET, the Project Proponent will engage an IEC. The IEC shall not be an associated body of the Permit Holder, the works contractor(s) or the ET. The IEC shall have at least 7 years of experience in EM&A or environmental management.

The duties and responsibilities of the IEC are:

- review the EM&A works performed by the ET
- review the EM&A reports submitted by the ET;
- review the effectiveness of environmental mitigation measures the Contractor's implementation, and project environmental performance;
- review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans; and
- adhere to the procedures for carrying out complaint investigation.

1.4 Liaison Officer

The Project proponent will also appoint a Liaison Officer for the Project, whose contact details will be made known to both the Environmental Protection Department (EPD) and the public, to ensure effective communication during the marine works.

A Liaison Officer is responsible for

- liaising with the Project Proponents of projects that may interface with the proposed SHV-HK Cable system (such as but not limited to Hong Kong – Guam Submarine Cable Project, Hong Kong Offshore Wind Farm in Southeastern Waters, and Tseung Kwan O Desalination Plant, etc.)

2. WATER QUALITY MONITORING

Potential impacts on water quality associated with the construction and operation of the Project have been identified in ***Appendix A*** and mitigation measures have been recommended, including limiting the speed of the cable installation barge and undertaking a water quality monitoring programme. The following section provides details of the water quality monitoring during the installation of the submarine cable system. The necessity of implementing these measures should also be reviewed if repair of the cable system is carried out.

2.1 Sampling and Testing Methodology

2.1.1 Parameters Measured

The parameters to be measured *in situ* are:

- dissolved oxygen (DO) (% saturation and mgL^{-1})
- temperature (°C)
- turbidity (NTU)
- salinity (‰ or ppt)

The only parameter to be measured in the laboratory is:

- suspended solids (SS) (mgL^{-1})

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

2.1.2 Equipment

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

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

  It shall have a membrane electrode with automatic temperature compensation complete with a cable of not less than 35 m in length. Sufficient stocks of spare electrodes and cable shall be available for replacement where necessary (for example, YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).
- ***Turbidity Measurement Equipment*** – Turbidity should be measured from a split water sample from the SS sample. A suitable turbidity test kit should be used to measure the turbidity level.
- ***Salinity Measurement Instrument*** – A portable salinometer capable of measuring salinity in the range of 0-40 ppt shall be provided for measuring salinity of the water at each monitoring location.
- ***Water Depth Gauge*** – No specific equipment is recommended for measuring the water depth. However, water depth gauge affixed to bottom of the water quality monitoring vessel is preferred. The environmental contractor shall seek approval of their proposed equipment with the client prior to deployment.

- ***Current Velocity and Direction*** – No specific equipment is recommended for measuring the current velocity and direction. However, the environmental contractor shall seek approval of their proposed equipment with the client prior to deployment.
- ***Positioning Device*** - A Global Positioning System (GPS) shall be used during monitoring to ensure the accurate recording of the position of the monitoring vessel before taking measurements. The use of DGPS is preferred for positioning device, which should be well calibrated at appropriate checkpoint (e.g. Quarry Bay Survey Nail).
- ***Water Sampling Equipment*** - A water sampler, consisting of a transparent PVC or glass cylinder of not less than two litres, which can be effectively sealed with cups at both ends, shall be used (Kahlsico Water Sampler 13SWB203 or an approved similar instrument). The water sampler shall have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth.

2.1.3 Sampling/ Testing Protocols

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

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

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

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

2.1.4 Laboratory Analysis

All laboratory work shall be carried out in a HOKLAS accredited laboratory. Water samples of about 1,000 mL shall be collected at the monitoring, gradient and control stations for carrying out the laboratory determinations. The determination work shall start within the next working day after collection of the water samples. The SS laboratory measurements shall be provided to the client within five (5) days of the sampling event. The analyses shall follow the standard methods as described in *APHA Standard Methods for the Examination of Water and Wastewater, 19th Edition*, unless otherwise specified (APHA 2540D for SS).

The submitted information should include pre-treatment procedures, instrument use, Quality Assurance/Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per-batch etc), detection limits and accuracy. The QA/QC details shall be in accordance with requirements of HOKLAS or another internationally accredited scheme.

2.2 Monitoring Locations

The monitoring station locations have been established to identify potential impacts to water and ecological sensitive receivers. The proposed monitoring stations are shown in ***Figure F1*** and detailed in ***Table F2.1***. These monitoring stations have been selected considering proximity to the proposed cable alignment, the identified water, ecology and fisheries sensitive receivers as shown in ***Figure A2***. The selected sensitive receivers are more likely to be impacted (compared with those further away) should any exceedances occur due to the Project, and monitoring at these stations would allow water

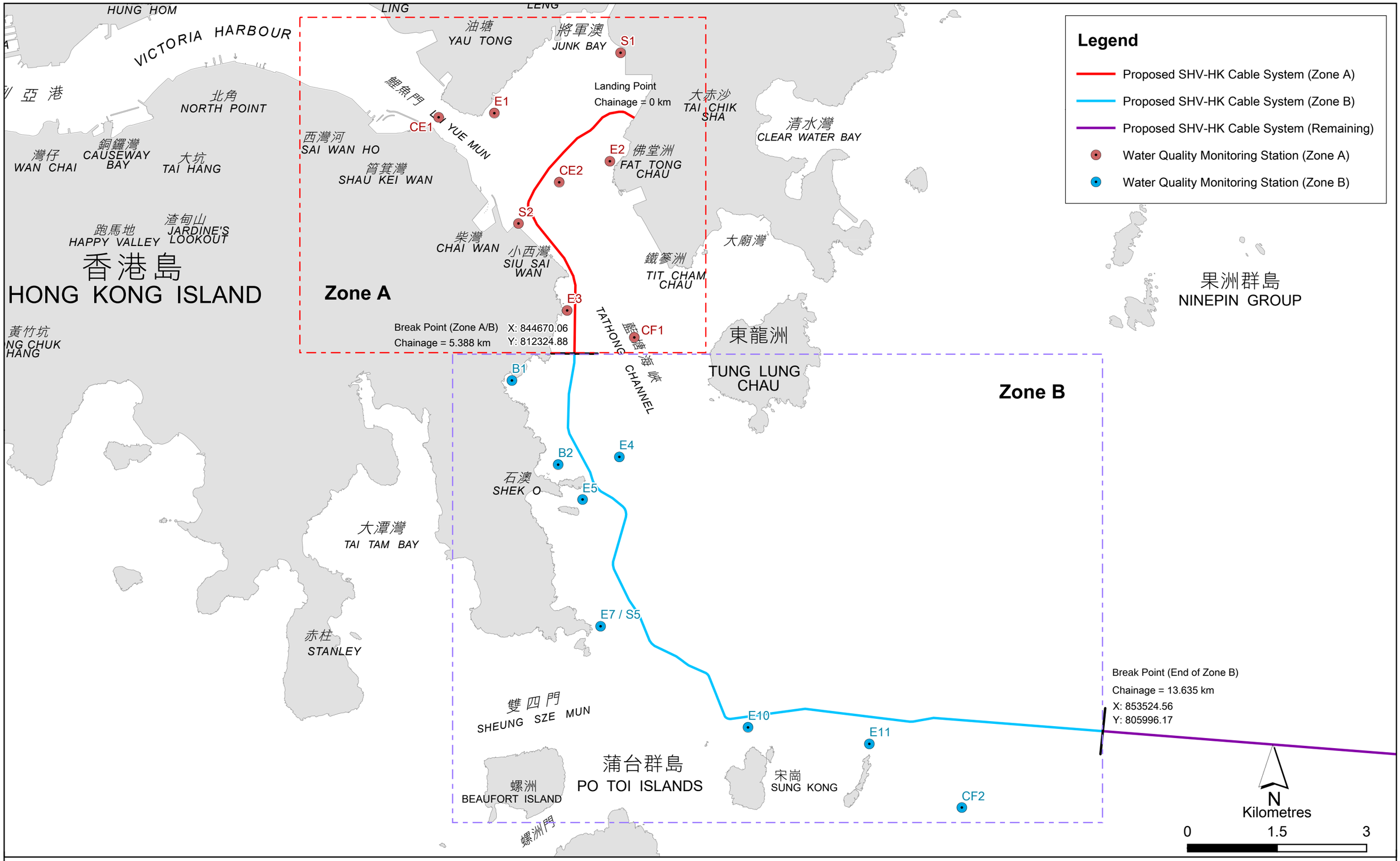


Figure F1

Proposed Water Quality Monitoring Station

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Date: 15/11/2024

quality impact, if any, to be observed early and close to the source, thus allowing control and additional mitigation to be put in place quickly before the impact could potentially reach a wider area covering other water and ecology further away. Control stations (CE1, CF1, CE2 and CF2) are also proposed to allow project contribution to be distinguished from non-project contribution.

Prior to, during, and after the installation of the cable system, water quality sampling will be undertaken at the proposed monitoring stations as shown in ***Table F2.1***, and ***Figure F1***. Similarly, water quality sampling should be undertaken prior to, during and after any necessary repair works.

The Project site has been divided into two zones for the purpose of water quality monitoring. The Project site within Junk Bay WCZ and Eastern Buffer WCZ is zoned as Zone A and the Project site within Southern WCZ is zoned as Zone B, as indicated in ***Figure F1***. The monitoring stations within Zone A should be monitored for all works between the landing point to the boundary of cable segment within Zone A (HK Grid coordinate 844670.06E 812324.88N / At 5.388 km from the landing point). The monitoring stations within Zone B should be monitored for all works of the cable alignment in this Zone (between HK Grid coordinate 844670.06E 812324.88N / At 5.388 km from the landing point and 853524.56E 805996.17N/ At 13.635 km from the landing point). Outside Zone A and Zone B, the cable works are considered too far away from any identified sensitive receivers for any potential impact, and water quality monitoring is not required.

The contractor should inform the ET every day of the expected cable segment which would be installed/ repaired in the next working day to allow the ET to plan ahead the required extent of water quality survey.

The suggested coordinates of these monitoring stations are listed in ***Table F2.1*** below. The exact coordinates should be confirmed before commencement of Baseline Monitoring (prior to cable installation/ repair works).

Table F2.1 Proposed Water Quality Monitoring Stations

Station	Nature	Approx. Geodesic Distance [1] to Proposed Cable Alignment (m)	Easting	Northing
Zone A: Works within Junk Bay and Eastern Buffer WCZs Covers the cable alignment between Chainage 0 km and 5.388 km.				
S1	WSD Junk Bay Seawater Intake	990	845445	817366
S2	WSD Siu Sai Wan Flushing Water Intake	270	843732	814502
E1	Coral communities of high ecological value at South West Junk Bay	1,300	843328	816357
E2	Coral communities of high ecological value at Fat Tong Chau	610	845264	815549
E3	Coral communities of high ecological value at Cape Collinson and Ngan Wan	130	844548	813046
E4	Coral communities of high ecological value at Tai Long Pai	550	845422	810592
CE1	Control Station 1 for ebb tide	2010	842395	816285
CF1	Control Station 1 for flood tide	1,000	845673	812597
Zone B: Works within Southern WCZ Covers the cable alignment between Chainage 5.388 km and 13.635 km.				
B1 [2]	Big Wave Bay Beach	980	843624	811873
B2 [2]	Rocky Bay Beach	410	844399	810465
E5 [2]	Shek O Headland SSSI	310	844806	809875
E7 / S5 [2] [3]	Cape D'Aguilar Marine Reserve SSSI / Seawater Intake for the Swire Institute of Marine Science	640	845108	807755
E10 [3]	Coral communities of high ecological value along the coast of Sung Kong	180	847579	806062
E11 [3]	Coral communities of high ecological value along the coast of Waglan Island	450	849614	805784
CE2	Control Station 2 for ebb tide	270	844416	815196
CF2	Control Station 2 for flood tide	1,460	851162	804714

Notes:
(1) Geodesic distance refers to the shortest displacement between two locations. Distances are rounded to the nearest 10 meters.
(2) These stations will also serve as monitoring stations for Secondary Contact Recreation Subzone.
(3) These stations will also serve as monitoring stations for Spawning Ground of Commercial Fisheries Resources.

2.3 Sampling Procedures

The proposed monitoring frequency and arrangements have been stipulated below. Reference has been made to the "EM&A Guidelines for Development Projects in Hong Kong, Appendix D2: General Technical Requirements of Environmental Monitoring" and other recently approved submarine cable installation projects such as DIR-244/2016 *Asia-Africa-Europe-1 (AAE-1) Cable System* and DIR-254/2017 *Pacific Light Cable Network (PLCN) – Deep Water Bay*.

2.3.1 Monitoring Frequency

The environmental contractor will be responsible for liaison with the engineering contractor to ensure water quality sampling is being conducted at appropriate times, including when installation/ repair works are being undertaken.

The monitoring frequency and timing for baseline, impact and post monitoring is detailed below and summarized in ***Table F2.2***. Tidal range for flood and ebb tides should not be less than 0.5 m for capturing representative tides.

2.3.1.1 Baseline Monitoring

Baseline monitoring will comprise sampling of three days per week for four consecutive weeks, before the commencement of cable installation. Given the shorter timeframe of maintenance/ repair work, the period for baseline monitoring will comprise sampling of three days per week for two consecutive weeks. The interval between two sets of monitoring shall not be less than 36 hours and samples will be taken twice during a 4-hour window of 2 hours before and 2 hours after a mid-flood and mid-ebb tidal state on each sampling occasion.

The baseline monitoring will be undertaken at the monitoring stations as shown in ***Table F2.2***.

2.3.1.2 Impact Monitoring

Impact monitoring will comprise sampling of three days per week during cable marine installation/ repairwork in Zone A and/or Zone B. The interval between two sets of monitoring shall not be less than 36 hours and samples will be taken daily during a 4-hour window of 2 hours before and 2 hours after a mid-flood and mid-ebb tidal state.

2.3.1.3 Continuous Monitoring for Station E3

In additional to the impact monitoring described above, additional monitoring turbidity for station E3 is recommended for jetting works from 4.288 km to 5.088 km from the landing point. During this period, turbidity measurements should be conducted at station E3 at hourly interval to allow quick response to potential sediment impact during the jetting at the specified section that is close to the underlying coral local of station E3. The corresponding Action and Limit Levels as well as Event and Action Plan are applicable to the turbidity finding under this Continuous Monitoring exercise.

2.3.1.4 Post Project Monitoring

After completion of the cable marine installation/ repair works in a particular Zone, post project monitoring will be carried out for one week in that Zone in the same manner as the impact monitoring.

The stations monitored should be consistent with the corresponding Baseline Monitoring exercise.

Table F2.2 Summary of Monitoring Frequency

Zone	Baseline	Impact	Continuous (E3)	Post
Zone A: Impact stations S1, S2, E1, E2, E3 and E4, and Control stations CE1 and CF1. **Zone B**: Impact stations B1, B2, E5, E7 / S5, E10, and E11, and Control stations CE2 and CF2.	Installation On three days per week for four weeks, twice in a day (4-hour window of 2 hours before and 2 hours after mid flood and mid-ebb tides).	For three days per week, twice in a day (4-hour window of 2 hours before and 2 hours after mid flood and mid-ebb tides) when cable installation/repair works is in Zone A.	For jetting works from 4.288 km to 5.088 km from the landing point, turbidity measurements to be conducted at hourly interval.	On three days over one week, twice in a day (a 4-hour window of 2 hours before and 2 hours after mid flood and mid-ebb tides) upon completion or works in a particular Zone.
	Maintenance/ Repair On three days per week for two weeks, twice in a day (4-hour window of 2 hours before and 2 hours after mid flood and mid-ebb tides).	For three days per week, twice in a day (4-hour window of 2 hours before and 2 hours after mid flood and mid-ebb tides) when cable installation/repair works is in Zone B.		

2.3.2 Depths

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

2.4 Compliance/ Action Event Plan

Water quality monitoring results will be evaluated against Action and Limit levels shown in ***Table F2.3***.

Table F2.3 Action and Limit Level for Water Quality (based on the result of the Baseline Report)

Parameter	Action Level	Limit Level
SS in mgL^{-1} (Depth-averaged)	**For S1 and S2:**	**For S1 and S2:**
	9 mg/L or	10 mg/L or
	20% exceedance of value at any impact station compared with corresponding data from control station, whichever monitoring result is higher	30% exceedance of value at any impact station compared with corresponding data from control station, whichever monitoring result is higher
	For all other monitoring stations:	**For all other monitoring stations:**
	95%-ile of baseline data, or	99%-ile of baseline data, or
	20% exceedance of value at any impact station compared with corresponding data from control station, whichever monitoring result is higher	30% exceedance of value at any impact station compared with corresponding data from control station, whichever monitoring result is higher

Parameter	Action Level	Limit Level
DO in mgL^{-1}	**For S1 and S2:** 3 mg/L **For all other monitoring stations:** Surface and Middle 5%-ile of baseline data for surface or middle layer Bottom 5%-ile of baseline data for bottom layers	**For S1 and S2:** 2 mg/L **For all other monitoring stations:** Surface and Middle 4mg/L or 1%-ile of baseline for surface and middle layer, whichever is lower Bottom 2mg/L or 1%-ile of baseline data for bottom layer whichever is lower
Turbidity in NTU (Depth-averaged)	**For S1 and S2:** 9 mg/L or 20% exceedance of value at any impact station compared with corresponding data from control station, whichever monitoring result is higher **For all other monitoring stations:** 95%-ile of baseline data, or 20% exceedance of value at any impact station compared with corresponding data from control station, whichever monitoring result is higher	**For S1 and S2:** 10 mg/L or 30% exceedance of value at any impact station compared with corresponding data from control station, whichever monitoring result is higher **For all other monitoring stations:** 99%-ile of baseline data, or 30% exceedance of value at any impact station compared with corresponding data from control station, whichever monitoring result is higher

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

The measures that will be undertaken in the event that the Action or Limit Levels are exceeded are shown in ***Table F2.4***.

Table F2.4 Event Action Plan for Water Quality

Event	Contractor
Action Level Exceedance	**Step 1** - repeat sampling event. Where applicable, review results of gradient station(s) to confirm the source of impact. **Step 2** – Inform EPD and the Agriculture, Fisheries and Conservation Department (AFCD) and confirm notification of the non-compliance in writing; **Step 3** - discuss with cable installation/ repair contractor the most appropriate method of reducing suspended solids during cable installation/ repair(e.g. reduce cable laying speed/pressure in jetting water) and agree with EPD. **Step 4** - repeat measurements after implementation of mitigation for confirmation of compliance. **Step 5** - if non-compliance continues - increase measures in Step 3 and repeat measurements in Step 4. If non-compliance occurs a third time, suspend cable installation/ repair works.

Event	Contractor
Limit Level Exceedance	**Step 1** - Suspend cable installation/repair works immediately (until the cause of the non-compliance is detected and the situation is rectified). **Step 2** - repeat sampling event. Where applicable, review results of gradient station(s) to confirm the source of impact. **Step 3** – Inform EPD and AFCD and confirm notification of the non-compliance in writing **Step 4** - discuss immediately with cable installation/ repaircontractor the most appropriate method of reducing suspended solids during cable installation/ repair(e.g. reduce cable laying speed/pressure in jetting water) and agree with EPD. **Step 5** - repeat measurements after implementation of mitigation or suitable time has elapsed since suspension of cable installation/ repair works, for confirmation of compliance. **Step 6** -. Repeat Step 5 until measurements show compliance.

2.5 Reporting

Schedule for baseline and start of impact monitoring should be submitted to EPD two weeks before commencement of the monitoring works for agreement.

The reports to be provided shall include:

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

2.5.1 Baseline Monitoring Report(s)

The Baseline Monitoring Report, certified by the ET and verified by the IEC, shall be provided to EPD no later than two weeks before the cable installation/ maintenance / repairing works, for agreement on the Action/Limit Levels prior to installation work commencing.

2.5.2 Weekly Impact Monitoring Reports

The Impact Monitoring Report will be provided weekly within five days after the relevant monitoring data are collected or become available during the cable installation/ repairwork, having been reviewed by the IEC.

2.5.3 Post Project Monitoring Report(s)

The Post Project Monitoring Report to review the environmental status after cable installation/ repairand compare with the results as presented in the Baseline Monitoring Report and Impact Monitoring Reports where appropriate. It shall be provided within one month after completion of the marine works.

2.5.4 Baseline Monitoring Report

The Baseline Monitoring Report shall include the following details:

- brief project background information;
- drawings showing locations of the baseline monitoring stations;
- an updated construction/ repair programme with milestones of environmental protection/mitigation activities annotated;

- monitoring results together with the information including monitoring methodology, parameters monitored, monitoring locations (and depth), monitoring date, time, frequency and duration;
- details on influencing factors, including major activities, if any, being carried out on the Site during the period, weather conditions during the period and other factors which might affect the results;
- determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored; and
- comments and conclusions.

2.5.5 Weekly Impact Monitoring Report

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

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

2.5.6 Post Project Monitoring Report

The Post Project Monitoring Report shall include the following details:

- brief project background information;
- drawings showing locations of the post-project monitoring stations;
- full construction/ repair programme with milestones of environmental protection/ mitigation activities annotated;
- monitoring results together with the information including monitoring methodology, parameters monitored, monitoring locations (and depth), monitoring date, time, frequency and duration. Monitoring results should show relationship between Control and Impact monitoring stations;
- review the environmental status after the cable installation/ repair and compare with the results as presented in the Baseline Monitoring Report and Impact Monitoring Reports where appropriate; and
- comments and conclusions.

3. MARINE MAMMAL OBSERVATION

3.1 Potential Impact on Marine Mammal

Cable installation/ maintenance/ repairing works may result in a minor and short-term increase in underwater sound from marine vessels. Given that Finless Porpoises and Chinese White Dolphins use high frequency ultrasonic clicks for foraging and communication, the low frequency underwater sound associated with vessels, jetting and cable laying are not expected to interfere significantly with these two species of cetaceans. No unacceptable adverse impacts to Finless Porpoises and Chinese White Dolphins from underwater sounds are expected to occur during either cable installation or repair works. The cable installation works will be short-term and temporary, and be carried out by one cable installation barge within up to 95 working days in Hong Kong waters. The Finless Porpoises and Chinese White Dolphins are hence not expected to be disturbed by the cable laying vessel. Any cable repair works are expected to of shorter-term than initial cable installation works and therefore also not expected to disturb Finless Porpoise or Chinese White Dolphins.

3.2 Marine Mammal Exclusion Zone

However, additional precautionary measure will be implemented for marine mammals during the cable installation works and cable maintenance / repairing works.

3.2.1 Zoning

A marine mammal exclusion zone within a radius of 250 m from the cable installation/ repair vessel will be implemented during the cable installation/repair works taking place in daylight hours along the section starting from Zone B (Chainage distance 5.388 km) to the east boundary of Hong Kong along the cable alignment. (For location refer to ***Figure F2***). The marine mammal exclusion zone will be monitored by qualified observer(s) [(1)] with an unobstructed, elevated view of the area. The view will be undertaken from the cable installation/repair vessel. The viewpoint will be proposed by the IEC.

3.2.2 Role of Qualified Observers

Qualified observer(s) will stand on the open upper decks of the vessel, allowing for observer eye heights of 4 to 5 m above water level and relatively unobstructed 180° visibility. Vessel-based observation by the observer(s) shall be conducted by searching a 180° swath where the installation/repair works are being conducted at the centre, with appropriate marine binoculars, scanning the same area with the naked eyes and occasional binocular check.

Qualified observer(s) will scan the 250 m exclusion zone for at least 30 minutes prior to the start of cable installation/ repair works. If marine mammals are observed in the exclusion zone, cable installation/repair works will be delayed until they have left the area. This measure will confirm that the area in the vicinity of the cable installation/repair work is clear of marine mammals prior to the commencement of works and will serve to reduce any disturbance to marine mammals. During cable installation, if marine mammals are spotted within the exclusion zone, cable installation works will cease and will not resume until the observer confirms that the zone has been continuously clear of marine mammals for a period of 30 minutes.

3.2.3 Monitoring Period

The marine mammal exclusion zone monitoring will be required during periods when there is cable installation works or repair works as necessary. Daily monitoring will be conducted until the completion of cable installation works or repair works as agreed.

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

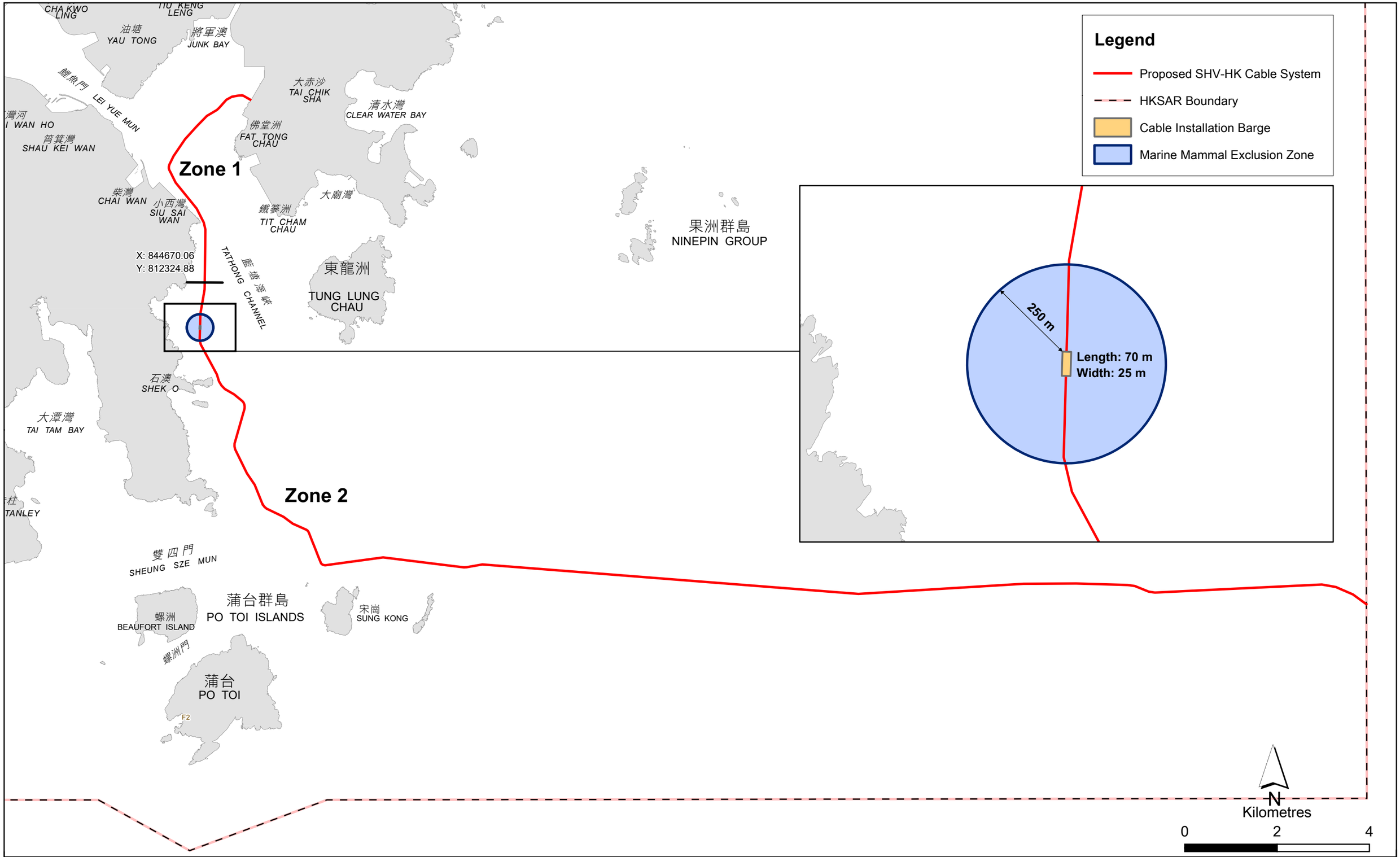

Figure F2

Marine Mammal Exclusion Zone

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Date: 14/11/2024

4. ENVIRONMENTAL COMPLAINTS

An Environmental Team (ET) will undertake the following procedures upon receipt of a complaint:

i. log complaint and date of receipt into the complaint database and inform IEC immediately;

ii. investigate the complaint and discuss with IEC, the Contractor(s) and Project Proponent to determine its validity and to assess whether the source of the issue is due to works activities;

iii. if a complaint is considered valid due to the works, the ET will identify mitigation measures in consultation with the Contractor(s) and Project Proponent;

iv. if mitigation measures are required, the ET will advise the Contractor(s) accordingly;

v. review the Contractor(s)'s response on the identified mitigation measures and the updated situation;

vi. if the complaint is transferred from EPD, an interim report will be submitted to EPD on the status of the complaint investigation and follow-up action within the time frame assigned by EPD;

vii. undertake additional monitoring and audit to verify the situation if necessary and ensure that any valid reason for complaint does not recur;

viii. report the investigation results and the subsequent actions on the source of the complaint for responding to complainant. If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD; and

ix. record the complaint, investigation, the subsequent actions and the results in the EM&A report.

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

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