

South-East Asia Hainan-Hong Kong Express (SEA-H2X) Submarine Cable System

Project Profile

10 March 2025

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Project Profile



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1 BASIC INFORMATION

1.1 Project Title

The title of the project is “South-East Asia Hainan-Hong Kong Express (SEA-H2X) Submarine Cable System” (hereafter referred to as the Project).

1.2 Purpose and Nature of the Project

China Mobile International Limited (CMI) (the cable owner) has decided to build a new optical cable system, the South-East Asia Hainan-Hong Kong Express (SEA-H2X) Submarine Cable System (SEA-H2X cable system). The SEA-H2X cable system link Hainan, Philippines, Malaysia, Thailand, Singapore and Hong Kong, while crossing waters of Vietnam and Indonesia. The proposed SEA-H2X cable system is a single cable consists of eight pairs of optical fibres bundled inside, enabling high-capacity transmission of data and more reliable communications across the Southeast Asian regions, favouring Hong Kong for future international submarine cable connections and help to meet the growing demand for greater bandwidth. The new cable system will connect to a pre-constructed Beach Manhole (“BMH”) in Tseung Kwan O Industrial Estate (TKOIE).

HMN Technologies Co., Limited. (“HMN Tech”) is awarded as the main contractor. This cable system will span approximately 6,400 km in total and about 35.1 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. repairing works.

1.3 Name of Project Proponent

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

China Mobile International Limited (CMI)

Name:	Lisa Xiao
Position:	Assistant Transmission Engineering Manager
Email:	lisaxiao@cmi.chinamobile.com
Telephone:	+852 6765 6912

1.4 Location and Scale of the Project

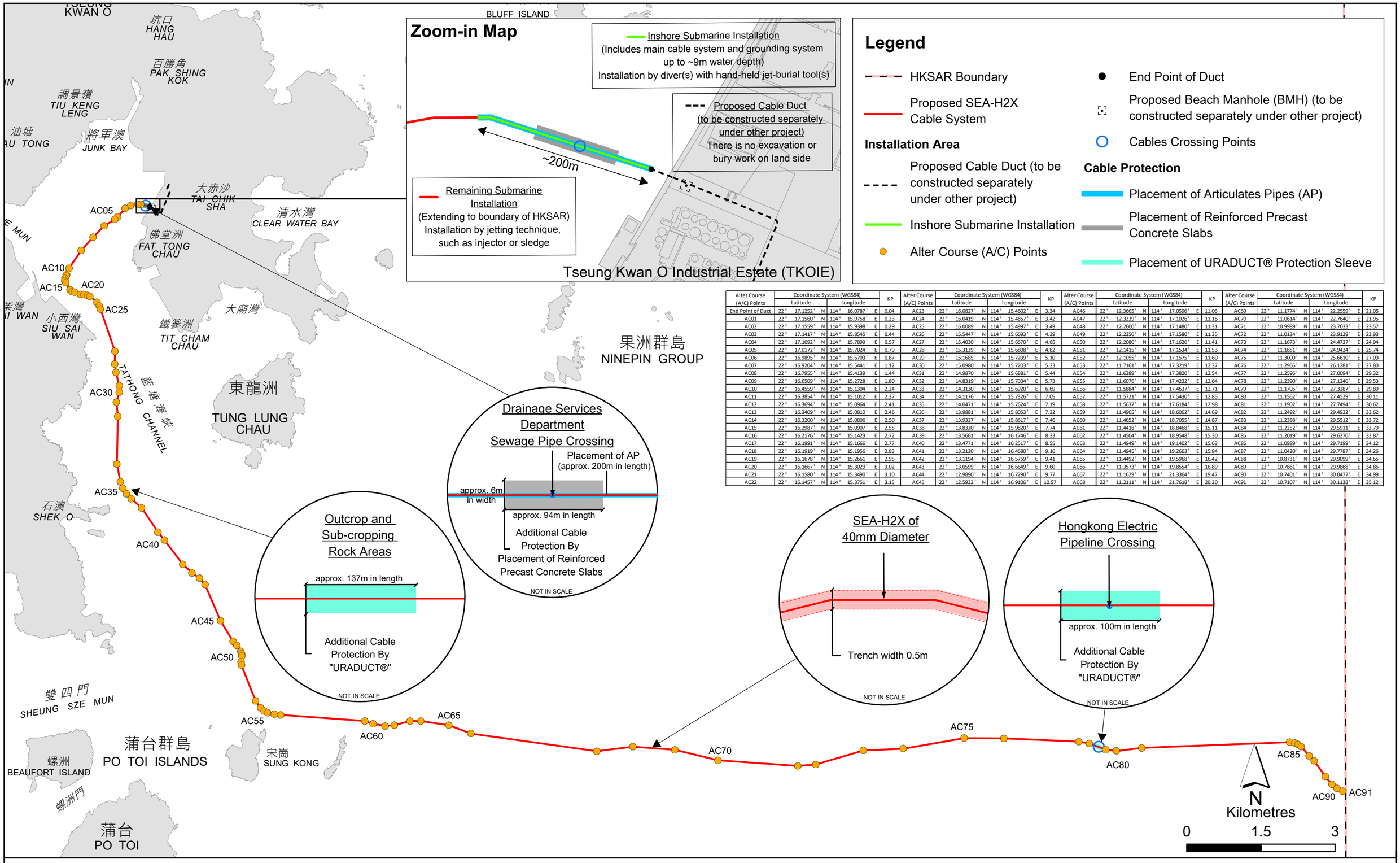
1.4.1 Location

The route of the proposed SEA-H2X cable system within HKSAR is depicted in ***Figure 1.1***. The proposed cable system would land at a duct in the Harbour seawall, which leads to the pre-constructed Beach Manhole (BMH) and ultimately connect to a Cable Landing Station located at TKOIE. The BMH infrastructure and the purpose-designed landing points (cable ducts) do not fall within the scope of this Project, and will be constructed separately by other project. The location and photo of the landing site are presented in ***Figure 1.2***.

The proposed SEA-H2X 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.

1.4.2 Scale of the Project

The entire SEA-H2X cable length is around 6400 kilometers, which has a total length of approximately 35.1 km and a diameter of approximately 40 mm within HKSAR waters. The SEA-H2X cable system



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
AC01	22° 17.1560' N	114° 15.9758' E	0.23
AC02	22° 17.1559' N	114° 15.9398' E	0.29
AC03	22° 17.1417' N	114° 15.8545' E	0.44
AC04	22° 17.1092' N	114° 15.7899' E	0.57
AC05	22° 17.0172' N	114° 15.7024' E	0.79
AC06	22° 16.9895' N	114° 15.6703' E	0.87
AC07	22° 16.9204' N	114° 15.5441' E	1.12
AC08	22° 16.7955' N	114° 15.4139' E	1.44
AC09	22° 16.6509' N	114° 15.2728' E	1.80
AC10	22° 16.4559' N	114° 15.1304' E	2.24
AC11	22° 16.3854' N	114° 15.1012' E	2.37
AC12	22° 16.3694' N	114° 15.0964' E	2.41
AC13	22° 16.3409' N	114° 15.0810' E	2.46
AC14	22° 16.3200' N	114° 15.0806' E	2.50
AC15	22° 16.2987' N	114° 15.0907' E	2.55
AC16	22° 16.2176' N	114° 15.1423' E	2.72
AC17	22° 16.1991' N	114° 15.1666' E	2.77
AC18	22° 16.1919' N	114° 15.1956' E	2.83
AC19	22° 16.1678' N	114° 15.2661' E	2.95
AC20	22° 16.1667' N	114° 15.3029' E	3.02
AC21	22° 16.1580' N	114° 15.3490' E	3.10
AC22	22° 16.1457' N	114° 15.3751' E	3.15
AC23	22° 16.0827' N	114° 15.4602' E	3.34
AC24	22° 16.0419' N	114° 15.4857' E	3.42
AC25	22° 16.0089' N	114° 15.4997' E	3.49
AC26	22° 15.5447' N	114° 15.6693' E	4.39
AC27	22° 15.4030' N	114° 15.6670' E	4.65
AC28	22° 15.3139' N	114° 15.6808' E	4.82
AC29	22° 15.1685' N	114° 15.7209' E	5.10
AC30	22° 15.0980' N	114° 15.7203' E	5.23
AC31	22° 14.9870' N	114° 15.6881' E	5.44
AC32	22° 14.8319' N	114° 15.7034' E	5.73
AC33	22° 14.3130' N	114° 15.6920' E	6.69
AC34	22° 14.1176' N	114° 15.7326' E	7.05
AC35	22° 14.0471' N	114° 15.7624' E	7.19
AC36	22° 13.9881' N	114° 15.8053' E	7.32
AC37	22° 13.9327' N	114° 15.8617' E	7.46
AC38	22° 13.8320' N	114° 15.9820' E	7.74
AC39	22° 13.5661' N	114° 16.1746' E	8.33
AC40	22° 13.4771' N	114° 16.2517' E	8.55
AC41	22° 13.2120' N	114° 16.4680' E	9.16
AC42	22° 13.1194' N	114° 16.5759' E	9.41
AC43	22° 13.0599' N	114° 16.6649' E	9.60
AC44	22° 12.9890' N	114° 16.7290' E	9.77
AC45	22° 12.5932' N	114° 16.9106' E	10.57
AC46	22° 12.3665' N	114° 17.0596' E	11.06
AC47	22° 12.3239' N	114° 17.1026' E	11.16
AC48	22° 12.2600' N	114° 17.1480' E	11.31
AC50	22° 12.2080' N	114° 17.1620' E	11.41
AC51	22° 12.1415' N	114° 17.1534' E	11.53
AC52	22° 12.1055' N	114° 17.1575' E	11.60
AC53	22° 11.7161' N	114° 17.3219' E	12.37
AC54	22° 11.6389' N	114° 17.3820' E	12.54
AC55	22° 11.6076' N	114° 17.4232' E	12.64
AC56	22° 11.5884' N	114° 17.4637' E	12.71
AC57	22° 11.5721' N	114° 17.5430' E	12.85
AC59	22° 11.4965' N	114° 18.6062' E	14.69
AC60	22° 11.4652' N	114° 18.7055' E	14.87
AC61	22° 11.4418' N	114° 18.8468' E	15.11
AC62	22° 11.4504' N	114° 18.9548' E	15.30
AC63	22° 11.4949' N	114° 19.1402' E	15.63
AC64	22° 11.4945' N	114° 19.2663' E	15.84
AC65	22° 11.4492' N	114° 19.5968' E	16.42
AC66	22° 11.3573' N	114° 19.8554' E	16.89
AC67	22° 11.1629' N	114° 21.3364' E	19.47
AC68	22° 11.2111' N	114° 21.7618' E	20.20
AC69	22° 11.1774' N	114° 22.2559' E	21.05
AC70	22° 11.0614' N	114° 22.7640' E	21.95
AC71	22° 10.9989' N	114° 23.7033' E	23.57
AC72	22° 11.0134' N	114° 23.9129' E	23.93
AC73	22° 11.1673' N	114° 24.4737' E	24.94
AC74	22° 11.1851' N	114° 24.9424' E	25.74
AC75	22° 11.3000' N	114° 25.6610' E	27.00
AC76	22° 11.2966' N	114° 26.1281' E	27.80
AC77	22° 11.2596' N	114° 27.0094' E	29.32
AC78	22° 11.2390' N	114° 27.1340' E	29.53
AC79	22° 11.1705' N	114° 27.3287' E	29.89
AC80	22° 11.1562' N	114° 27.4529' E	30.11
AC81	22° 11.1902' N	114° 27.7494' E	30.62
AC82	22° 11.2492' N	114° 29.4922' E	33.62
AC83	22° 11.2388' N	114° 29.5512' E	33.72
AC84	22° 11.2252' N	114° 29.5911' E	33.79
AC85	22° 11.2019' N	114° 29.6270' E	33.87
AC86	22° 11.0989' N	114° 29.7199' E	34.12
AC87	22° 11.0420' N	114° 29.7787' E	34.26
AC88	22° 10.8731' N	114° 29.9099' E	34.65
AC89	22° 10.7861' N	114° 29.9868' E	34.86
AC90	22° 10.7401' N	114° 30.0477' E	34.99
AC91	22° 10.7107' N	114° 30.1138' E	35.12

Figure 1.1

Proposed South-East Asia Hainan-Hong Kong Express (SEA-H2X) Submarine Cable System (Hong Kong Section)

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will consist of eight pairs of optical fibres enabling high-capacity transmission of data, and more reliable communications for future Southeast Asian regions and international submarine cable connections. The new cable system connects Hong Kong and Singapore, with branches towards Mainland China, Philippines, Malaysia and Thailand.

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 maximum width of the seabed fluidised by the burial tool is 0.5m, and the burial depth offshore will be up to around 5 m below the seabed in HKSAR waters, except the crossing areas over obstructions or in-service facilities, and in transient zones, such as between launch position of burial machines. The burial depth will be increased to 6 m below the seabed at the submarine cable section between the inshore completion point and the exit of the Tathong Channel Traffic Separation Scheme ("TSS") crossing, in order to avoid potential impact to the submarine cable due to the high traffic flow, such as emergency anchoring within the Channel, and the potential reprovision of dangerous good in Junk Bay Dangerous Good Anchorage in TKO. After the cable system is laid, the seabed will return to its original profile, and the trenched material will be naturally re-filled in a short period of time.

Close to the eastern boundary of Hong Kong waters, the SEA-H2X cable will unavoidably cross a HK Electric gas pipeline, which is buried around 3.8m below the seabed. The SEA-H2X cable will be laid by either the burial tool or divers at a depth possible/agreed with the facility owner over the top of the Gas Pipeline to avoid any interference. In addition to agreed vertical separation, enhanced cable protection will be used to minimise the chance of future damage by vessel anchors and dropped objects. Since a cable laid with shallow burial may be susceptible to anchor damage, additional cable protection, i.e. URADUCT (as referred to **Figure 2.1b**) will be employed for this approximately 100m section.

The BMH infrastructure and the purpose-designed landing points (cable ducts) do not fall within the scope of this Project and will be constructed separately. No earthworks will be involved in the cable connection works for the proposed SEA-H2X cable system.

During the operation phase, no adverse environmental impacts would arise under operation. Cable 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 repairing works, the scale of the 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 CMI existing Global Network Centre is in TKOIE, it is reasonable to select the landing site in close proximity to the CMI existing Global Network 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.

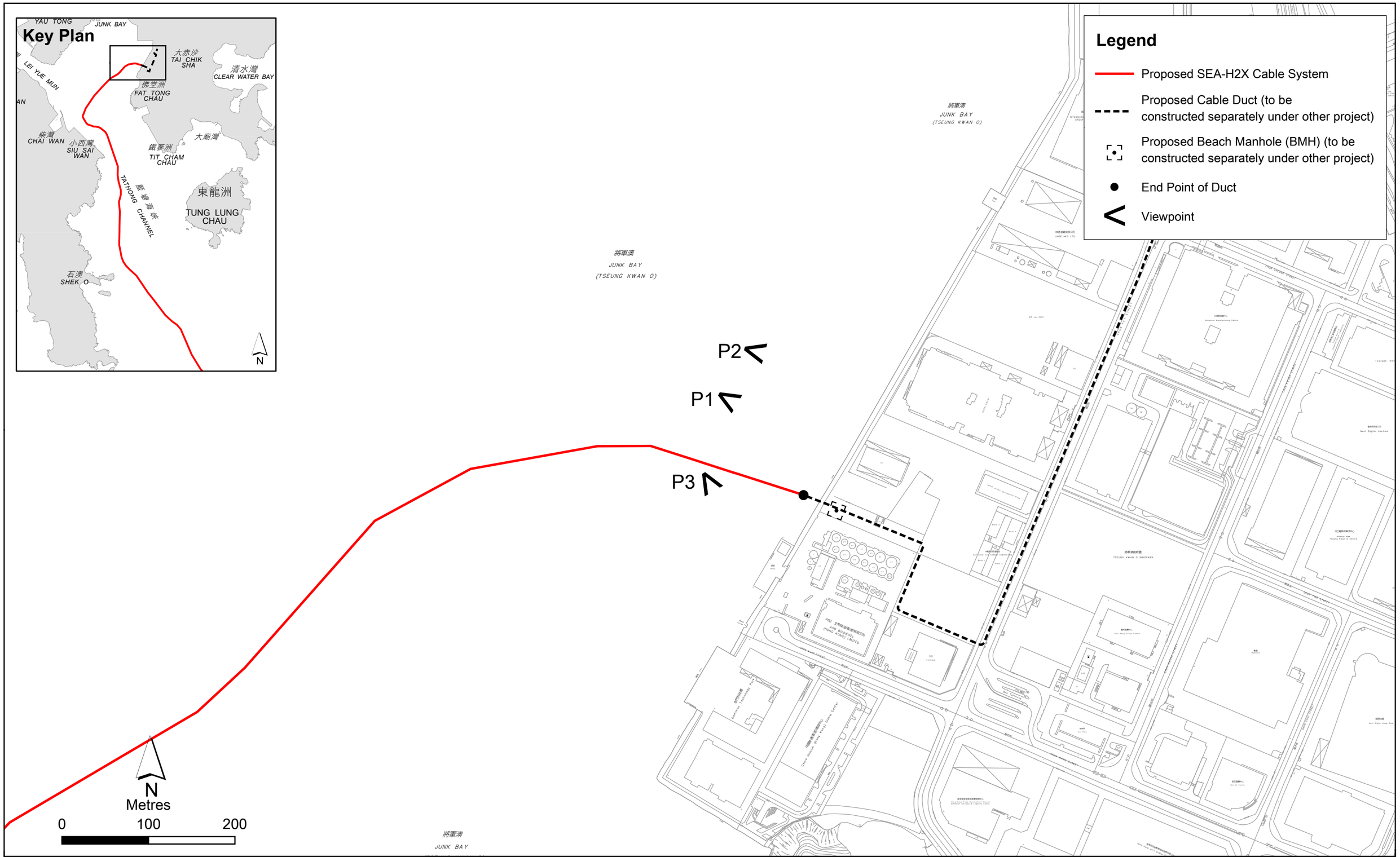

Figure 1.2a

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

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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 other company with other projects.



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 SEA-H2X cable route (***Figures 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.

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 works.

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 ***Figures 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 Cape Collison, 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 ***Figures 1.3a and 1.3b***. 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.

Minimise Disturbance to Heritage Sites

The alignment was selected to avoid impact and minimise disturbance to any heritage sites within 500 m area from the proposed SEA-H2X cable system as shown in **Figure 3.2**, including Site of Chinese Customs Station, Fat Tau Chau (declared monument), Rock Carving at Cape Collinson (declared monument), Cape Collinson Lighthouse (Grade 3 historic building), Fat Tau Chau Sites of Archaeological Interest (SAI), and Fat Tau Chau Qing Dynasty Gravestone SAI. They are located over 300m from the proposed submarine cable system and there are no land-based earthworks will be involved in the cable connection works, thus the Project is unlikely to cause impacts and disturbances to the heritage sites.

Other Submarine Cables and Pipelines

Minimise disturbance to existing submarine cables and pipelines, thereby ensuring that the SEA-H2X 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 SEA-H2X cable route, with at least 2m vertical separation with the crossed cables. 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. For example, the SEA-H2X Cable will unavoidably cross a HK Electric gas pipeline, which is buried around 3.8m below the seabed. In order to avoid any interference with this pipeline (at around 100m from the pipeline), the SEA-H2X Cable will be laid by either the burial tool or divers at a depth possible/agreed with the facility owner, over the top of the Gas Pipeline. Since a cable laid with shallow burial may be susceptible to anchor damage, additional cable protection, i.e. high-density polyurethane protection “URADUCT” (as referred to ***Figure 2.1b***) will be employed for this approximately 100m section.

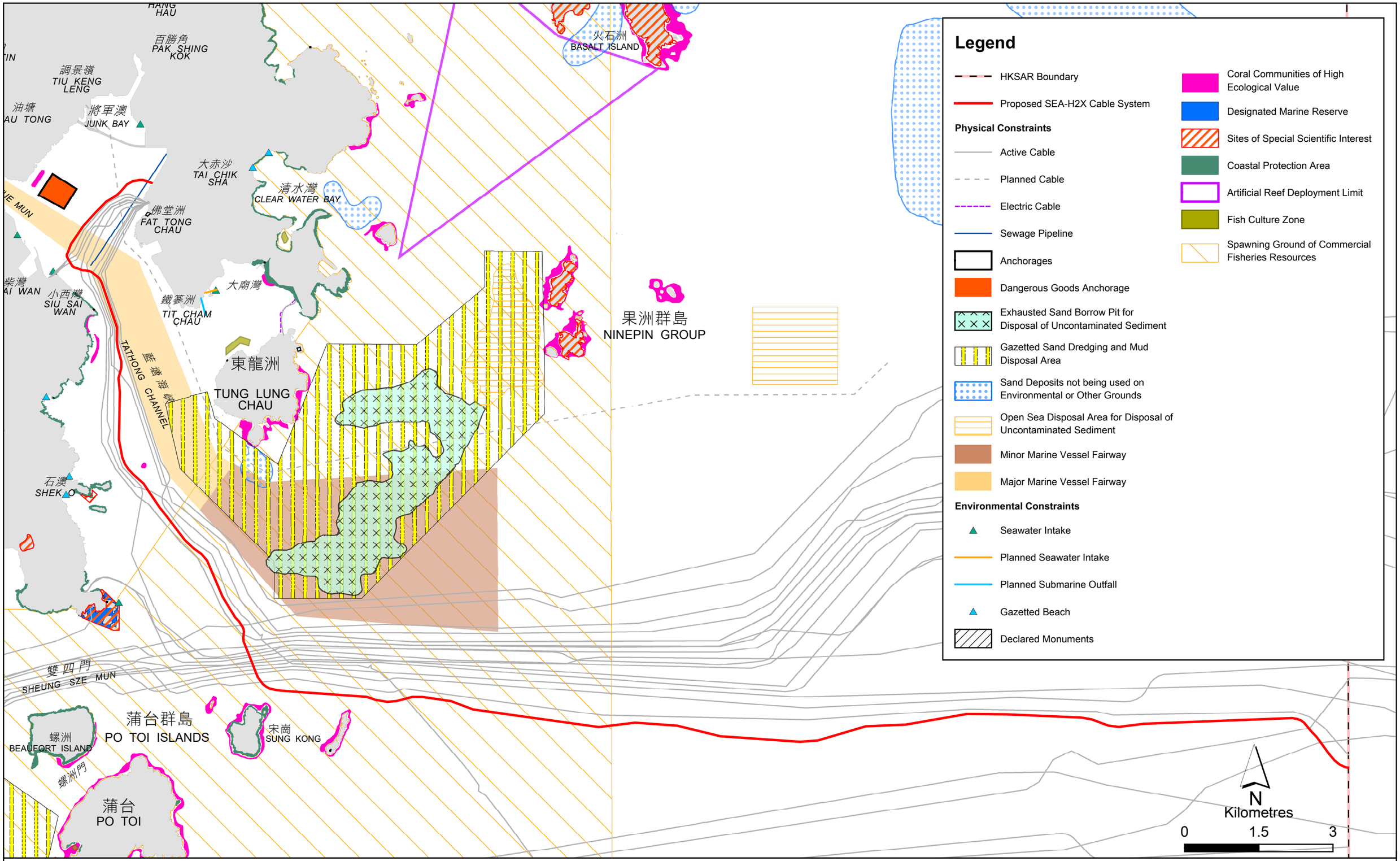

Figure 1.3a

Key Environmental & Physical Constraints

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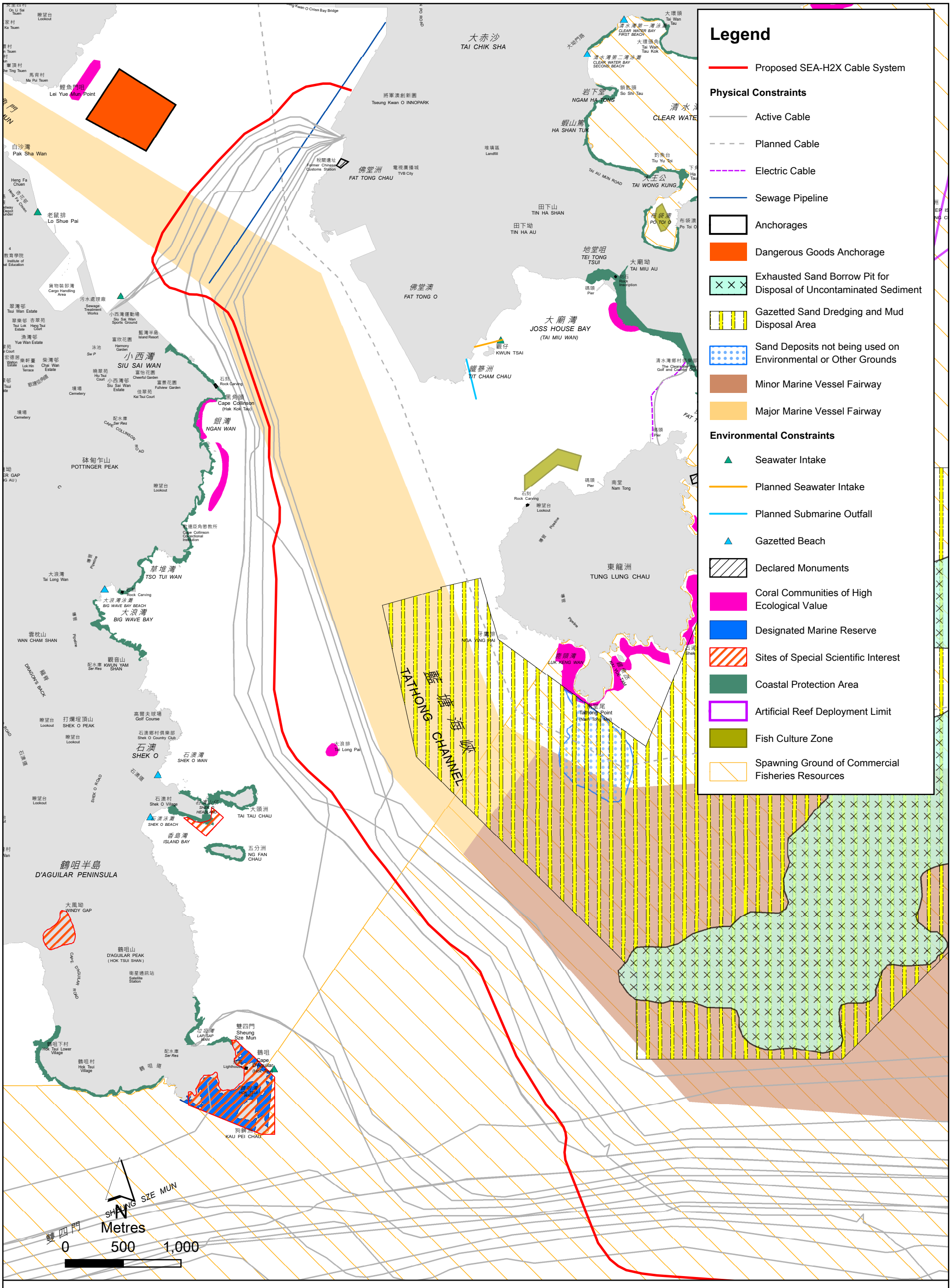
Legend
Proposed SEA-H2X Cable System
Physical Constraints
Active Cable
Planned Cable
Electric Cable
Sewage Pipeline
Anchorages
Dangerous Goods Anchorage
Exhausted Sand Borrow Pit for Disposal of Uncontaminated Sediment
Gazetted Sand Dredging and Mud Disposal Area
Sand Deposits not being used on Environmental or Other Grounds
Minor Marine Vessel Fairway
Major Marine Vessel Fairway
Environmental Constraints
Seawater Intake
Planned Seawater Intake
Planned Submarine Outfall
Gazetted Beach
Declared Monuments
Coral Communities of High Ecological Value
Designated Marine Reserve
Sites of Special Scientific Interest
Coastal Protection Area
Artificial Reef Deployment Limit
Fish Culture Zone
Spawning Ground of Commercial Fisheries Resources
大赤沙 TAI CHIK SHA
佛堂洲 FAT TONG CHAU
佛堂澳 FAT TONG O
大廟灣 JOSS HOUSE BAY (TAI MIU WAN)
小西灣 SIU SAI WAN
銀灣 NGAN WAN
草堆灣 TSO TUI WAN
大浪灣 BIG WAVE BAY
石澳 SHEK O
石澳灣 SHEK O WAN
鶴咀半島 D'AGUILAR PENINSULA
東龍洲 TUNG LUNG CHAU
鹿頸灣 LUK KENG WAN
大王公 TAI WONG KUNG
岩下堂 NGAM HA TONG
蝦山篤 HA SHAN TUK
地堂咀 TEI TONG TSUI
大廟坳 TAI MIU AU
田下山 TIN HA SHAN
田下坳 TIN HA AU
布袋澳 PO TOI O
鰂魚門 Lei Yue Mun Point
老鼠排 Lo Shue Pai
白沙灣 Pak Sha Wan
將軍澳創新園 Tseung Kwan O INNOPARK
大環頭 Tai Wan Tau
大環頭角 Tai Wan Tau Kok
清水灣第一灣泳灘 CLEAR WATER BAY FIRST BEACH
清水灣第二灣泳灘 CLEAR WATER BAY SECOND BEACH
銷馬頭 So Shi Tau
釣魚台 Tiu Yu Toi
大環頭 Tai Wan Tau
大廟坳 TAI MIU AU
觀仔 KWUN TSAI
鑊箩洲 TIT CHAM CHAU
南堂 Nam Tong
東龍尾 Tathong Point (Nam Tong Mei)
大浪排 Tai Long Pai
牙鷹排 NGA YING PAI
大頭洲 TAI TAU CHAU
五分洲 NG FAN CHAU
香島灣 ISLAND BAY
石澳泳灘 SHEK O BEACH
石澳村 Shek O Village
石澳角 SHEK O HEADLAND
石澳鄉村俱樂部 Shek O Country Club
高爾夫球場 Golf Course
打爛埕頂山 SHEK O PEAK
觀音山 KWUN YAM SHAN
雲枕山 WAN CHAM SHAN
砵甸乍山 POTTINGER PEAK
鶴咀山 D'AGUILAR PEAK (HOK TSUI SHAN)
大風坳 WINDY GAP
鶴咀 Cape D'Aguilar (Hok Tsui)
鶴咀村 Hok Tsui Village
鶴咀下村 Hok Tsui Lower Village
雙四門 Sheung Sze Mun
狗脾洲 KAU PEI CHAU
立坡灣 LAP SAP WAN
大浪灣 Tai Long Wan
大浪灣泳灘 BIG WAVE BAY BEACH
草堆灣 TSO TUI WAN
藍灣半島 Island Resort
富欣花園 Harmony Garden
富怡花園 Cheerful Garden
富景花園 Fullview Garden
翠灣邨 Tsui Wan Estate
翠樂邨 Tsui Lok Estate
杏翠苑 Hang Tsui Court
漁灣邨 Yue Wan Estate
柴灣邨 Chai Wan Estate
樂軒臺 Lok Hin Terrace
宏德居 Walton Estate
曉翠苑 Hiu Tsui Court
小西灣邨 Siu Sai Wan Estate
佳翠苑 Kai Tsui Court
小西灣運動場 Siu Sai Wan Sports Ground
污水處理廠 Sewage Treatment Works
貨物裝卸灣 Cargo Handling Area
香花邨 Heng Fa Chuen
教育學院 Institute of Education
將軍澳工業邨 Tseung Kwan O Industrial Estate
將軍澳跨灣大橋 Tseung Kwan O Cross Bay Bridge
將軍澳道 Tseung Kwan O Road
大坳門路 Tai Au Mun Road
堆填區 Landfill
稅關遺址 Former Chinese Customs Station
電視廣播城 TVB City
大廟灣 JOSS HOUSE BAY (TAI MIU WAN)
地堂咀 TEI TONG TSUI
大廟坳 TAI MIU AU
碼頭 Pier
石刻 Rock Inscription
清水灣鄉村俱樂部 The Clearwater Bay Golf and Country Club
鰂魚門 Lei Yue Mun Point
將軍澳創新園 Tseung Kwan O INNOPARK
大坳門路 Tai Au Mun Road
堆填區 Landfill
大環頭 Tai Wan Tau
大環頭角 Tai Wan Tau Kok
清水灣第一灣泳灘 CLEAR WATER BAY FIRST BEACH
清水灣第二灣泳灘 CLEAR WATER BAY SECOND BEACH
銷馬頭 So Shi Tau
釣魚台 Tiu Yu Toi
大王公 TAI WONG KUNG
岩下堂 NGAM HA TONG
蝦山篤 HA SHAN TUK
田下山 TIN HA SHAN
田下坳 TIN HA AU
布袋澳 PO TOI O
地堂咀 TEI TONG TSUI

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. Appropriate separation from existing cables and pipelines is important for successful and efficient repairing activities if required in the future.

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.

Gazetted Bathing Beaches

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

Other Projects

In order to avoid interface and cumulative impacts with other projects, installation program of the SEA-H2X cable has considered the prevention of overlapping with the construction works of other projects, as detailed in ***Section 2.3***. A Liaison Officer will be appointed by the Project Proponent of the SEA-H2X Cable, who will be responsible for liaising with the Project Proponent of other projects so as to avoid any work conflicts.

1.6 Designated Project to be Covered by the Project Profile

The SEA-H2X submarine cable laying works will be less than 500m from the boundary of the existing CPA along the coast from Siu Sai Wan to Cape Collison and the boundary of the existing CPA along the coastline of Tai Tau Chau near Shek O. Both CPAs are partly situated below the highwater mark. The locations of the CPAs and highwater mark are presented in ***Figure 1.5*** for reference. The project is classified as a Designated Project (DP) by virtue of item C.12 (1)(b) 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;

(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;

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

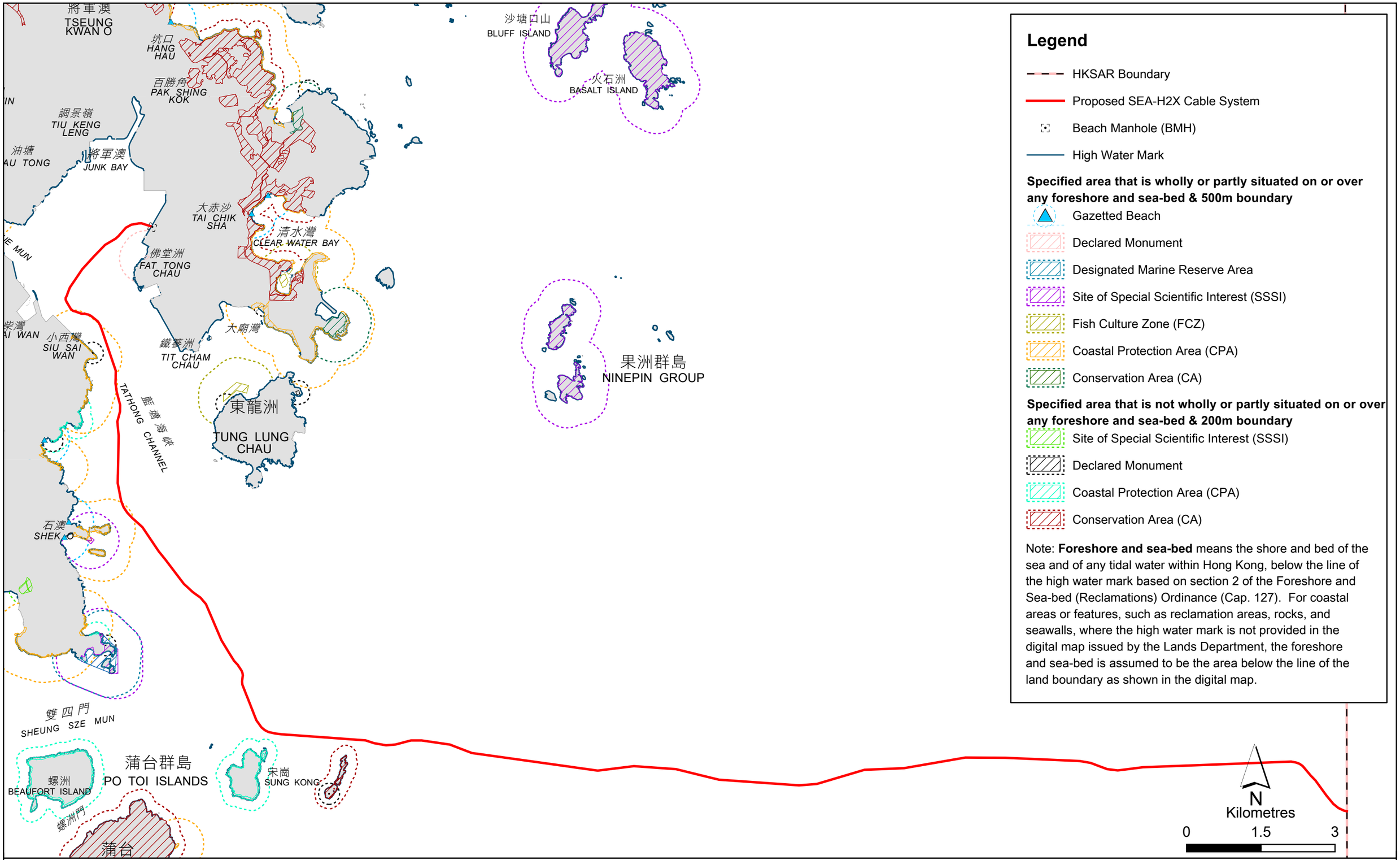

Figure 1.4a

Designated Project Elements

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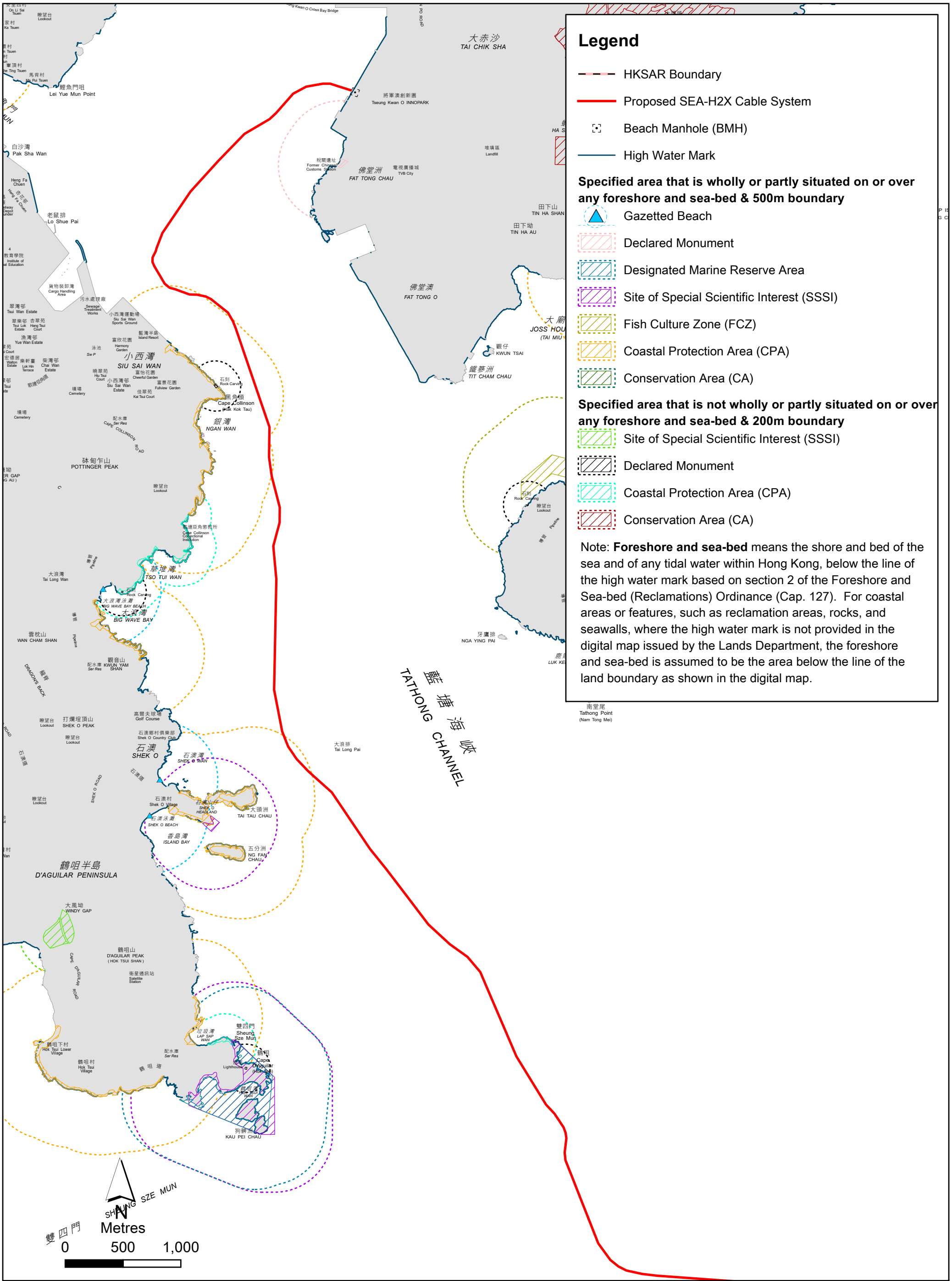

Figure 1.4b

Designated Project Elements
(Part Plan)

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Date: 6/11/2024

Legend

- Proposed SEA-H2X Cable System
- High Water Mark
- Coastal Protection Area
- 500m from CPA that is 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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(e) marine reserve;

(f) fish culture zone;

(g) wild animal protection area;

(h) coastal protection area; and

(i) conservation area.

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

2. OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

2.1 Project Planning and Implementation

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

2.1.1 Construction Phase

The Hong Kong section of the SEA-H2X cable installation works will be a "Pre-lay Shore End" (PLSE), where the cable system will be landed from Hong Kong landing point, the cable will be pulled through the duct, which will be constructed by other company separately, until the cable being pulled and secured in the BMH. After landing, the cable will be laid up to the edge of Hong Kong waters, sealed and dropped onto the seabed. In this way the cable 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 (as referred to ***Figure 2.1a***) will be deployed to accomplish the submarine cable installation and protection works, and the cable 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)

Prior to the submarine cable burial, PLGR is designed to clean all seabed debris along the planned cable route, and RC activity 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 referred to ***Figure 2.1a***) towed along the route and penetrate up to 1.5 m to ensure the whole cable route is clear. As sediment plumes are not expected to produce by the penetrating grapnels, and hand jetting has low jetting power only applying at specific point(s) if need, no significant water quality impacts are expected.

2.1.1.2 Cable Installation Works at the Landing Site

Site Preparation

Prior to cable landing, cable landing team will be dispatched to landing point ahead of cable laying barge (as referred to ***Figure 2.1a***) arrival to prepare the site for the cable landing works. The existing 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.

Cable Landing Works

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 (as referred to ***Figure 2.1a***) will be setup in the pre-determined location for landing the cable. A 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 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. Then the cables will be de-armoured, coiled and fixed inside the BMH with anchor plate.

2.1.1.3 Submarine Cable Installation

After the submarine 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***.

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

After the completion of landing works, an estimated length of 200 m articulated pipes (as referred to ***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. The cable installed by divers will be protected by articulated pipes and buried by hand-held jetting tools (as referred to ***Figure 2.1b***). The cable will be pulled through the pre-constructed landing ducts from the seawall side (under-seawater activity below the high-water mark area) and secured into the BMH. Once the cables are fixed inside the BMH, the main laying works will be started. 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 referred to ***Figure 2.1a***) to the target burial depth penetration. 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). A dive team on the cable-laying vessel will be on standby to ensure proper functioning and positioning of the burial tool. The seabed is expected to reinstate to its original condition shortly after burial.

One electrical earthing cable and anode (called Ocean Ground Bed (OGB), acting as grounding) will be generally laid along the 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 referred to ***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.

Remaining/offshore Submarine Cable Main Installation Seaward

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 barge (as referred to ***Figure 2.1a***) slowly moves forward and the cable will be laid out correspondingly to the forwarding speed of the barges, with maximum speed at 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 disturbed area of the seabed will be limited to this width.

Cable and Pipeline Crossings Protection

As stated in ***Appendix A Section A 4.1.3.2***, 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 referred to ***Figure 2.1a***) is not achievable, hand jetting by divers will be adopted (as referred to ***Figure 2.1b***). The practical burial depth for hand jetting will be from around 0.1 m to 1.5 m, subject to the seabed conditions. The trenching area would be approximately 0.5 m wide. 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. The vertical separation at the crossing point is 2m, meaning that the SEA-H2X Cable will be buried 3m below the seabed at these crossing locations.

Whereas where the SEA-H2X cable route crosses the existing gas pipeline of HK Electric Company Limited (HEC), to ensure the pipeline safety, the cable laying barge (as referred to ***Figure 2.1a***) 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 an injector burial tool / jet sled tools or fully retract the blade by divers if using a sled burial tool (as referred to ***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 with diameter of approximately 93mm (as referred to ***Figure 2.1b***) on top of the submarine cable system at the crossing location.

Whereas where the SEA-H2X cable route crosses the existing sewers of Drainage Services Department (DSD), to ensure the pipeline safety, as the DSD pipeline is the "inshore cable installation" section, the cable laying barge (as referred to ***Figure 2.1a***) will first landing the cable (surface lay) to the BMH through seaward ducts and on top of the DSD crossing point, and the diver will install the articulated pipes (as referred to ***Figure 2.1b***) with as estimated width of 0.073 m after the cable has been laid, and then use the hand held jetting tool to bury the inshore section cable into 0.5 – 1.5 m approx. under the sea bed, after all the cable to the boundary of the Hong Kong waters has been installed, the cable laying barge will load the concrete mattress and place of reinforced precast concrete slabs with dimensions of approximately 94m(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 (as referred to ***Figure 2.1b***) 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 diver 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 and Cable Installation 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 – 20	>9 – 32
Approximate burial depth, m	0.5-1.5	6	5
Approximate extent of works (cable system length), km	0.2	2.08	32.82
Cable section	From the Beach Manhole (BMH) landing duct connection point to the end of articulated pipe	From the end of the articulated pipe to the exit of the Traffic Separation Scheme (TSS) crossing in the Tathong Channel	From the exit of the TSS crossing to the eastern boundary of Hong Kong waters
Target tools & cable installation methods	Diver hand jetting tools (as referred to ***Figure 2.1b***), 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)



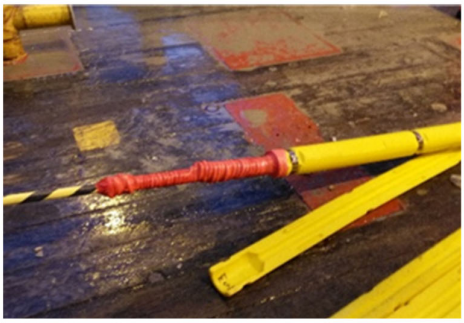
Buoys / Floats on Messenger Line and Cable



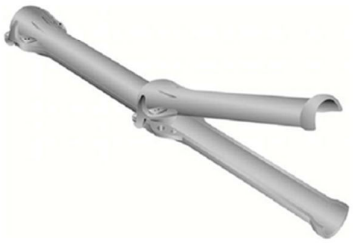
Diver Cutting Off Buoys / Floats



Diver Jetting



URADUCT® used for Crossing Protection



Articulated Pipe

2.1.2 Operation Phase

During cable system operation (after completion of installation), there may be a potential requirement for maintenance work (i.e. cable repairing at particular fault location due to unexpected damage) to be carried out. Such 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 SEA-H2X cable system is provisionally scheduled to be landed and installed at TKOIE commencing in Q3 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 90 working days.

Table 2.2 Tentative Construction Schedule

Works Stage	Tentative Timeframe
PLGR and RC (***Section 2.1.1.1***)	Up to 30 working days
Cable Installation Work at the Landing Site (***Section 2.1.1.2***)	Up to 5 working days
Inshore Cable Installation Shore End Laying, Burial and Ocean Ground Bed Installation, Remaining/offshore Submarine Cable Main Installation Seaward, and Cable and Pipeline Crossings Protection (***Section 2.1.1.3***)	Up to 55 working days
TOTAL	Approximately 90 days, including contingency and buffer

Note:

[1] Post-Lay Inspection and Burial (PLIB) (Section 2.1.1.4), if necessary, would be take up to 40 workings days.

All cable installation/ 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 repairing work during operation is anticipated to be of shorter duration than cable installation during construction.

2.3 Interaction with Concurrent Projects

The proposed SEA-H2X 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 SEA-H2X 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 SEA-H2X 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 SEA-H2X 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 desalination plant has commenced operation in Q3 of 2024. Therefore, the desalination plant will

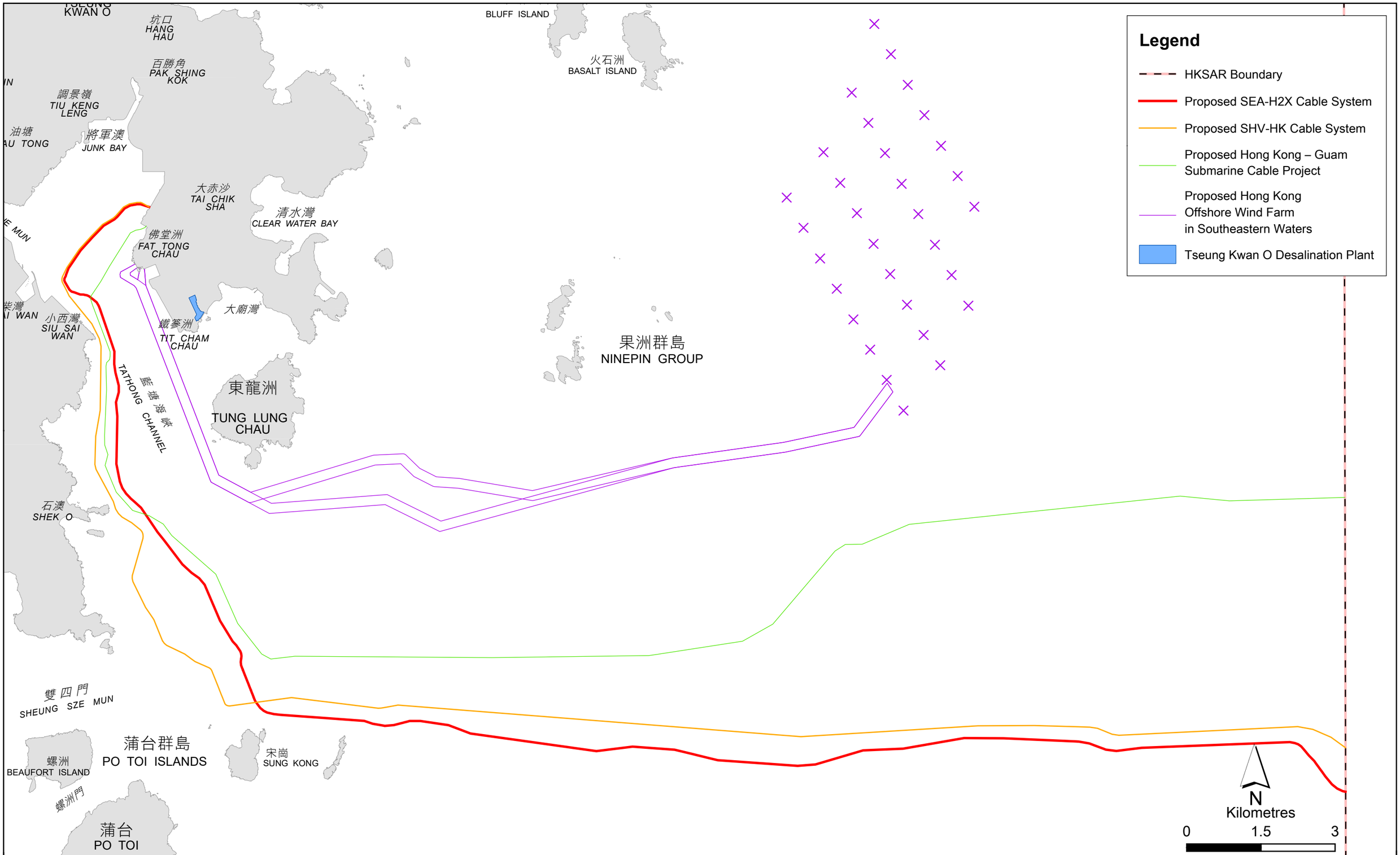


Figure 2.2

Other Projects in Vicinity of the Proposed Cable System

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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.

- **Sihanoukville – Hong Kong (SHV-HK) Submarine Cable System:** SHV-HK is also scheduled to be installed in Q3 of 2025. As the cable alignment of SHV-HK is similar to that of SEA-H2X 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 3.1a and Figure 3.1b 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 HK 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 repairing works 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 boundary of the cable landing site or cable corridor. The nearest gazetted beach is Rocky Bay Beach located ~1,140 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 boundary of two CPAs, which are located along the coastline of Siu Sai Wan and small part of Tai Tau Chau near Shek O with the distances being approximately 270 m and 430 m away, respectively. These CPAs are designated under approved Chai Wan Outline Zoning Plan (OZP) no. S/H20/27 and approved 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 Intakes

The nearest flushing water intake is Water Supplies Department (WSD) Siu Sai Wan Flushing Water Intake (see ***Figure 3.1a and Figure 3.1b***) positioned ~380 m from the cable alignment. The nearest cooling water intake is the one for Pamela Youde Nethersole Eastern Hospital and it is over 1,000 m away from the cable alignment. The seawater intake for the Tseung Kwan O Desalination Plant is over 2,100 m away from the cable alignment.

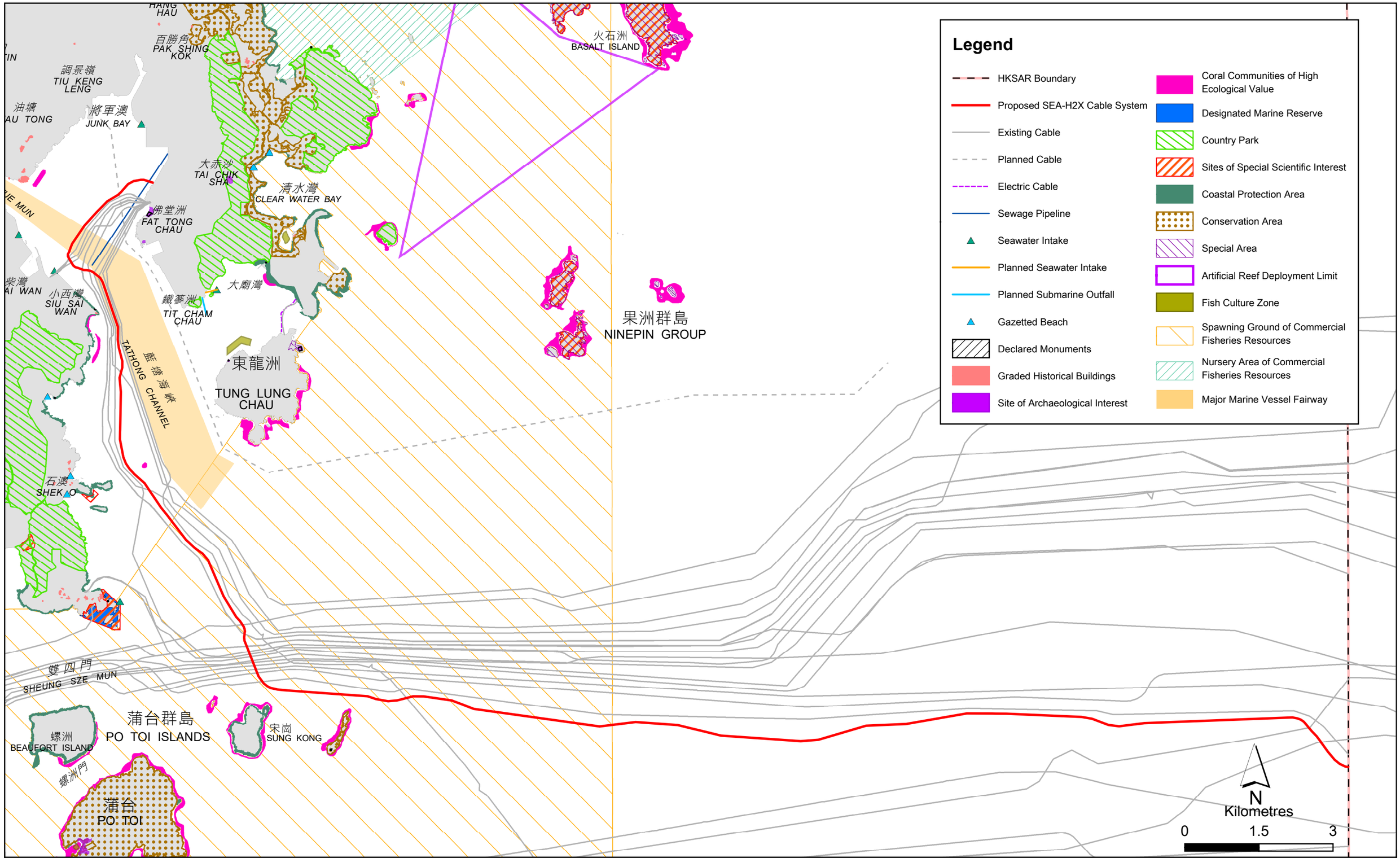

Figure 3.1a

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

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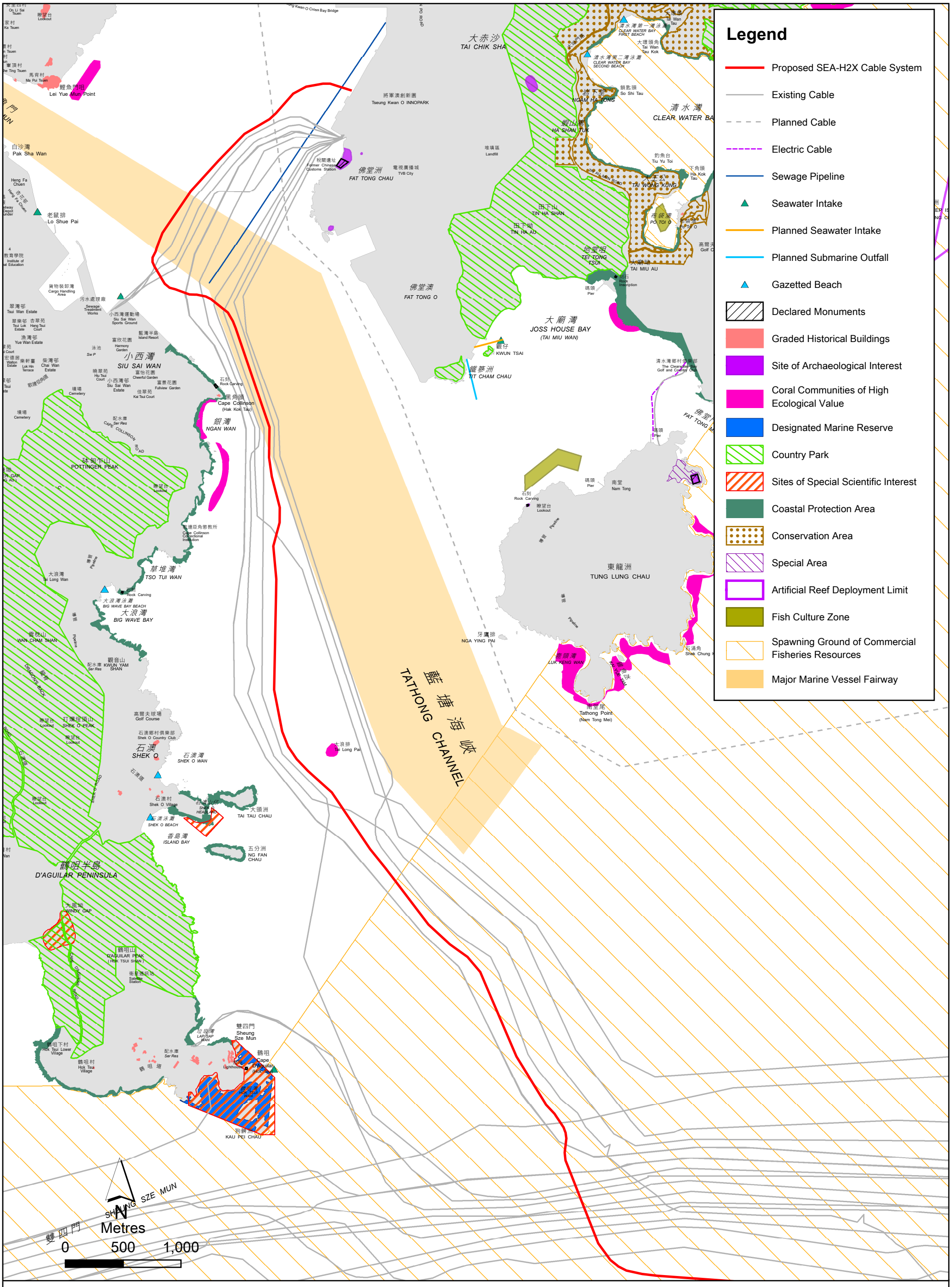

Figure 3.1b

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

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As discussed in ***Section 4.2.2***, it is expected that the maximum distance of transport for suspended sediments from Project works would be 180 m, hence any sediment plume due to the Project works would not be expected to reach any of the identified seawater intakes. No adverse water quality impact is expected at these intakes.

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 810 m and 1,880 m, respectively, away from the cable corridor. These two SSSIs are marine in nature. As detailed further in ***Section C3.1*** of ***Appendix B***, no adverse 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 adverse impact is foreseen in these areas.

3.9 Coral Communities

There are coral communities of ecological importance along the coast of Cape Collinson, Ngan Wan, Southwest Junk Bay, Sung Kong, Waglan islands, Ninepins, Fat Tong Chau, Tai Long Pai and Tung Lung Chau, as well as along the eastern coast of Beaufort Island and entire coast of Po Toi which are further from the proposed alignment (***Figure 3.1a***). The closest coral communities, located at Tai Long Pai, Waglan Island, and Sung Kong, would be ~210 m, ~270 m, and ~290 m away from the cable corridor, respectively. The other coral communities are ~350 m to >7.2 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 ~1,880 m from the proposed SEA-H2X 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 designated marine parks and marine reserve and overall, no anticipated adverse 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 3.1a and Figure 3.1b***). 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 two declared monuments within 500 m area from the proposed SEA-H2X cable system as shown in ***Figure 3.2***. They are namely, the Rock Carving at Cape Collinson (declared monument) and Fat Tau Chau (declared monument), located 312 m and 318 m respectively from the proposed cable system.

A Marine Archaeological Investigation (MAI) has been conducted by marine archaeologist for the proposed SEA-H2X cable system and summarised as below. Details of the MAI result is presented in ***Appendix E***. Desktop review revealed that the proposed SEA-H2X cable system is located within a disturbed marine area installed/ planned to install with numerous submarine cables or utilities and mostly fall within areas that had been covered by previous marine archaeological assessment/ survey areas, the previously 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 survey area for this Project concluded to have no marine archaeological interest.

A geophysical survey was conducted for this Project (see "Geophysical Survey Area for this Project" in **Figure 3.2**). Two wrecks with sonar contact number SC028 and SC051 are located 95m and 137m

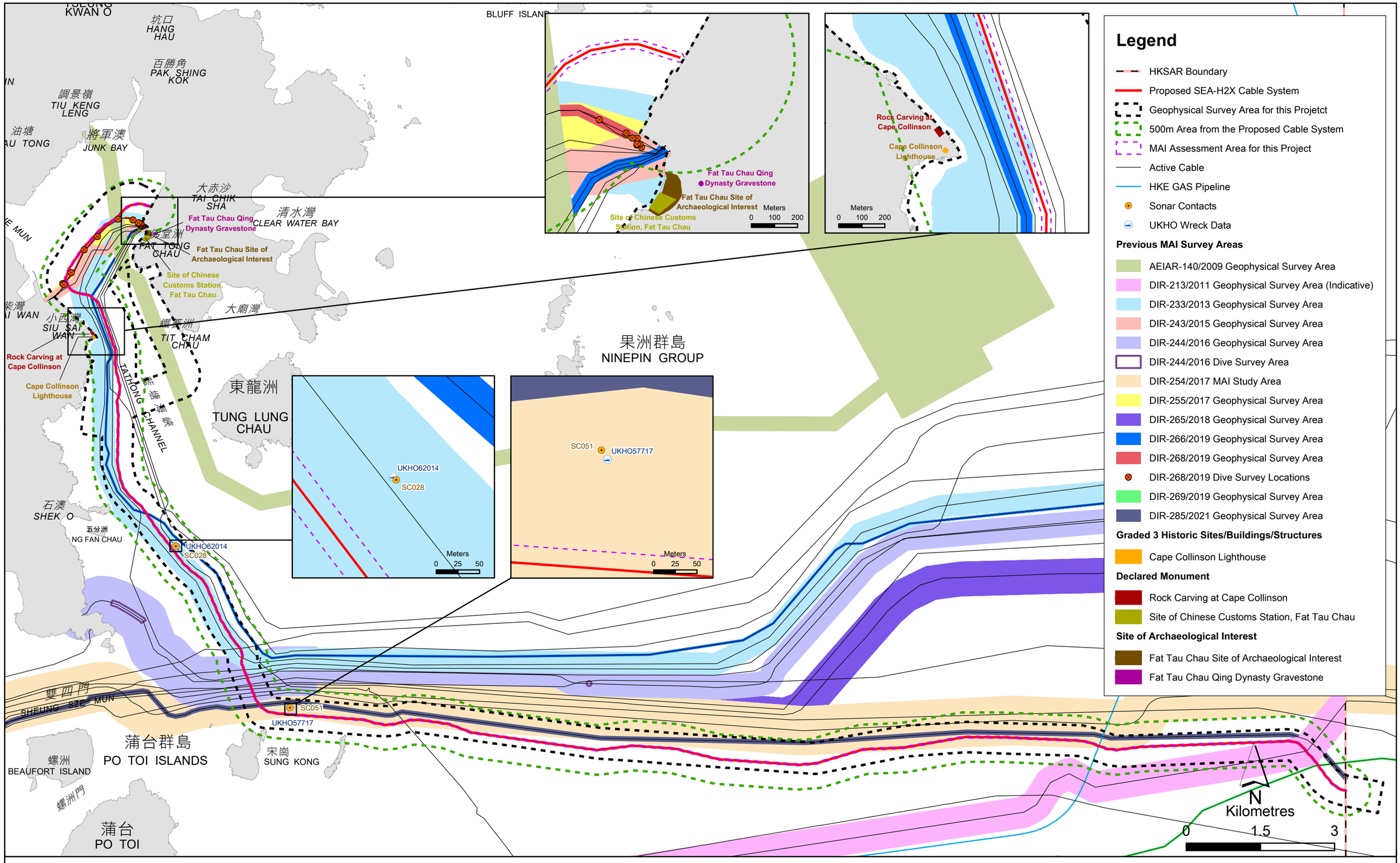

Figure 3.2

Heritage Sites, Geophysical Survey and MAI Assessment Area/Study Area/Survey Area in the Vicinity

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respectively from the cable alignment. Their locations are almost identical to UKHO wreck numbers 62014 and 57717 respectively. Therefore, they are referring to these wrecks.

The submarine cable laying process will involve minor marine works for a relatively short period of time. The seabed disturbance only involves a narrow and shallow trench of approximately 0.5 m wide at a target depth of up to around 6 m below the seabed, its impact will be localized and constrained to the immediate area of the trench itself. 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 and therefore it is defined as the MAI Assessment Area for this Project as shown in **Figure 3.2**.

Five (5) sonar contacts are identified in the MAI Assessment Area. They are classified as debris, including linear debris, and possible a tyre. None of these sonar contacts have any magnetic values.

Twenty-one (21) magnetic contacts were identified in MAI Assessment Area, 12 of them are modern cable routes without archaeological value. Nine of them are regarded as “unknown” contacts. A review of the nine “unknown” magnetic contacts found MC042, MC063, MC121, MC131 and MC132 are all regarded as old cables as they line up with other magnetic contacts in the near vicinity, and have similar magnetic values as the known cables, and therefore have no marine archaeological value. Of the other four magnetic contacts, OPT-MC069, OPT-MC071, MC168 and MC171, they appear to be isolated debris (either of natural or man-made materials) and are 11 m, 12 m, 13 m and 13 m respectively off the cable route. Deposited material from a shipwreck would contain clusters of material, not isolated objects like this.

Seven seismic contacts were identified in the geophysical survey area for the Project but only one of them is located in the MAI Assessment Area. They are part of the HK Electric gas pipeline buried around 3.4m to 3.8m below seabed crossing the proposed cable alignment at the eastern end (see “HKE Gas Pipe” in ***Figure 3.2***). The modern gas pipeline with these seismic contacts is of no marine archaeological value.

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 surveyed area.

To conclude, the MAI including desktop review and review and evaluation of the geophysical survey results of the Project by marine archaeologist identified no marine archaeological potential area within the MAI Assessment Area.

3.13 Cumulative Impacts from Other Projects

Section 2.3 identified potential interactions between the installation of the SEA-H2X cable system and construction of other projects in the vicinity. As described in ***Section 2.3***, the installation of the SEA-H2X submarine cable system will unlikely coincide with other projects and given the nature and scale of the Project and the installation, cumulative impacts are not anticipated.

4 POSSIBLE IMPACTS ON THE ENVIRONMENT

4.1 Summary of Potential Environmental Impacts

The SEA-H2X cable system installation/ 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 (2).

The construction, operation and potential repairing during operation impacts associated with the proposed SEA-H2X cable system are summarised in ***Table 4.1*** and elaborated on in the following sections.

No adverse 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 repairing at particular fault location due to unexpected damage) to be carried out during operation and ***Section 4.8*** addresses the potential impacts associated with these works.

Table 4.1 Potential Sources of Environmental Impacts

Potential Impact	Construction	Operation	Maintenance [1]
Water			
Activities at landing point	✓	×	×
Marine based activities	✓	×	×
Disruption of Water Movement or Bottom Sediment	✓	×	✓
Ecology			
Terrestrial	×	×	×
Marine	✓	×	✓
Fisheries	✓	×	✓
Cultural Heritage	×	×	×
Noise	✓	×	✓
Night-time Operations	×	×	×
Others			
Air Quality	×	×	×
Dust	×	×	×
Emissions from Marine Vessels and PMEs	×	×	×
Odour	×	×	×
Induced Vehicular Traffic	×	×	×
Waste Management	×	×	×
Visual and Landscape Impact	×	×	×
Hazard to life	×	×	×
Dangerous Goods	×	×	×
Hazardous Materials or Wastes, including Potentially Contaminated Materials	×	×	×

(2) Corresponding press release available here: https://www.info.gov.hk/gia/general/202411/01/P2024110100244.htm. In case the construction for the cable landing ducts involves discharges (such as site runoff), WPCO license would be required and the corresponding licensee is required to follow the corresponding requirements and discharge limits. No adverse water quality impact from this interfacing project is therefore expected.

Potential Impact	Construction	Operation	Maintenance [1]
Risk of Accidents Which Result 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 repairing during operation is expected to be less than that during construction due to shorter duration for repairing work than construction work, involvement of smaller extent, and use of smaller / less powerful equipment for repairing work than construction work, e.g. remotely operated vehicles (ROV) rather than injector tool / jet sled tools (see **Section 4.8**).

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 cable 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 cable 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 PN2/24*) 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, no activities at the landing point are anticipated and no water quality impacts are expected.

4.2.2 Marine Based Activities

The marine based construction activities include the preparation for cable installation (RC and/or PLGR), inshore installation involving burying the cable below the existing seabed. From the BMH seaward duct end to approximately 200 m out from the BMH, the cable will be buried by divers using

jet probes to achieve target burial depth of 1.5 m, and the remaining length of cable will be installed to approximately burial depth of max. 6 m below the sea-bed/ mudline 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 (as referred to ***Figure 2.1a***), 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. Coral colonies identified at dive survey transect near the landing point (WSR T1) are in the immediate proximity to inshore section/cable laying activities and part of the cable alignment will be directly located within the Spawning Ground of Commercial Fisheries Resources. All other identified WSRs are located beyond 180 m, distance ranging from ~210 m to >7.2 km, and thus sediment plume will not encroach into these WSRs (see ***Appendix A***). Details of water quality assessment are provided in ***Appendix A***. For such, no 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 operations (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 (as referred to ***Figure 2.1a***) 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 90 working days (including contingency and buffer). As described in ***Section 2.1.1,*** RC and PLGR will be conducted using tow of grapnel anchor (as referred to ***Figure 2.1a***).

These operations will be scheduled to take place before the actual submarine cable laying operation and are expected to take approximately 90 working days (including contingency and buffer) and restricted to limited areas, wherever necessary.

Operation Phase

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

Mitigation Measures

A number of mitigation measures have been proposed to control the sediment loss from the cable installation during construction phase and potential maintenance works. For the shallower section near the BMH, the installation would be conducted by diver(s) using less powerful handheld jetting tool. For the rest of the cable section, the forward cable installation barge will typically operate at 0.2 km hr-1 (maximum will be limited to 1 km hr-1) to control the sediment loss rate. Other good practices for land-based and marine works would be observed as well. In addition, marine water quality monitoring would be conducted to ensure the Project works will not result in any adverse impacts to water quality. These monitoring details are presented in ***Appendix F***.

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 land-based activities only involve pulling and guiding the cable into an existing duct.

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.

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 810 m and 1,880 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***).

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.

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 3.1a***). Coral assemblages of moderate/ high ecological value have been identified at Cape Collinson, Ngan Wan, South West Junk Bay, Sung Kong, Waglan Island, Ninepins, Fat Tong Chau, Tai Long Pai, Tung Lung Chau, Cape D'Aguilar Marine Reserve, Beaufort Island and Po Toi Island. All identified coral communities of high ecological value are located at least 200 m 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 [(3)] 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***).

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 90 working days including contingency and buffer) and will involve one main cable installation barge (as referred to ***Figure 2.1a***). Given the cable

(3) 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)

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 or jet sled tools (as referred to ***Figure 2.1a***) 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.

Potential Impacts during Construction Phase

Impacts to marine ecological resources have largely been avoided during cable laying, as well as RC/ PLGR operation(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.

Potential Impact during Operation Phase

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

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 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. Inshore cable installation works would be conducted by diver using hand-held jetting tools. Divers will manually install cable at inshore section to avoid direct impact and minimize indirect impact to the identified coral communities. 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.

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 – 400 vessels. Along the proposed alignment, the grid at the northeast of Po Toi Island has higher 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 ~2.1 km from the Project Site.

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 90 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 of 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 operation(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***).

Potential Impact during Operation Phase

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

Any 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.

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

Heritage Sites Impact Assessment

The five land-based heritage sites, including the Rock Carving at Cape Collinson (declared monument), Site of Chinese Customs Station, Fat Tau Chau (declared monument), Cape Collinson Lighthouse (Grade 3 historic building), Fat Tau Chau SAI, and Fat Tau Chau Qing Dynasty Gravestone (SAI) are located 312 m, 597 m, 318 m, 505 m and 549 m respectively from the proposed cable system (see **Figure 3.2** for their location). The identified declared monuments, Grade 3 historic building and SAIs will not be impacted by the construction and operation of the Project, as land-based activities only involve pulling and guiding the cable into an existing duct. Therefore, no mitigation measure is required.

Marine Archaeological Investigation

Appendix E provides the details of the marine archaeological investigation due to the Project, and a summary of the assessment is provided as follows.

Sonar contact SC028 located 95 m away from the proposed cable system (see **Figure 3.2** for its location) was identified as a wreck UKHO62014 according to the database of UKHO. Sonar contact SC051 located 137m 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 value. Both wrecks are far away from the proposed cable system, no impacts are anticipated. Therefore, no marine archaeological impact is anticipated due to the proposed works.

Although five (5) sonar contacts and twenty-one (21) magnetic contacts are identified at the distance between 6 and 20m from the proposed cable system in the MAI Assessment Area, they are either modern features or contacts without marine archaeological value. Furthermore, the actual area of disturbance is approximately 0.5 m when laying the cable, the contacts will not be impacted. Thus, no mitigation measure is required.

One seismic contact is identified in the MAI Assessment Area, which is part of the gas pipeline of the Hong Kong Electric without marine archaeological value, therefore no marine archaeological impact is anticipated. Thus, no mitigation measure is required.

To conclude, the MAI including desktop review and review and evaluation of the geophysical survey results of the Project by marine archaeologist identified no marine archaeological potential area within the MAI Assessment Area. Potential impact to marine archaeological resource due to the Project is not anticipated. Therefore, no further field investigation or mitigation measures is required.

The cultural heritage impact assessment including marine archaeological investigation and assessment identified no adverse cultural heritage impacts during construction and operation of the Project. Therefore, no cultural heritage mitigation measures are 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, Construction Noise Permit(s) (CNP) will be applied for.

During operation, no adverse noise impacts are anticipated.

4.7 Others

4.7.1 Air Quality Impact

Air Sensitive Receivers

4 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**. 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 between the identified ASRs and entire proposed cable alignment section and section with S2 method.

Table 4.2 Identified Representative Air Sensitive Receivers

ASR ID	Description	Type of Use	Approximate Building Height (m)	Approximate Distance from the Proposed Cable Alignment (m)	Approximate Distance from the Proposed Cable Alignment (Section with S2 Method) (m)
A1	ASB Biodiesel (HK) Limited	Industrial	18	123 (from landing site)	281
A2	China Unicom (HK) Global Centre	Industrial	35	219 (from landing site)	347
A3	HKSTP Project Development Office	Commercial	8	201 (from landing site)	396
A4	Island Resort	Residential	193	382	382

Evaluation of Air Quality Impacts during Construction Phase

Dust

The Project only involve submarine cable installation works. During the cable landing work, only pulling and guiding the cable to the duct for connection to the BMH would be involved. No

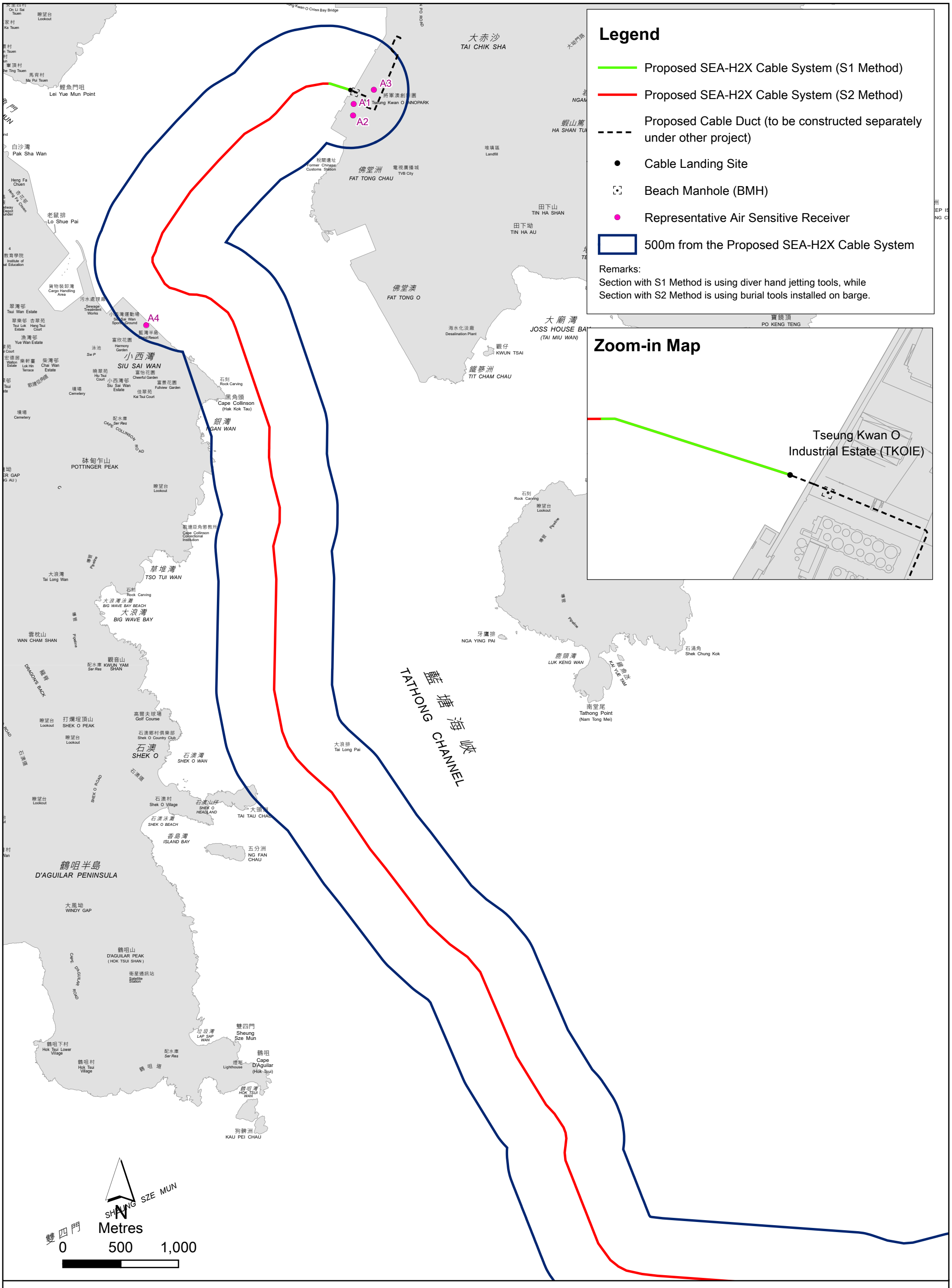

Figure 4.1

Representative Air Sensitive Receivers

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construction and excavation works are required at the landing site, and there are no land-based construction activities for the Project. 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 (NOx, 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 three marine vessels (including one cable installation barge and two 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.

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

Vehicular Traffic Generation

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.

Evaluation of Air Quality Impacts during Operation Phase

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.

4.7.2 Waste Management

No excavated materials or waste materials are anticipated from the landing works. During the cable landing work, only pulling and guiding the cable to the duct for connection to the BMH would be involved.

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. There will be no waste generated during operation of the cable system. Recycling arrangement will be im-plemented where practicable for debris collected during the construction works. There will be no waste generated during operation phase of the cable system.

Therefore, in 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 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

Dangerous Goods

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

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.

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.

4.8 Maintenance

It is considered unlikely that the submarine cable system will require maintenance during operation, however should a cable fault arise that necessitates this, repairing works will be required. Methods used for cable maintenance and repairing at any location along the submarine cable route are anticipated to be as per those used for cable installation during construction, with the potential to use smaller equipment such as remotely operated vehicles (ROVs) equipped with injector tool / jet sled tools, diver hand jetting and/or grapnels (as referred to ***Figure 2.1a***).

Repairing works will be conducted (and repairing cable laid back) along the same proposed alignment as installed cable system but duration of any cable repairing work is anticipated to be of shorter duration than cable installation during construction, since 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 / jet sled tools (typical injector tools jet around eight times (x8) more litres of water per minute than typical ROVs) and diver hand jetting (as referred to ***Figure 2.1b***)is even less powerful (ROVs jet around four times (x4) more litres of water per minute than typical diver jetting). Grapnels (as referred to ***Figure 2.1a***) 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.

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 inshorecable installation, with reference to water quality and detailed in ***Appendix A***.

5.1.2 Operation Phase

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

Should repairing operation 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 90 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.

As the environmental impact of the works activities are predicted to be localised and the environment is expected to reinstate to its original condition in a short period of time, short-term effects are anticipated to be negligible. Besides, no environmental impacts are predicted during the operation of the submarine cable, no long-term effects are expected.

No secondary or induced effects will be caused by the installation and operation of the cable. As the installation barge for the only planned concurrent projects - Sihanoukville – Hong Kong (SHV-HK) Submarine Cable System – will be operated for each cable one-by-one without overlapping for safety reason, the potential cumulative effects are anticipated to be negligible, considering the relatively minor scale of both projects.

There is no anticipated transboundary effect arising from the proposed submarine cable installation with limited localised impact during the construction phase and operational phase of the Project.

5.3 Maintenance Phase and Further Implications

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.

The Project Proponent has engaged relevant consultants to obtain gazettal under the Foreshore and Seabed (Reclamation) Ordinance (FSRO) and liaise with Lands Department (LandsD) and District Councils (DCs), undertake a Marine Traffic Impact Assessment (MTIA) to address the marine traffic issue and to obtain approval from Marine Department (MD).

6 ENVIRONMENTAL MONITORING & AUDIT

No adverse 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. These are detailed in ***Appendix F***. Should repairing works be necessary during operation of the cable system, appropriate mitigation measures, as proposed for the construction phase, will be implemented.

Water quality monitoring will be carried out at the representative locations 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) during the cable laying activity.

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.

Full details of the EM&A requirements are given in ***Appendix F***.

7. USE OF PREVIOUSLY APPROVED EIA REPORTS

The proposed landing site for SEA-H2X 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).
- **Hong Kong-Americas Cable (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 HK 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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A1. 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 South-East Asia Hainan-Hong Kong Express Submarine Cable System ("SEA-H2X cable system") (hereafter referred to as the Project). The cable system will consist a cable 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 adverse 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 repairing 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/ repairing works are also considered in this **Appendix**.

A2. 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- DSS); and,
- *Professional Persons Environmental Consultative Committee Practice Notes, Construction Site Drainage* (ProPECC PN2/24).

A2.1 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 SEA-H2X 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.

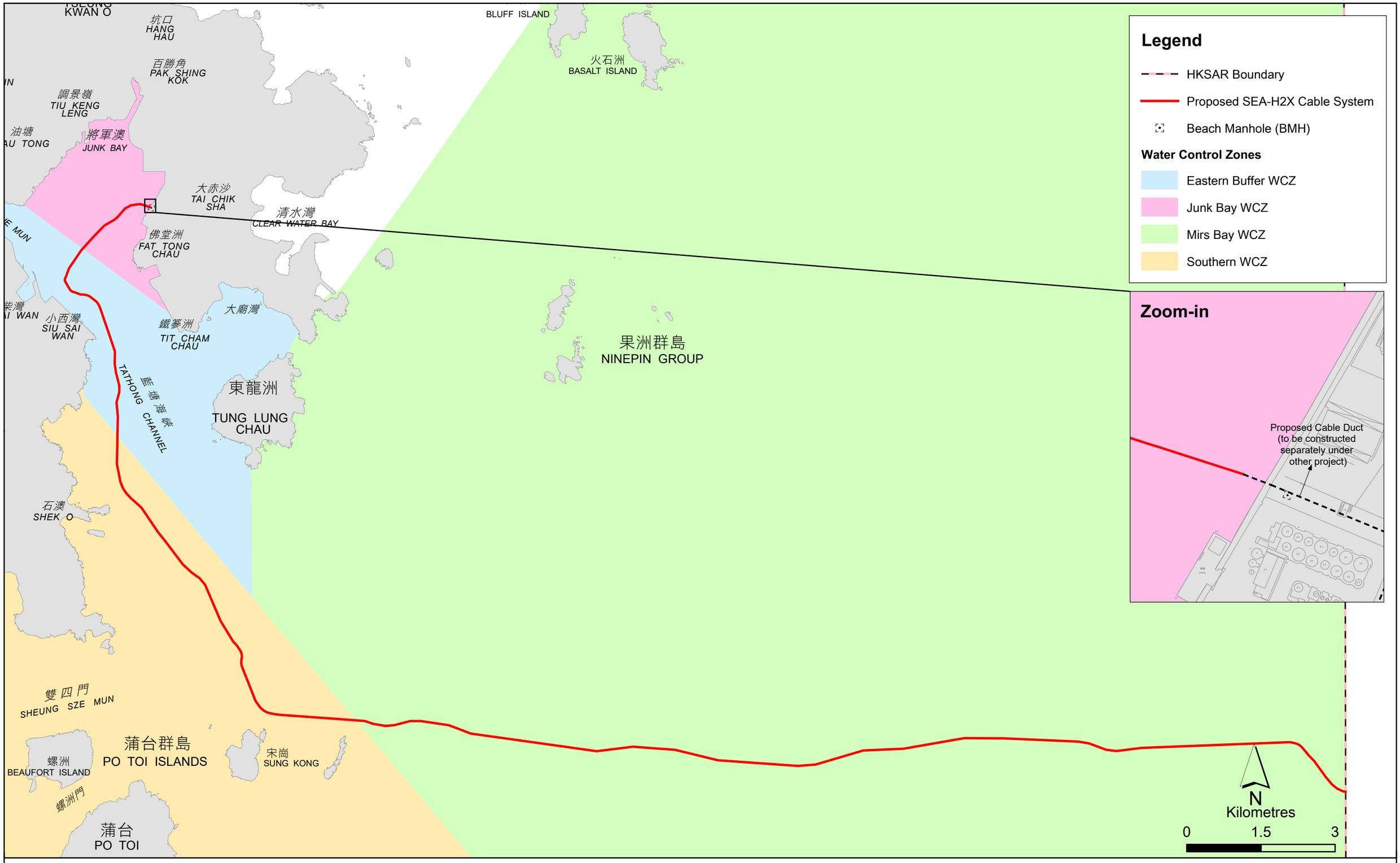

Figure A1

Water Control Zones (WCZs) Passed through by SEA-H2X Cable System

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Date: 9/1/2025

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

	Water Quality Objective	Junk Bay WCZ	Eastern Buffer WCZ	Southern WCZ	Second Southern Supplementary WCZ	Mirs Bay WCZ
A	AESTHETIC APPEARANCE					
a)	Waste discharges shall cause no objectionable odours or discolouration of the water.	Whole zone	Not applicable	Whole zone	Whole zone	Whole zone
b)	There should be no objectionable odours or discolouration of the water.	Not applicable	Whole zone	Not applicable	Not applicable	Not applicable
c)	Tarry residues, floating wood, articles made of glass, plastic, rubber or of any other substance should be absent.	Whole zone	Not applicable	Whole zone	Whole zone	Whole zone
d)	Mineral oil should not be visible on the surface. Surfactants should not give rise to a lasting foam.	Whole zone	Whole zone	Whole zone	Whole zone	Whole zone
e)	There should be no recognizable sewage-derived debris.	Whole zone	Whole zone	Whole zone	Whole zone	Whole zone
f)	Floating, submerged and semi-submerged objects of a size likely to interfere with the free movement of vessels, or cause damage to vessels, should be absent.	Whole zone	Whole zone	Whole zone	Whole zone	Whole zone
g)	Waste discharges shall / should not cause the water to contain substances which settle to form objectionable deposits.	Whole zone	Not applicable	Whole zone	Whole zone	Whole zone
h)	The water should not contain substances which settle to form objectionable deposits.	Not applicable	Whole zone	Not applicable	Not applicable	Not applicable
B	BACTERIA					
a)	The level of *Escherichia coli* should not exceed 610 per 100 mL, calculated as the geometric mean of all samples collected in a / one calendar year.	Secondary Contact Recreation Subzones and Fish Culture Subzones	Fish Culture Subzones	Secondary Contact Recreation Subzone & Fish Culture Zones	Secondary Contact Recreation Subzones	Secondary Contact Recreation Subzone & Fish Culture Zones
b)	The level of *Escherichia coli* should not exceed 180 per 100 mL, calculated as the geometric mean of all samples collected from March to October inclusive in one calendar year. Samples should be taken at least 3 times in a calendar month at intervals of between 3 and 14 days.	Not applicable	Not applicable	Bathing Beach Subzones	Not applicable	Not applicable
c)	The level of *Escherichia coli* should be zero / less than 1 per 100 mL, calculated as the running median / geometric mean of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days.	Not applicable	Water Gathering Ground Subzones	Not applicable	Not applicable	Water Gathering Ground Subzones

	Water Quality Objective	Junk Bay WCZ	Eastern Buffer WCZ	Southern WCZ	Second Southern Supplementary WCZ	Mirs Bay WCZ
d)	The level of *Escherichia coli* should not exceed 1000 per 100 mL, calculated as the geometric mean / running median of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days.	Inland waters	Other inland waters	Not applicable	Not applicable	Other inland waters
C	COLOR					
a)	Human activity should not cause the colour of water to exceed 30 Hazen units.	Not applicable	Water Gathering Ground Subzones	Not applicable	Not applicable	Not applicable
b)	Waste discharges shall not cause the colour of water to exceed 30 Hazen units.	Not applicable	Not applicable	Not applicable	Not applicable	Water Gathering Ground Subzones
c)	Human activity should not cause the colour of water to exceed 50 Hazen units.	Not applicable	Other inland waters	Not applicable	Not applicable	Not applicable
d)	Waste discharges shall not cause the colour of water to exceed 50 Hazen units	Inland waters	Not applicable	Not applicable	Not applicable	Other inland waters of the Zone
D	DISSOLVED OXYGEN					
a)	Waste discharges should / shall not cause the level of dissolved oxygen to fall below 4 mg per litre for 90% of the sampling occasions during the year; values should be calculated as the water column average (arithmetic mean of at least 3 measurements at 1 m below surface, mid-depth and 1 m above seabed). In addition, the concentration of dissolved oxygen should not be less than 2 mg per litre within 2 m of the seabed for 90% of the sampling occasions during the (whole) year.	Marine waters excepting Fish Culture Subzones	Not applicable	Marine waters excepting Fish Culture Subzones	Whole zone	Marine waters excepting Fish Culture Subzones
b)	The level of dissolved oxygen should not fall below 4 mg per litre for 90% of the sampling occasions during the whole year; values should be calculated as water column average (arithmetic mean of at least 3 measurements at 1 m below surface, mid-depth and 1 m above seabed). In addition, the concentration of dissolved oxygen should not be less than 2 mg per litre within 2 m of the seabed for 90% of the sampling occasions during the whole year.	Not applicable	Marine waters excepting Fish Culture Subzones	Not applicable	Not applicable	Not applicable
c)	The dissolved oxygen level should not be less than 5 mg per litre for 90% of the sampling occasions during the year; values	Fish Culture Subzones	Not applicable	Fish Culture Subzones	Not applicable	Fish Culture Subzones

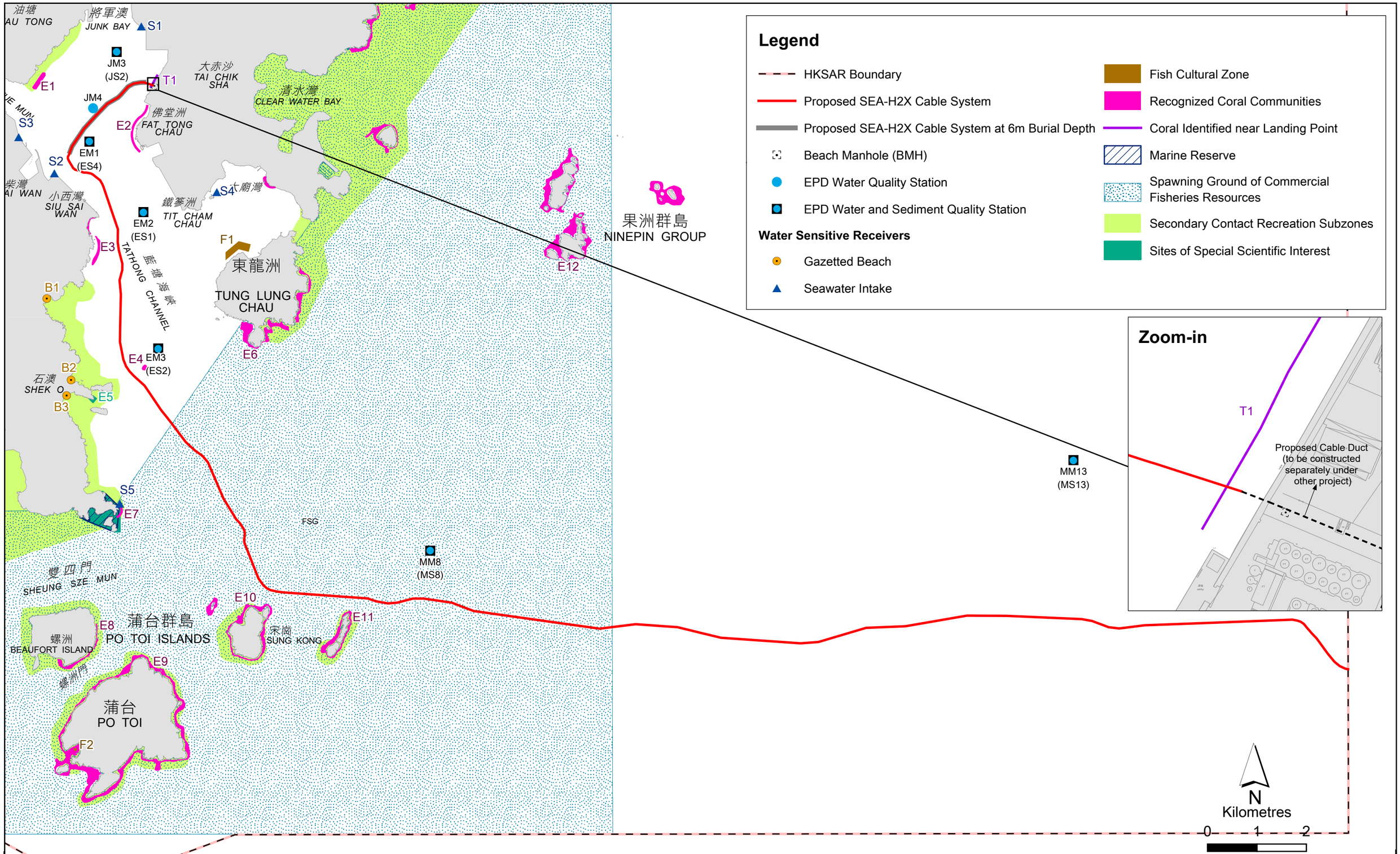

Figure A2

EPD Monitoring Stations and Water Sensitive Receivers

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	Water Quality Objective	Junk Bay WCZ	Eastern Buffer WCZ	Southern WCZ	Second Southern Supplementary WCZ	Mirs Bay WCZ
	should be calculated as water column average (arithmetic mean of at least 3 measurements at 1 m below surface, mid-depth and 1 m above seabed). In addition, the concentration of dissolved oxygen should not be less than 2 mg per litre within 2 m of the seabed for 90% of the sampling occasions during the year.					
d)	The level of dissolved oxygen should not be less than 5 mg per litre for 90% of the sampling occasions during the year; values should be calculated as water column average (arithmetic mean of at least 3 measurements at 1 m below surface, mid-depth and 1 m above seabed). In addition, the concentration of dissolved oxygen should not be less than 2 mg per litre within 2 m of the seabed for 90% of the sampling occasions during the whole year.	Not applicable	Fish Culture Subzones	Not applicable	Not applicable	Not applicable
e)	Waste discharges shall not cause the level of dissolved oxygen to be less than 4 mg per litre.	Inland waters	Not applicable	Inland waters of the Zone	Not applicable	Water Gathering Ground Subzones and Other inland waters
f)	The level of dissolved oxygen should not be less than 4 mg per litre.	Not applicable	Water Gathering Ground Subzones and other inland waters	Not applicable	Not applicable	Not applicable
E	pH					
a)	The pH of the water should be within the range of 6.5-8.5 units. In addition, waste discharges / human activities shall not cause the natural pH range to be extended by more than 0.2 units.	Marine waters	Marine waters	Marine waters excepting Bathing Beach Subzones; Mui Wo (A), Mui Wo (B), Miu Wo (C), Mui Wo (E) and Mui Wo (F) Subzones.	Not applicable	Marine waters
b)	Human activity / waste discharges should / shall not cause the pH of the water to exceed the range of 6.5-8.5 units.	Not applicable	Water Gathering Ground Subzones	Not applicable	Not applicable	Water Gathering Ground Subzones

	Water Quality Objective	Junk Bay WCZ	Eastern Buffer WCZ	Southern WCZ	Second Southern Supplementary WCZ	Mirs Bay WCZ
c)	Waste discharges should not cause the natural pH range of the water to be extended by more than 0.2 unit. In addition, the pH of the water should be in the range of 6.5–8.5 units.	Not applicable	Not applicable	Not applicable	Whole zone	Not applicable
d)	The pH of the water should be within the range of 6.0-9.0 units.	Inland waters	Not applicable	Mui Wo (D) Subzone and other inland waters.	Not applicable	Other inland waters of the Zone
e)	Human activity should not cause the pH of the water to exceed the range of 6.0-9.0 units.	Not applicable	Other inland waters	Not applicable	Not applicable	Not applicable
f)	The pH of the water should be within the range of 6.0–9.0 units for 95% of samples. In addition, waste discharges shall not cause the natural pH range to be extended by more than 0.5 units.	Not applicable	Not applicable	Bathing Beach Subzones	Not applicable	Not applicable
F	TEMPERATURE					
a)	Waste discharges / human activity should / shall not cause the natural daily temperature range to change by more than 2.0°C.	Whole zone	Whole zone	Whole zone	Whole zone	Whole zone
G	SALINITY					
a)	Waste discharges / human activity should / shall not cause the ambient salinity level to change by more than 10%.	Whole zone	Whole zone	Whole zone	Whole zone	Whole zone
H	SUSPENDED SOLIDS					
a)	Waste discharges / human activity shall / should neither cause the natural ambient level to be raised by 30% nor give rise to accumulation of suspended solids which may adversely affect aquatic communities.	Marine waters	Marine waters	Marine waters	Whole zone	Marine waters
b)	Waste discharges / human activity shall / should not cause the annual median of suspended solids to exceed 20 mg per litre.	Not applicable	Water Gathering Ground Subzones	Mui Wo (A), Mui Wo (B), Mui Wo (C), Mui Wo (E) and Mui Wo (F) Subzones.	Not applicable	Water Gathering Ground Subzones and Other inland waters of the Zone (E.R. 6 of 2019)
c)	Waste discharges / human activity shall not cause the annual median of suspended solids to exceed 25 mg per litre.	Inland waters	Other inland waters	Mui Wo (D) Subzone and other inland waters.	Not applicable	Not applicable
I	AMMONIA					
a)	The ammonia nitrogen level should not be more than 0.021 milligram per litre, calculated as the annual average (arithmetic mean), as unionised form.	Whole Zone	Not applicable	Whole zone	Whole zone	Not applicable

	Water Quality Objective	Junk Bay WCZ	Eastern Buffer WCZ	Southern WCZ	Second Southern Supplementary WCZ	Mirs Bay WCZ
b)	The un-ionized ammoniacal nitrogen level should not be more than 0.021 mg per litre, calculated as the annual average (arithmetic mean).	Not applicable	Whole zone	Not applicable	Not applicable	Whole zone
J	NUTRIENTS					
a)	Nutrients shall not be present in quantities sufficient to cause excessive or nuisance growth of algae or other aquatic plants.	Marine waters	Marine waters	Marine waters	Whole zone	Marine waters
b)	Without limiting the generality of objective (a) above, the level of inorganic nitrogen should not exceed 0.1 milligram per litre, expressed as annual water column average (arithmetic mean of at least 3 measurements at 1 metre below surface, mid-depth and 1 metre above seabed).	Not applicable	Not applicable	Marine waters	Whole zone	Not applicable
c)	Without limiting the generality of objective (a) above, the level of inorganic nitrogen should not exceed 0.3 mg per litre, expressed as annual water column average (arithmetic mean of at least 3 measurements at 1 m below surface, mid-depth and 1 m above seabed).	Marine waters	Not applicable	Not applicable	Not applicable	Marine waters
d)	Without limiting the generality of objective (a) above, the level of inorganic nitrogen should not exceed 0.4 mg per litre, expressed as annual water column average (arithmetic mean of at least 3 measurements at 1 m below surface, mid-depth and 1 m above seabed).	Not applicable	Marine waters	Not applicable	Not applicable	Not applicable
K	5-DAY BIOCHEMICAL OXYGEN DEMAND					
a)	Waste discharges shall not cause the 5-day biochemical oxygen demand to exceed 3 milligrams per litre.	Not applicable	Not applicable	Not applicable	Not applicable	Water Gathering Ground Subzones
b)	The 5-day biochemical oxygen demand should not exceed 3 mg per litre.	Not applicable	Water Gathering Ground Subzones	Not applicable	Not applicable	Not applicable
c)	Waste discharges shall not cause the 5-day biochemical oxygen demand to exceed 5 milligrams per litre.	Inland waters	Not applicable	Inland waters of the Zone	Not applicable	Other inland waters of the Zone
d)	The 5-day biochemical oxygen demand should not exceed 5 mg per litre.	Not applicable	Other inland waters	Not applicable	Not applicable	Not applicable
L	CHEMICAL OXYGEN DEMAND					
a)	Waste discharges shall not cause the chemical oxygen demand to exceed 15 milligrams per litre.	Not applicable	Not applicable	Not applicable	Not applicable	Water Gathering Ground Subzones

	Water Quality Objective	Junk Bay WCZ	Eastern Buffer WCZ	Southern WCZ	Second Southern Supplementary WCZ	Mirs Bay WCZ
b)	The chemical oxygen demand should not exceed 15 mg per litre.	Not applicable	Water Gathering Ground Subzones	Not applicable	Not applicable	Not applicable
c)	Waste discharges shall not cause the chemical oxygen demand to exceed 30 milligrams per litre.	Inland waters	Not applicable	Inland waters of the Zone	Not applicable	Other inland waters of the Zone
d)	The chemical oxygen demand should not exceed 30 mg per litre.	Not applicable	Other inland waters	Not applicable	Not applicable	Not applicable
M	DANGEROUS SUBSTANCES / TOXIC SUBSTANCES / TOXINS					
a)	Waste discharges shall not cause the concentrations of dangerous substances in marine waters to attain such levels as to produce significant toxic effects in humans, fish or any other aquatic organisms, with due regard to biologically cumulative effects in food chains and to toxicant interactions with each other.	Whole zone	Not applicable	Whole zone	Not applicable	Not applicable
b)	Toxic substances in the water should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms, with due regard to biologically cumulative effects in food chains and to interactions of toxic substances with each other.	Not applicable	Whole zone	Not applicable	Whole zone	Not applicable
c)	Waste discharges shall not cause the toxins in water to attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms, with due regard to biologically cumulative effects in food chains and to toxicant interactions with each other.	Not applicable	Not applicable	Not applicable	Not applicable	Whole Zone
d)	Waste discharges of dangerous substances shall not put a risk to any beneficial uses of the aquatic environment.	Whole zone	Not applicable	Whole zone	Not applicable	Not applicable
e)	Waste discharges / human activity should not cause a risk to any beneficial use of the aquatic environment.	Not applicable	Whole zone	Not applicable	Whole zone	Whole zone

Note:

Mui Wo (A) Subzone means all that area bounded by the river catchment boundary in the west, and by a line between a point north of Tseng Tau San Tsuen (22º 16'26"N, 113 º 59'02"E) and a point east of Lung Mei Hang (22º 16'16"N, 113º 59'05"E) in the east, which is delineated and marked MW(A) on the Map, and which includes the areas of Lin Fa Shan, Lung Mei Tsuen and Lung Mei Hang;

Mui Wo (B) Subzone means all that area bounded by the river catchment boundary in the south west, and by a line between a point south of Tseng Tau San Tsuen (22º 16'19"N, 113º 59'04"E) and Tsoi Yuen Tsuen (22º 16'12"N, 113º 59'13"E) in the east, which is delineated and marked MW(B) on the Map, and which includes the areas of Mui Wo Kau Tsuen, part of Tseng Tau San Tsuen and part of Tsoi Yuen Tsuen;

Mui Wo (C) Subzone means all that area bounded by the river catchment boundary in the south, and by a line between Tsoi Yuen Tsuen (22º 16'12"N, 113º 59'13"E) and a point east of Tai Tei Tong (22º 16'02"N, 113º 59'32"E), which is delineated and marked MW(C) on the Map, and which includes the areas of Luk Tei Tong and Lai Chi Yuen Tsuen;

Mui Wo (D) Subzone means all that area bounded by a line between a point west of Chung Hau (22º 16'14"N, 113º 59'31"E) and a point north of Lai Chi Yuen Tsuen (22º 15'34"N, 113o59'54"E) in the west, and by the river catchment boundary in the east, which is delineated and marked MW(D) on the Map, and which includes the areas of Chung Hau and the Water Treatment Works;

Mui Wo (E) Subzone means all that area bounded by a line between a point north of Tseng Tau San Tsuen (22º 16'26"N, 113º 59'02"E) and a point south of Tseng Tau San Tsuen (22º 16'19"N, 113º 59'04"E) in the west, and by a line between a point east of Pak Ngan Heung (22º16'19"N, 113º59'31"E) and a point east of Tai Tei Tong (22º16'02"N, 113º59'32"E) in the east, which is delineated and marked MW(E) on the Map, and which includes the areas of Tai Tei Tong, part of Tseng Tau San Tsuen and part of Tsoi Yuen Tsuen;

Mui Wo (F) Subzone means all that area bounded by the river catchment boundary in the north west and east, and by a line between a point east of Pak Ngan Heung (22º 16'19"N, 113º 59'31"E) and a point north of Lin Fa Shan (22º 16'32"N, 113º 58'00"E), which is delineated and marked MW(F) on the Map, and which includes the areas of Mong To Au, A Po Long, Wo Sheung Au, Wong Kung Tin, Wo Tin and Pak Ngan Heung;

A2.2 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.

A2.3 WSD Seawater Intakes

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

Table A2.2 WSD Water Quality Criteria 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).

A2.4 Applicable Criteria for Other Seawater Intakes

The following design basis for the first stage of the Tseung Kwan O Desalination Plant is deemed applicable for assessing the potential water quality impact from this Project.

Table A2.3 Water Quality Criteria for Tseung Kwan O Desalination Plant

Parameter	Design Basis Value
Temperature	15 to 30.1˚C
TSS	≤ 40 mg/L
Total Dissolved Solids (TDS)	≤ 39,000 mg/L
Bromide	≤ 80 mg/L
Boron	≤ 5.3 mg/L

For other seawater intakes, the WQO is deemed suitably protective of the corresponding beneficial uses. Specifically for suspended solids elevation, the WQO dictated suspended solids elevation because of project activities should not raise the natural ambient level by 30%.

A2.5 ProPECC PN 2/24

Apart from the above statutory requirements, the *Professional Persons Environmental Consultative Committee Practice Notes*, *Construction Site Drainage* (*ProPECC PN 2/24*), issued by EPD in 2024,

shall also be followed to prevent water pollution associated with construction activities. The applicable measures from *ProPECC PN 2/24* are listed in ***Section AA4.4***.

A3. DESCRIPTION OF THE ENVIRONMENT

A3.1 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.

A3.2 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 adopted from EPD's Marine Water Quality Monitoring Program 2019 to 2023, 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 23.7 mg/L at EM3. *E. coli* levels are also in compliance with the WQO at all stations between 2019 and 2023. The maximum *E. coli* level could be up to 997 cfu/100 m/L (at EM1).

A3.3 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, except for slight elevation above LCEL for copper at JS2. According to the sediment quality data at other water quality monitoring stations, the sediment in the vicinity of the proposed cable route was not highly contaminated based on the existing sediment classification guidelines.

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 (°C)	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)
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)
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)
Secchi Disc Depth (m)	2.8 (1.4 - 5.4)	2.9 (1.8 - 5.5)	2.9 (1.9 - 5.4)	2.9 (1.6 - 6.5)	3.1 (1.8 - 5.4)	3.6 (1.5 - 9.0)	3.9 (1.5 - 10.7)
Turbidity (NTU)	6.3 (0.2 - 53.5)	6.2 (0.3 - 63.8)	5.8 (0.2 - 50.6)	6.7 (0.2 - 115.4)	6.0 (0.4 - 56.9)	5.0 (0.6 - 18.8)	4.8 (0.8 - 18.5)
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)
5-day Biochemical Oxygen Demand (BOD5) ($mg\ L^{-1}$)	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)
Ammonia Nitrogen ($mg\ L^{-1}$)	0.054 (0.013 - 0.130)	0.052 (0.009 - 0.140)	0.057 (0.013 - 0.200)	0.046 (0.009 - 0.227)	0.034 (0.006 - 0.126)	0.017 (0.003 - 0.047)	0.017 (0.003 - 0.049)
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)
Nitrite Nitrogen ($mg\ L^{-1}$)	0.018 (0.002 - 0.052)	0.018 (0.001 - 0.055)	0.018 (0.001 - 0.058)	0.015 (0.001 - 0.052)	0.012 (0.001 - 0.044)	0.010 (0.001 - 0.045)	0.009 (0.001 - 0.037)
Nitrate Nitrogen ($mg\ L^{-1}$)	0.078 (0.001 - 0.287)	0.075 (0.001 - 0.263)	0.078 (0.001 - 0.297)	0.068 (0.001 - 0.283)	0.054 (0.001 - 0.247)	0.040 (0.001 - 0.207)	0.041 (0.001 - 0.198)
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)

WQ Parameter	Junk Bay		Chai Wan	Tathong Channel		Waglan Island	Mirs Bay (South)
Total Kjeldahl Nitrogen	0.39	0.41	0.40	0.40	0.38	0.39	0.39
(mg L^{-1})	(0.09 - 1.37)	(0.04 - 1.23)	(0.07 - 1.00)	(0.07 - 1.40)	(0.08 - 1.23)	(0.10 - 1.30)	(0.05 - 1.17)
Total Nitrogen	0.49	0.50	0.49	0.48	0.45	0.44	0.44
(mg L^{-1})	(0.12 - 1.41)	(0.08 - 1.28)	(0.13 - 1.13)	(0.16 - 1.46)	(0.15 - 1.25)	(0.10 - 1.32)	(0.09 - 1.26)
Orthophosphate Phosphorus	0.010	0.011	0.011	0.011	0.008	0.007	0.008
(mg L^{-1})	(0.001 - 0.022)	(0.001 - 0.024)	(0.001 - 0.036)	(0.001 - 0.035)	(0.001 - 0.028)	(0.001 - 0.028)	(0.001 - 0.028)
Total Phosphorus	0.05	0.05	0.05	0.05	0.04	0.04	0.04
(mg L^{-1})	(0.01 - 0.12)	(0.01 - 0.09)	(0.01 - 0.09)	(0.01 - 0.16)	(0.01 - 0.08)	(0.01 - 0.08)	(0.01 - 0.13)
Silica (as SiO_2)	0.69	0.69	0.72	0.67	0.61	0.51	0.46
(mg L^{-1})	(0.04 - 1.73)	(0.03 - 1.77)	(0.03 - 1.87)	(0.03 - 1.83)	(0.03 - 1.60)	(0.09 - 1.47)	(0.09 - 1.43)
Chlorophyll-a	3.7	3.2	3.2	2.9	2.7	2.3	1.8
(µg L^{-1})	(0.3 - 19.0)	(0.2 - 10.7)	(0.3 - 11.9)	(0.1 - 9.9)	(0.3 - 11.0)	(0.2 - 14.5)	(0.2 - 10.1)
Escherichia coli	35	47	63	40	8	1	1
(cfu 100mL^{-1})	(1 - 367)	(1 - 380)	(1 - 997)	(1 - 510)	(1 - 201)	(1 - 16)	(1 - 25)
Faecal Coliforms	98	103	134	85	18	1	1
(cfu 100mL^{-1})	(6 - 3527)	(2 - 1067)	(1 - 2267)	(3 - 1167)	(1 - 897)	(1 - 16)	(1 - 26)

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 of depth-averaged values (except for bottom dissolved oxygen).
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
Particle Size Fractionation <63µm (%w/w)	-	-	74 (2 - 98)	64 (24 - 95)	75 (10 - 98)	83 (52 - 97)	63 (3 - 96)	69 (40 - 96)
Electrochemical Potential (mV)	-	-	-133 (-265 - -93)	-133 (-220 - -85)	-161 (-243 - -103)	-122 (-187 - -54)	-118 (-241 - -73)	-114 (-255 - -36)
Total Solids (%w/w)	-	-	45 (39 - 73)	50 (42 - 61)	52 (42 - 73)	49 (35 - 63)	50 (44 - 65)	49 (35 - 60)
Total Volatile Solids (%TS)	-	-	6.8 (3.2 - 8.3)	6.9 (4.9 - 8.6)	6.2 (3.8 - 8.0)	6.9 (4.7 - 9.3)	6.4 (5.3 - 7.6)	6.3 (5.3 - 7.3)
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 Carbon (%w/w)	-	-	0.7 (0.6 - 0.9)	0.9 (0.7 - 1.2)	0.9 (0.5 - 2.5)	0.8 (0.6 - 1.0)	0.7 (0.5 - 1.3)	0.6 (0.5 - 0.9)
Ammonical Nitrogen (mg/kg)	-	-	4.93 (1.10 - 7.90)	5.49 (0.25 - 9.30)	9.31 (1.80 - 29.00)	5.18 (1.00 - 13.00)	2.63 (0.16 - 4.70)	2.46 (0.42 - 4.20)
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)
Total Phosphorus (mg kg^{-1})	-	-	191 (100 - 230)	208 (180 - 250)	189 (140 - 230)	206 (190 - 240)	219 (150 - 250)	231 (180 - 280)
Total Sulphide (mg kg^{-1})	-	-	14.4 (0.1 - 32.0)	22.5 (4.6 - 43.0)	25.5 (0.1 - 83.0)	23.6 (2.3 - 46.0)	20.0 (3.2 - 140.0)	11.4 (0.1 - 32.0)
Total Cyanide (mg kg^{-1})	-	-	0.1 (0.1 - 0.2)	0.1 (0.1 - 0.2)	0.1 (0.1 - 0.1)	0.1 (0.1 - 0.2)	0.1 (0.1 - 0.1)	0.1 (0.1 - 0.1)
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)
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)
Lead (mg kg^{-1})	75	110	49 (24 - 58)	34 (21 - 41)	35 (15 - 52)	42 (22 - 55)	35 (21 - 41)	34 (28 - 43)
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)

Parameter	LCEL	UCEL	Junk Bay	Chai Wan	Tathong Channel		Waglan Island	Mirs Bay (South)
			JS2	ES1	ES2	ES4	MS8	MS13
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)
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)
Total Polychlorinated Biphenyls (PCBs) (mg kg-1)	23	180	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 21)	18 (18 - 18)	18 (18 - 18)
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) (mg 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 (mg kg^{-1})	1,700	9,600	204 (54 - 353)	158 (39 - 281)	197 (18 - 704)	241 (43 - 562)	38 (19 - 99)	35 (22 - 65)

Note:

1. Data presented are five-year arithmetic means; data in brackets indicate ranges.
2. Data below the corresponding reporting limits are treated as 0.5X of the reporting limits.

A3.4 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);
- **Secondary Contact Recreation Subzone (SCR)**;
- **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); (1)
- **Coral Identified in Survey under this Project:** Dive survey transect near the landing point (T1); and
- **Sites of Special Scientific Interest (SSSI):** Shek O Headland SSSI (E5) and Cape D'Aguilar Marine Reserve (E7).

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	1,480
B2	Rocky Bay Beach (Also near to Shek O)	1,140
B3	Shek O Beach	1,340
S1	WSD Junk Bay Seawater Intake	1,130
S2	WSD Siu Sai Wan Flushing Water Intake	380
S3	Pamela Youde Nethersole Eastern Hospital Cooling Water Intake	1,070

(1) Note that this list of sites of high ecological importance is not exhaustive and is a selection of representative locations that is relatively closer to the cable alignment (with respect to other sites not taken into account) so they are relatively more likely to be affected.

ID	Water Sensitive Receivers	Approximate Geodesic Distance to Proposed Cable Alignment (m) [1][2]
S4	Tseung Kwan O Desalination Plant Seawater Intake	2,140
S5	Seawater Intake for the Swire Institute of Marine Science	1,830
F1	Tung Lung Chau FCZ	2,120
F2	Po Toi FCZ	4,990
FSG	Spawning Ground of Commercial Fisheries Resources	Immediate proximity
E1	Recognized coral communities at South West Junk Bay	1,250
E2	Recognized coral communities at Fat Tong Chau	440
E3	Recognized coral communities at Cape Collinson and Ngan Wan	350
E4	Recognized coral communities at Tai Long Pai	210
E5	Shek O Headland SSSI	810
E6	Recognized coral communities along Tung Lung Chau	2,160
E7	Cape D'Aguilar Marine Reserve/ SSSI	1,880
E8	Recognized coral communities along the coast of Beaufort Island	3,380
E9	Recognized coral communities along the coast of Po Toi Island	2,640
E10	Recognized coral communities along the coast of Sung Kong	290
E11	Recognized coral communities along the coast of Waglan Island	270
E12	Recognized coral communities along the coast of Ninepins	7,240
T1	Corals at dive survey transect near the landing point	Immediate proximity
SCR	Secondary contact recreation subzone	280

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.

A4. IMPACT ASSESSMENT

There will be no adverse 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 repairing work during operation have been assessed below.

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.

A4.1 Construction Phase

A4.1.1 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 4.8*** for details), while grapnels simply penetrate the sea bed and are therefore not expected to cause significant sediment plumes (i.e. limited suspended solids elevation around works area). It is therefore anticipated that PLGR/ RC will not cause significant water quality impacts.

A4.1.2 Cable Installation/ Operation at the Landing Site

As stated in ***main report Section 4.2.1***, land-based activities involve pulling and guiding the cable into an existing duct. At the landing point, the cable will be pulled through a duct (to be constructed by other company separately [(2)]) and be secured at the Beach Manhole (BMH). 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 AA4.4***.

A4.1.3 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***.

A4.1.3.1 Inshore Cable Installation Shore End Laying, Burial and Ocean Ground Bed Installation

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 referred to

(2) Corresponding press release available here: https://www.info.gov.hk/gia/general/202411/01/P2024110100244.htm. In case the construction for the cable landing ducts involves discharges (such as site runoff), WPCO license would be required and the corresponding licensee is required to follow the corresponding requirements and discharge limits. No adverse water quality impact from this interfacing project is therefore expected.

Figure 2.1a) to the target burial depth penetration. The section of cable burial will be conducted by diver(s) with hand-held jetting tool(s) and is about 200 m long. 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). One electrical earthing cable and anodes (called Ocean Ground Bed (OGB), acting as grounding) will be laid in this section, and generally laid along the cable system and to the same depth as the fibre-optic cables. Divers with hand jet 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.

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 identified at the diver survey transection 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.

A4.1.3.2 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.

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 barge (as referred to Figure 2.1a) slowly moves forward and the cable will be laid out correspondingly to the forwarding speed of the barges, with maximum speed at 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 disturbed area of the seabed will be limited to this width.

For cable installation through jetting, the cable and injector / jet sled tool are lowered to the seabed. The injector / jet sled fluidises a trench using high pressure water jets and the cable is immediately laid within the trench. The sides of the trench slip around the cable, 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 / jet sled is 0.5 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 2.08 km of the 35.1 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 operation, 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 / jet sled.

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.

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 operation, 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 [3][4][5][6][7][8].

Similar projects including those listed at the start of this ***Section AA4.1.3.2*** 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

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

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

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

(6) 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.

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

(8) 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.

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/ jet sled. 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.

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} [(9)]. 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 [(10)].

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.

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

(10) 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.

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.

Table A4.1 shows that all identified WSRs, with the exception of the Spawning Ground of Commercial Fisheries Resources (FSG), are located beyond the above predicted distance of 180 m.

The Spawning Ground of Commercial Fisheries Resources cover a large swath of water (11). It would potentially be impacted by the predicted SS elevation by the cable installation under this Project, which passes through the Spawning Ground of Commercial Fisheries Resources. Given the relatively localised area (12) 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 during any one moment of the marine installation. As such, no adverse water quality impact on these WSRs is expected.

(11) The total area of Spawning Ground of Commercial Fisheries Resources is up to 477 sq. km.

(12) 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.

Table A4.1 Evaluation of Impacts with respect to the Extension of the Construction Phase 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	1,480	No	No	Sediment would not reach WSR.
B2	Rocky Bay Beach	1,140	No	No	Sediment would not reach WSR.
B3	Shek O Beach	1,340	No	No	Sediment would not reach WSR.
S1	WSD Junk Bay Seawater Intake	1,130	No	No	Sediment would not reach WSR.
S2	WSD Siu Sai Wan Flushing Water Intake	380	No	No	Sediment would not reach WSR.
S3	Pamela Youde Nethersole Eastern Hospital Cooling Water Intake	1,070	No	No	Sediment would not reach WSR.
S4	Tseung Kwan O Desalination Plant Seawater Intake	2,140	No	No	Sediment would not reach WSR.
S5	Seawater Intake for the Swire Institute of Marine Science	1,830	No	No	Sediment would not reach WSR.
F1	Tung Lung Chau FCZ	2,120	No	No	Sediment would not reach WSR.
F2	Po Toi FCZ	4,990	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	1,250	No	No	Sediment would not reach WSR.
E2	Recognized coral communities at Fat Tong Chau	440	No	No	Sediment would not reach WSR.
E3	Recognized coral communities at Cape Collinson and Ngan Wan	350	No	No	Sediment would not reach WSR.
E4	Recognized coral communities at Tai Long Pai	210	No	No	Sediment would not reach WSR.
E5	Shek O Headland SSSI	810	No	No	Sediment would not reach WSR.
E6	Recognized coral communities along Tung Lung Chau	2,160	No	No	Sediment would not reach WSR.
E7	Cape D'Aguilar Marine Reserve / SSSI	1,880	No	No	Sediment would not reach WSR.
E8	Recognized coral communities along the coast of Beaufort Island	3,380	No	No	Sediment would not reach WSR.
E9	Recognized coral communities along the coast of Po Toi Island	2,640	No	No	Sediment would not reach WSR.
E10	Recognized coral communities along the coast of Sung Kong	290	No	No	Sediment would not reach WSR.
E11	Recognized coral communities along the coast of Waglan Island	270	No	No	Sediment would not reach WSR.
E12	Recognized coral communities along the coast of Ninepins	7,240	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 at dive survey transect 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.
SCR	Secondary contact recreation subzone	280	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 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.

Overall, it is anticipated that the cable installation works will not cause 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.

A4.2 Operation Phase

A4.2.1 Submarine Cable Operation

Under normal condition, the operation of the installed submarine cable system would not cause adverse impact in water quality.

It should be noted that in case submarine cable 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. 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 4.8***) 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 repairing works. No unacceptable water quality impact to the identified WSRs is expected from the potential cable repairing works.

In case of land-based maintenance works, earthworks and civil works would not be required as welland thus no adverse water quality impact would be anticipated as well.

A4.3 Cumulative Impacts

Three projects, namely the Hong Kong – Guam Submarine Cable Project (HK-G), the Hong Kong Offshore Wind Farm in Southeastern Waters and the Sihanoukville – Hong Kong (SHV-HK) Submarine Cable System are planned in the vicinity of the proposed SEA-H2X Cable system, yet none of them are anticipated to be constructed concurrently with the Project. The Project Proponent will keep track of any updates of the HK-G cables and SHV-HK cable, and liaise with the HK-G and SHV-HK project team to avoid overlapping of the construction activities of HK-G Cable and SHV-HK Cable system with the SEA-H2X cable system. As such, cumulative water quality impacts are not anticipated.

According to the project website of the Tseung Kwan O Desalination Plant [13], the first stage of Desalination Plant has already commenced its operation in 2024 Q3. For the second stage, only land-based construction works would be required. Therefore, no marine construction from this project is anticipated. Also, according to the approved EIA of this project, the mixing zone for reverse osmosis reject discharge would only be localized at around its submarine outfall. As such, no cumulative water quality impact from the construction and operation of the Tseung Kwan O Desalination Plant is anticipated.

A4.4 Mitigation Measures

A4.4.1 Land Cable Works

Land-based activities under this Project at the Tseung Kwan O landing point involve pulling and guiding the cable 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

(13) Available at: https://www.tkodesal.hk/eng/Major_Activities

project. The pulling of cable by winches will not involve 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 PN2/24*) 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
  - 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.

A4.4.2 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,
  - hand jetting tools 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:

- 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}).
- 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 water quality 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 would be carried out, as further detailed in ***Appendix F***. In case any Limit Levels are exceeded, cable installation/ repairing 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.

A4.4.3 Cable Operation (After Installation), including Maintenance

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

- For maintenance/repairing works located in the land cable area, measures outlined in ***Section AA4.4.1*** would generally apply;
- For maintenance/repairing works for submarine cable system, measures outlined in ***Section AA4.4.2*** would generally apply.

A5. 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.

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 operation, will settle onto the seabed within approximately 180 m from the cable alignment. WSRs have been identified near the cable alignment. Two (WSR FSG and WSR T1) 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. 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 adverse impacts to water quality at WSRs. For protection of WSR T1 which is at the immediate proximity of the cable landing location, cable installation within 200 m from the BMH at Tseung Kwan O would be conducted using jet probe by divers with minimal sediment disturbance . As such, no adverse water quality impact on WSR T1 would be expected as well.

Overall, no adverse water quality impact would arise from the Project.

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 South-East Asia Hainan-Hong Kong Express Submarine Cable System ("SEA-H2X 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 810 m from the closest cable segment, and Cape D'Aguilar SSSI and Ninepin Group SSSI are situated about 1,880 m and 7,270 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 about 1,880 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

The nearest Green Belt zone from the closest cable segment is situated along Hong Kong Island locating approximately 290 m from the Project. While the site is designated as Green Belt, 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 430 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 270 m.

Part of these designated CPAs are located on land, and therefore it is anticipated that no unacceptable impacts would occur to the land portions of 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 about 510 m to the south of the proposed cable landing point at Tseung Kwan O Industrial Estate (TKOIE). The proposed cable segment is located ~1,140 m and ~1,340 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 [5]. 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 [6]. 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 [7]. 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)

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

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

(7) 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}) [8]. 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* [9]. 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.

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

(9) 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 [10] [11] [12] [13] [14] [15] [16] [17]. 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 to provide updated information on the status of subtidal hard bottom habitats in the vicinity of the proposed cable alignment and at the

(10) 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)

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

(12) 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.

(13) 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)

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

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

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

(17) 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)

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 in ***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

Taxon abundance (0-5)	C1	C2	C3	C4
Tunicates	0	0	0	0
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

Legend

- Proposed SEA-H2X Cable System
- Beach Manhole (BMH)
- Subtidal Coral Survey Dive Extent
- Coral Communities of High Ecological Value

Zoom-in

Proposed Cable Duct (to be constructed separately under other project)

大赤沙 TAI CHIK SHA
將軍澳創新園 Tseung Kwan O INNOPARK
岩下塘 NGAM HA TONG
蝦山篤 HA SHAN TUK
佛堂洲 FAT TONG CHAU
堆填區 Landfill
大王公 TAI WONG KUNG
田下山 TIN HA SHAN
田下坳 TIN HA AU
地堂咀 TEI TONG TSUI
佛堂澳 FAT TONG O
大廟坳 TAI MIU AU
大廟灣 JOSS HOUSE BAY (TAI MIU WAN)
觀仔 KWUN TSAI
鐵箏洲 TIT CHAM CHAU
藍塘海峽 TATHONG CHANNEL
小西灣 SIU SAI WAN
銀灣 NGAN WAN
砵甸乍山 POTTINGER PEAK
黑角頭 Cape Collinson (Hak Kok Tau)
草堆灣 TSO TUI WAN
大浪灣 BIG WAVE BAY
雲枕山 WAN CHAM SHAN
觀音山 KWUN YAM SHAN
石澳 SHEK O
石澳灣 SHEK O WAN
大頭洲 TAI TAU CHAU
香島灣 ISLAND BAY
五分洲 NG FAN CHAU
鶴咀半島 D'AGUILAR PENINSULA
鶴咀山 D'AGUILAR PEAK (HOK TSUI SHAN)
大風坳 WINDY GAP
東龍洲 TUNG LUNG CHAU
南堂尾 Tathong Point (Nam Tong Mei)
牙鷹排 NGA YING PAI
鹿頭灣 LUK KENG WAN
石涌角 Shek Chung Kok
大浪排 Tai Long Pai
雙四門 SHEUNG SZE MUN
狗脾洲 KAU PEI CHAU

Metres
0 500 1,000

Figure B1

Locations of Marine Ecological Survey

ERM

File: T:\GIS\CONTRACT\SEA-H2X_Temp\mxd\Marine_Ecology.mxd
Date: 7/11/2024

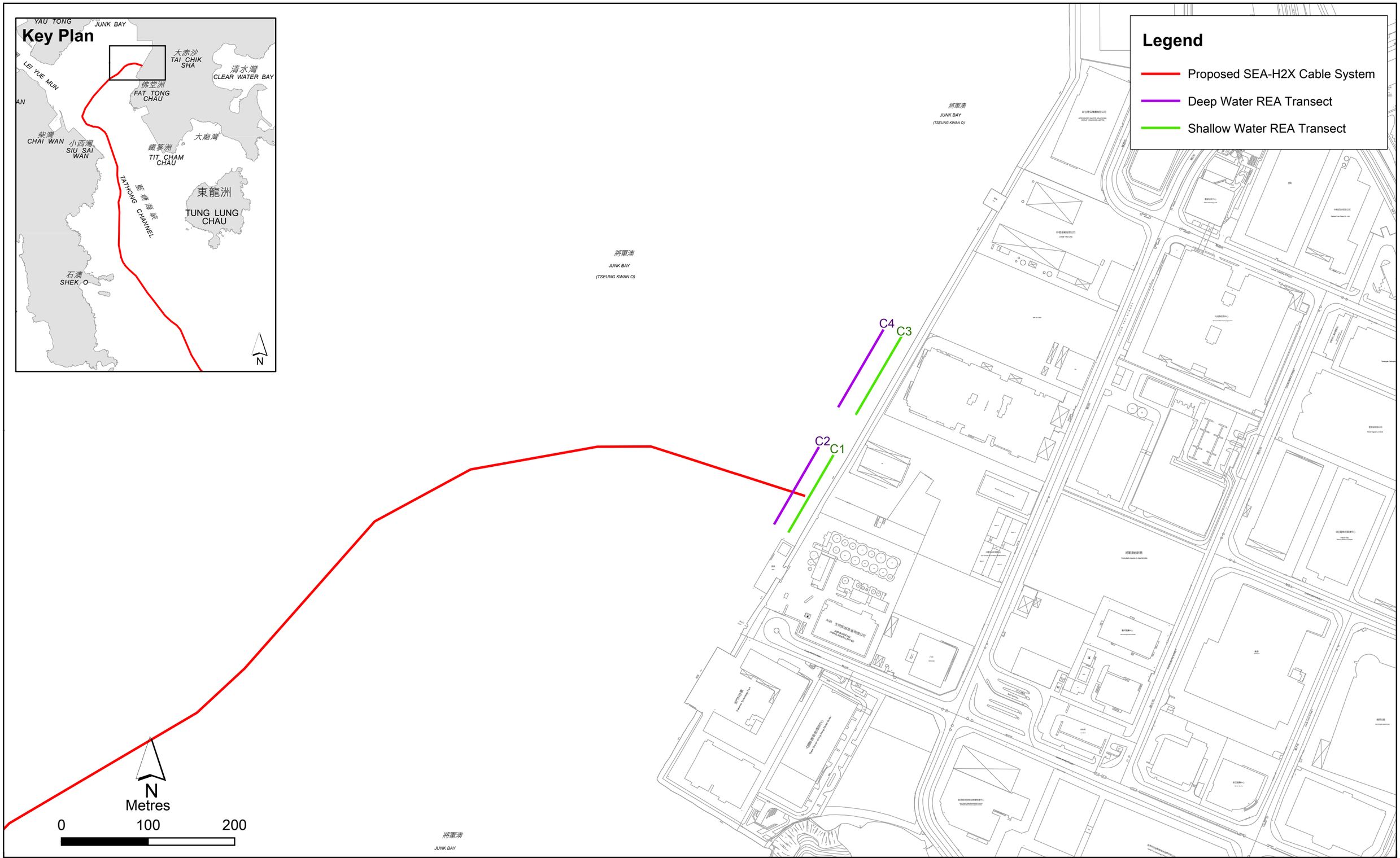


Figure B2

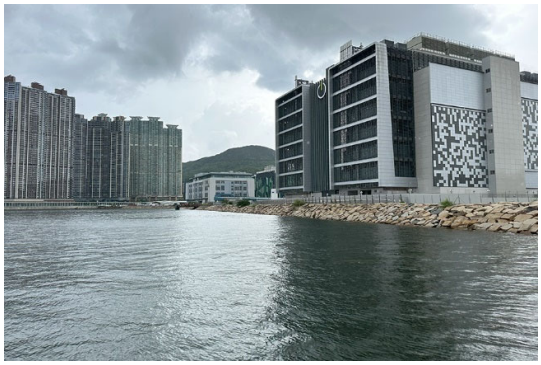
Dive Survey Locations at Junk Bay, Tseung Kwan O (TKO)

File: T:\GIS\CONTRACT\SEA-H2X_Temp\mxd\Dive_Survey_Locations_at_TKO.mxd
Date: 6/11/2024

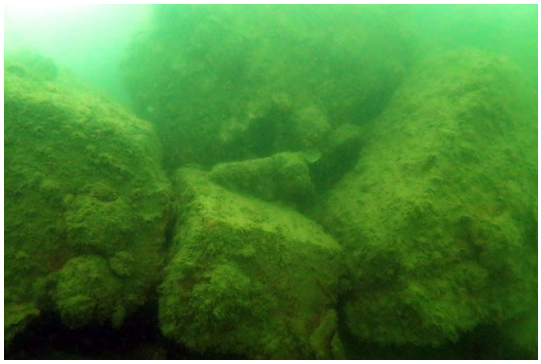
Figure B3 Photos of the Conditions and Representative Taxa at the Survey Locations



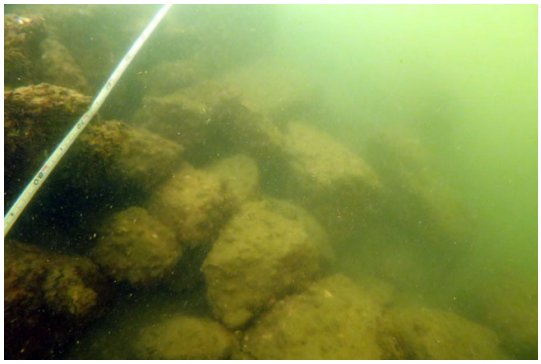
Survey Location C1 & C2



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 [(18)]. 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 [(19)]. 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 [(20)].

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.

(18) Hong Kong Cetacean Research Project (2022). Final Report for Monitoring of Marine Mammals in Hong Kong Waters (2021-22) (Contract Ref.: AFCD/SQ/260/20/C). Report submitted to the Agriculture, Fisheries and Conservation Department.

(19) Hong Kong Cetacean Research Project (2022). *Op. cit.* . (Contract Ref.: AFCD/SQ/260/20/C)

(20) Hong Kong Cetacean Research Project (2022). *Op. cit.* . (Contract Ref.: AFCD/SQ/260/20/C)

4. IMPACT ASSESSMENT

4.1 Impacts on Sites of Special Scientific Interest

Shek O Headland SSSI and Cape D'Aguilar SSSI are located approximately 810 m and 1,880 m from the closest cable segment, 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 operation, 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 six (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***, including the use of hand-held jetting tools with limited dispersion of suspended sediment, the indirect impacts to these coral colonies are not expected to be significant. Coral communities of moderate/ high ecological value at Cape Collinson, Ngan Wan, Southwest Junk Bay, Sung Kong, Waglan islands, Ninepins, Fat Tong Chau, Tai Long Pai and Tung Lung Chau, given the proposed cable alignment is located beyond the distance suspended sediments generated by the construction of the Project are expected to travel these areas i.e. at least 200 m from the alignment, indirect impact to these coral communities is not expected. 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 the short term nature of the cable laying works, mitigation measures presented in ***Section 5.1***, and that these corals are over the maximum distance of transport for suspended sediments (i.e. 180 m) and at a different depth. 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 [21]. 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 operation for submarine cable laying works will take approximately 90 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 Inshore Cable Installation Shore End Laying, Burial and Ocean Ground Bed Installation and Remaining / offshore Submarine Cable Main Installation Seaward

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 / jet sled 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 / jet sled is 0.5 m for most of the route and 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 the northern part of Siu Sai Wan and a small part 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-

(21) 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

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 repairing) 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***, including inshore cable installation works would be conducted by diver using hand jetting tools and minor adjustment in the cable alignment by divers in case corals are encountered near the landing site at TKO, direct impact to the coral communities in the vicinity of the proposed cable alignment near TKO is not anticipated. 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 [22] [23], 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. As discussed above, there will be no underwater noise impact,

4.3 Cumulative Impacts

As discussed in ***Section 2.3 of main report***, the construction of Hong Kong – Guam Submarine Cable Project (HK-G) and the SHV-HK cable project may be conducted concurrently with the Project. The Project Proponent will keep track of any updates of the HK-G cables and SHV-HK cable, and liaise with the HK-G and SHV-HK project team to avoid overlapping of the construction activities of HK-G Cable and SHV-HK Cable system with the SEA-H2X cable system. As such, cumulative marine ecological impacts are not anticipated.

(22) 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.

(23) 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.

4.4 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 inshore 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 200 m away from marine sensitive receivers and short-term nature (i.e. approximately 90 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 six (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***, such as the use of hand-held jetting tools with limited dispersion of suspended sediment, 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 Cape Collinson, Ngan Wan, Southwest Junk Bay, Sung Kong, Waglan islands, Ninepins, Fat Tong Chau, Tai Long Pai and Tung Lung Chau are located at least 200 m from the alignment which is over the distance suspended sediments generated by 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. 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 35.1 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 90 days (including contingency and buffer).
- *Reversibility*: Direct impacts to soft bottom marine communities are expected to be short-term and re-colonisation of the sediments is expected to occur shortly. Indirect impact to hard bottom marine communities 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 not 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 CPAs along the northern coast of Siu Sai Wan and small part of Tai Tau Chau near Shek O. The distances between the alignment and the CPAs have been optimised as much as possible. The SEA-H2X 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. Inshore cable installation works would be conducted by diver using hand-held jetting tools.
- Divers will manually install cable at inshore section to avoid direct impact and minimize indirect impact to the identified coral communities.
- 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 90 days, including contingency and buffer), 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 repairing 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 moderate/ high ecological value identified are located at least 200 m away from the alignment which is outside the dispersal range of suspended sediment due to the Project construction. Inshore cable installation works would be conducted by diver using hand-held jetting tools. Divers will also manually install cable at inshore section to avoid direct impact and minimize indirect impact to the identified coral communities. 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. 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 90 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. Inshore cable installation works would be conducted by diver using hand-held jetting tools. Divers will also manually install cable at inshore section to avoid direct impact and minimize indirect impact to the identified coral communities. 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/ repairing 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

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Figure C5 Geographical Distribution of Fisheries Production (Fish Fry) near the Project in 2006

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 South-East Asia Hainan-Hong Kong Express (SEA-H2X) Submarine Cable System ("SEA-H2X 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 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.

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 ranking 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 ranking 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 ~2.1 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.

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 SEA-H2X cable system. The site of artificial reef deployment located closest to the proposed SEA-H2X 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 ~2.1 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

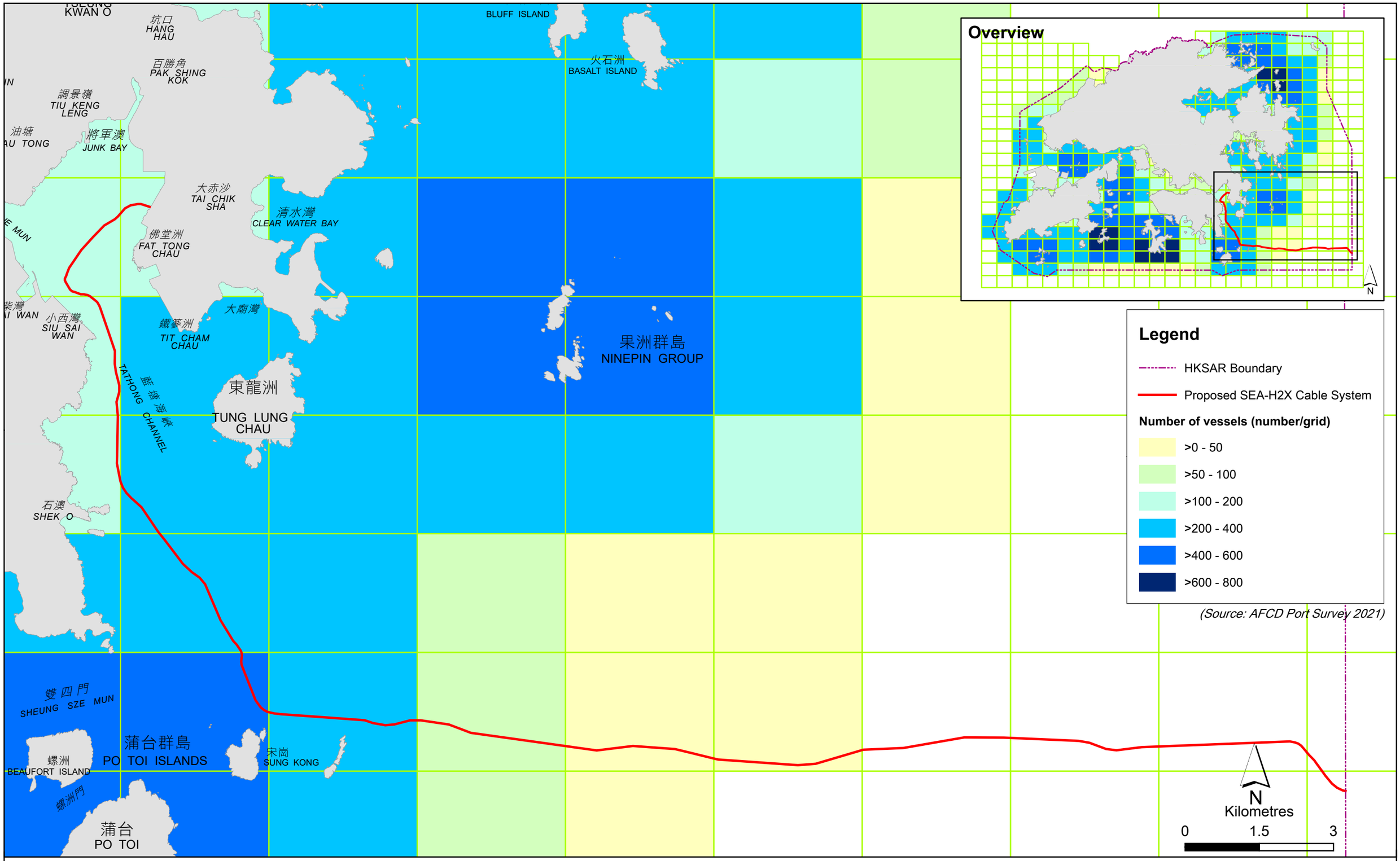

Figure C1

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

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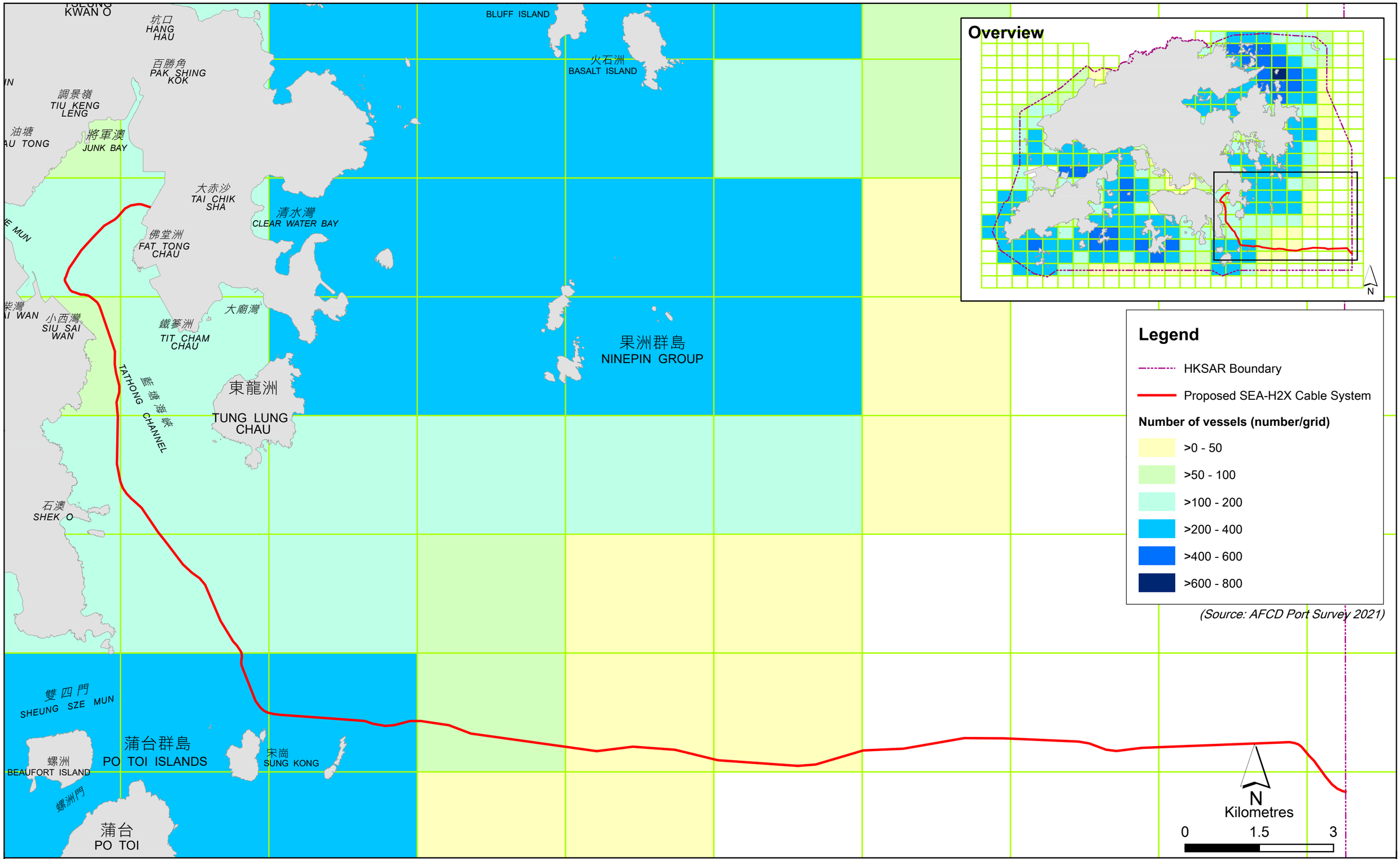

Figure C2

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

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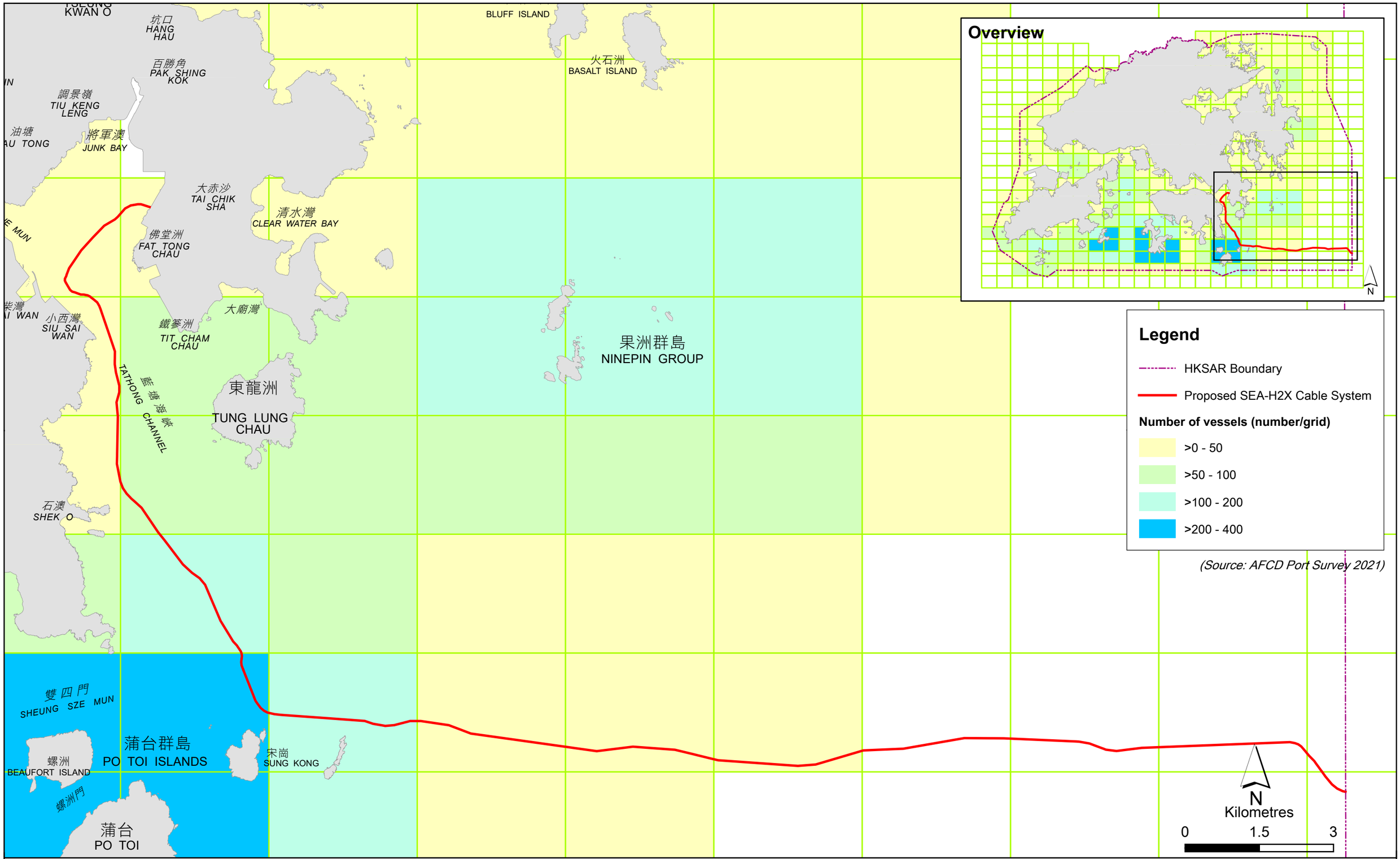

Figure C3

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

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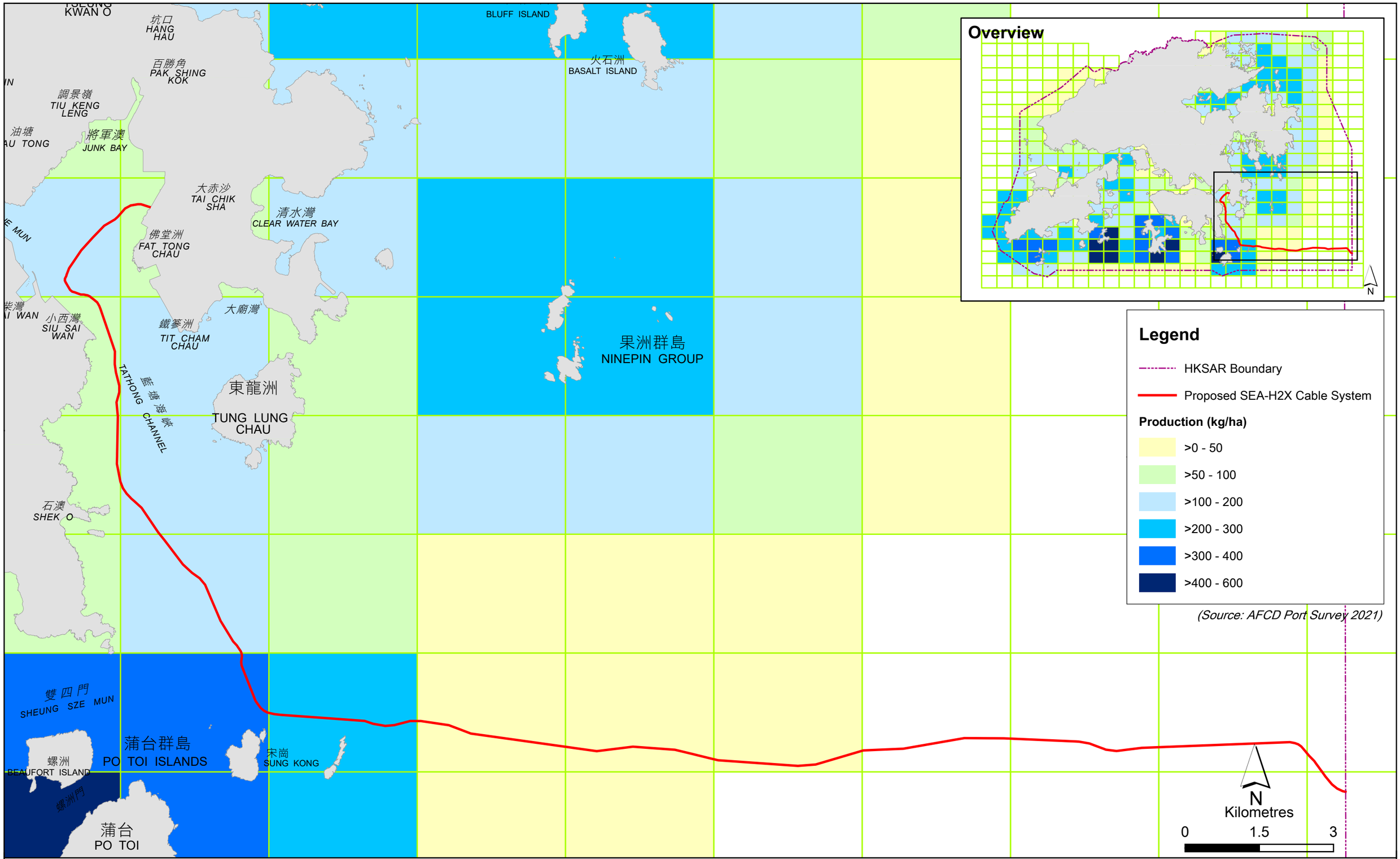

Figure C4

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

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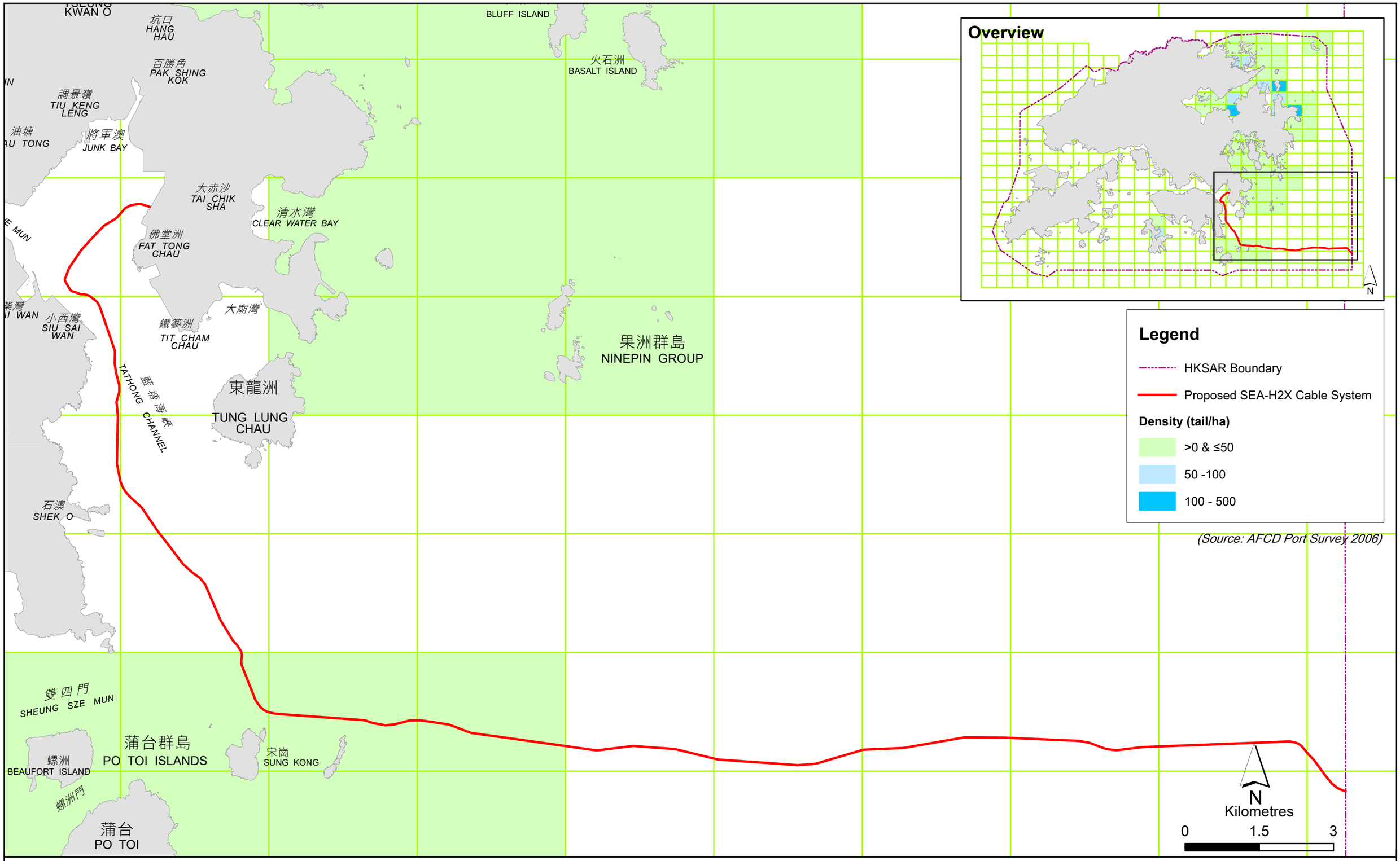

Figure C5

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

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4. IMPACT ASSESSMENT

4.1 Direct Impacts

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 dwelling fisheries resources and the habitat will continue serve as spawning ground of commercial fisheries resources. In addition, minor interruptions to fishing operations are expected to occur within the temporary works area only during the cable installation and potential repairing of the proposed Project. These disruptions are, however, expected to be minimal as the duration of time required for cable installation/ repairing works will be short (i.e. approximately 90 days (including contingency and buffer) for cable laying and duration of any cable 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 outside the temporary works area. 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 ground of commercial fisheries resources 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 temporary 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 Indirect Impacts

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. 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***). In addition, the submarine cable laying works will last approximately 90 days (including contingency and buffer), with any repairing works considered to take less time. Cable laying and burial, and associated grounding installation as well as route clearance (RC) and pre-lay grapnel run (PLGR), and any repairing work during operation, are thus not predicted to cause unacceptable impacts to water quality and consequently unacceptable impacts to fisheries sensitive receivers will not occur.

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/ 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 35.1 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 to moderate level of fisheries resources/ production, with the waters to the northeast of Po Toi Island and to the north of Sung Kong supported moderate level of fisheries resources/ production. During the construction phase, considering that the construction scale is relatively minor and the construction duration is short (90 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 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 90 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 90 days (including contingency and buffer), with any 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 ~2.1 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

As no unacceptable impacts to fisheries are expected to occur, no mitigation measures specific to fisheries are required.

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

A review of existing information on fisheries in the vicinity of the proposed cable corridor has identified the majority of the area as supporting low to moderate 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 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.

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***. Approval from EPD and other relevant authorities should be sought before action.

APPENDIX D REVIEW OF POTENTIAL NOISE IMPACTS

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Annex D1 Construction Noise Impact Assessment

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 during 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, Construction Noise Permit(s) (CNP) will be applied for.

Under the *EIAO*, noise impact arising from general construction works during non-restricted hours at opened windows for ventilation 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 30 working days;

- **Submarine cable main installation seaward (>9 m water depth)** – After PLGR and RC, 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

- **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 200 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.

- **Post-Lay Inspection and Burial (PLIB)** – PLIB will be carried out by means of driver operated water jetting. The hand jetting will be conducted underwater. Considering that no noisy PME will be utilised above water, no unacceptable construction noise impact is anticipated from the inshore works. The construction activities for PLIB will take approximately 40 days

The overall construction would take 90 working days, including contingency and buffer.

4.2 Operation Phase

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, repairing operation will be required. As described in ***Section 4.10 of main report***, remotely operated vehicles (ROVs) equipped with injector tool / jet sled tools, 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.

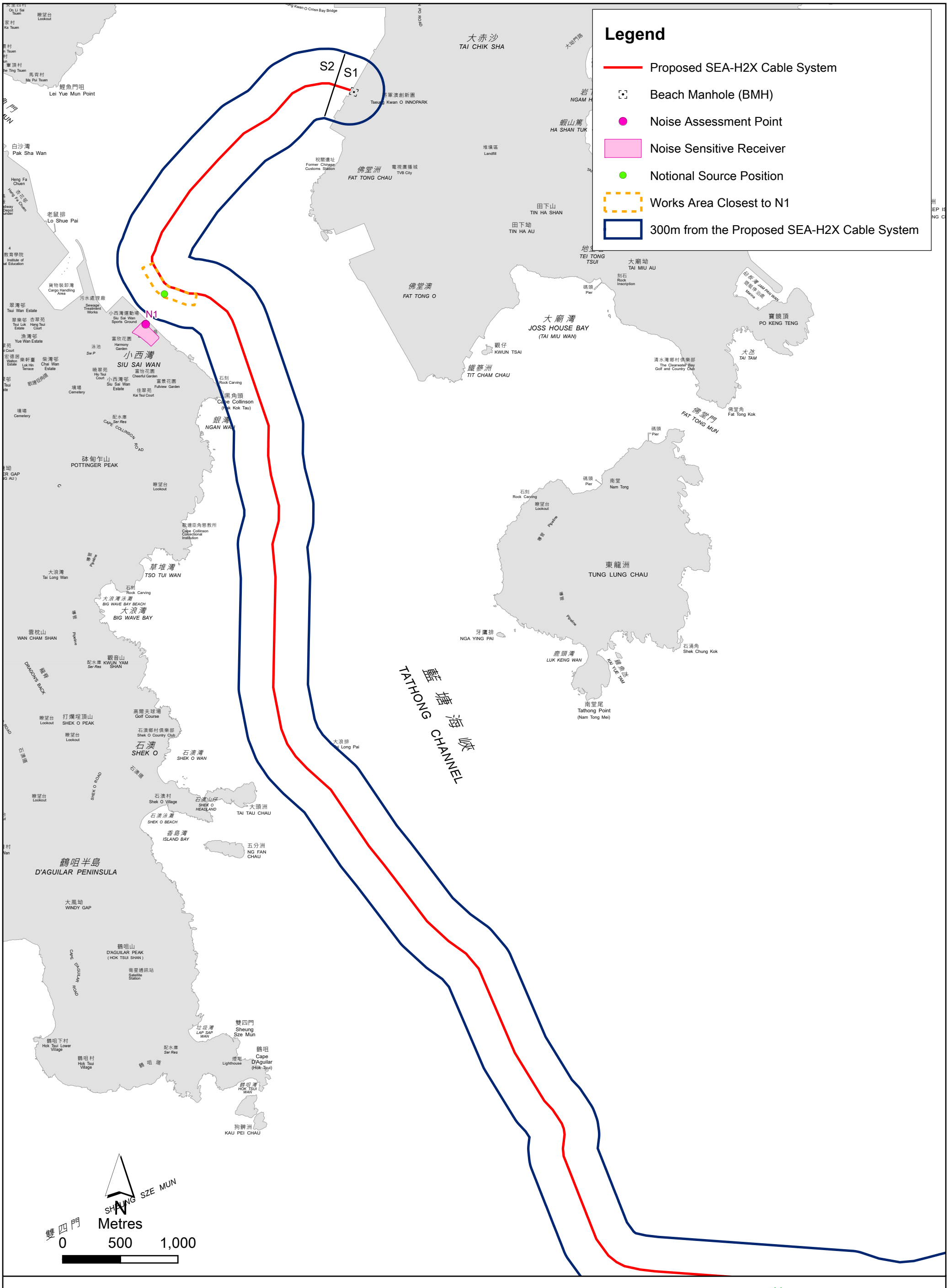

Figure D1

Noise Sensitive Receiver and Noise Assessment Point

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Date: 11/11/2024

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***.

No NSRs have been identified within the 300m Study Area of the proposed cable alignment. Nevertheless, the first layer of NSRs having direct line of sight towards the cable alignment have been included in the assessment. One is identified in Siu San Wan, i.e. Island Resort. 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 and 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 30 days and 55 days, respectively, only. Therefore, the duration of the construction activities at the part of the works area located closest to NSR N1, of which NSR 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)

NSR	Representative NAP	Type of Use	Shortest Horizontal Distance from Notional Source Position, m
Island Resort	Block 9, Island Resort (N1)	Residential	307



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

A 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	49	75	Yes
Submarine cable main installation seaward			
N1	49	75	Yes

The predicted construction noise level at N1 is 49 dB(A), and complies with the noise criterion. Noise mitigation measures are not required.

7. CONCLUSION

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. 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. Approval from EPD and other relevant authorities should be sought before action.

Cable installation at present is not expected to take place during restricted hours. If restricted hours works are later found to be necessary, Construction Noise Permit(s) (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 9, Island Resort	843889	814249
Nearest Notional Source Position (NSP):		
PLGR & RC, and submarine cable main installation seaward	844051	814510

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	307	0	-57.8	3	0	49	49	**75**	**Yes**
Submarine cable main installation seaward												
Barge	CNP 061	1	104	307	0	-57.8	3	0	49	49	**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 MARINE ARCHAEOLOGICAL INVESTIGATION

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1. INTRODUCTION

This **Appendix** presents the marine archaeological investigation as part of the cultural heritage impact assessment of the environmental assessments associated with the installation of the Hong Kong section of the proposed South-East Asia Hainan-Hong Kong Express (SEA-H2X) Submarine Cable System ("SEA-H2X cable 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 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 Heritage Sites

Desktop review identified two declared monuments within 500 m area from the proposed SEA-H2X Cable system as shown in ***Figure E4.1***. They are namely, the Rock Carving at Cape Collinson (declared monument) and Fat Tau Chau (declared monument), located 312 m and 318 m respectively from the proposed cable system.

4.2 Marine Archaeological Resources

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

Table E4.1 UKHO Wrecks in the Geophysical Survey Area of the Project

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'.625 N 114 17'.727 E [1]	137
62014	None.	Live	22 13'.406 N 114 16'.379 E	95

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 value. See ***Annex E1*** for details.

Wreck No. 62014 is also reported as 'live' i.e. still existing. But no description is available about the wreck. 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 E4.1*** shows the area

[1] According to the marine data portal updated in Oct 2024, the coordinates of this wreck has been updated.

Legend

- HKSAR Boundary
- Proposed SEA-H2X Cable System
- Geophysical Survey Area for this Projetct
- 500m Area from the Proposed Cable System
- MAI Assessment Area for this Project
- Active Cable
- HKE GAS Pipeline
- Sonar Contacts
- Magnetic Contacts
- Seismic Contacts
- UKHO Wreck Data

Previous MAI Survey Areas

- AEIAR-140/2009 Geophysical Survey Area
- DIR-213/2011 Geophysical Survey Area (Indicative)
- DIR-233/2013 Geophysical Survey Area
- DIR-243/2015 Geophysical Survey Area
- DIR-244/2016 Geophysical Survey Area
- DIR-244/2016 Dive Survey Area
- DIR-254/2017 MAI Study Area
- DIR-255/2017 Geophysical Survey Area
- DIR-265/2018 Geophysical Survey Area
- DIR-266/2019 Geophysical Survey Area
- DIR-268/2019 Geophysical Survey Area
- DIR-268/2019 Dive Survey Locations
- DIR-269/2019 Geophysical Survey Area
- DIR-285/2021 Geophysical Survey Area

Graded 3 Historic Sites/Buildings/Structures

- Cape Collinson Lighthouse

Declared Monument

- Rock Carving at Cape Collinson
- Site of Chinese Customs Station, Fat Tau Chau

Site of Archaeological Interest

- Fat Tau Chau Site of Archaeological Interest
- Fat Tau Chau Qing Dynasty Gravestone

Figure E4.1

Heritage Sites, UKHO Wreck, Sonar Contact, Magnet Contact and Seismic Contact within and in the Vicinity of the MAI Assessment Area

ERM

File: T:\GIS\CONTRACT\0754048\mxd\0754048_SC_SEC_MC.mxd
Date: 21/1/2025

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 north of this 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 across 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 southwest end of the TKOIE to the marine area off Siu Sai Wan runs parallel and south of this 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-266/2019 (PP-579/2019) Hong Kong – Guam Submarine Cable Project (HK-G)	The section of cable route from the marine area off TKOIE to the marine area off Siu Sai Wan is similar and running to the east of this Project. The section for marine area off Siu Sai Wan towards south off northeast of Ng Fan Chau runs parallel and to the west of this Project. The section from northeast of Ng Fan Chau to north of Sung Kong runs to the east and parallel to this Project. The MAI Study Area was a 50m corridor of the cable alignment. Geophysical survey for the Project and previous geophysical survey data were reviewed for 100% coverage of the route. The MAI concluded that there is no evidence for marine archaeological resources in 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 TKOIE and Siu Sai Wan is similar to this 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 and to the north of this 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 No. (Project Profile No.) / Approved Environmental Impact Assessment (EIA) Report Register No.	Summary of Previous Marine Archaeological Assessment/Survey Findings/Results
DIR-244/2016 (PP-533/2016) Asia-Africa-Europe-1 (AAE-1) Cable System	The section of cable route from north of Sung Kong to middle section of the cable is similar to this 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-243/2015 (PP-532/2015) Tseung Kwan O Express - Cable System	The section of cable route at the marine area between TKOIE and Siu Sai Wan is similar to this 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 marine area off TKOIE to north of Sung Kong is similar to this 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 this 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 E4.1***.
AEIAR-140/2009 Hong Kong Offshore Wind Farm in Southeastern Waters EIA Report	The section of the cable off TKOIE runs across this Project. 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 E4.1***). The surveyed area overlapped with the geophysical survey area for this current Project identified no marine archaeological interest.

The proposed SEA-H2X 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 SEA-H2X cable system mostly falls within areas that had been overlapped with previous marine archaeological assessment/ survey areas as shown in ***Figure E4.1*** 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, which covers a 600 m corridor generally centred on the initial proposed cable system with alternative option (refer to "Geophysical Survey Area for this Project" in ***Figure E4.1*** and ***Annex E2***).

4.4 Results of Geophysical Survey

The geophysical survey for this Project was carried out in August 2023 using standard hydrographic and geophysical survey techniques. The survey findings were processed by geophysicists and 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 135 sonar contacts were identified in the surveyed area within HKSAR boundary. Of these: two (2) are interpreted as wrecks; one hundred and twenty-six (126) are interpreted as debris/tyre/linear debris; four (4) are interpreted as artificial object; one (1) is interpreted as possible container; and two (2) are interpreted as buoy sinker. Their locations are detailed in ***Annex E2***.

The two wrecks with sonar contact number SEA-H2X-S1.1-WH2-SC028 (SC028) and SEA-H2X-S1.1-WH2-SC051 (SC051) are located 95 m and 137 m respectively off the cable alignment. Their locations are almost identical to UKHO wreck numbers 62014 and 57717 respectively. Therefore, they are referring to these wrecks. See ***Figure E4.2*** to ***Figure E4.*** for images of the two sonar contacts.

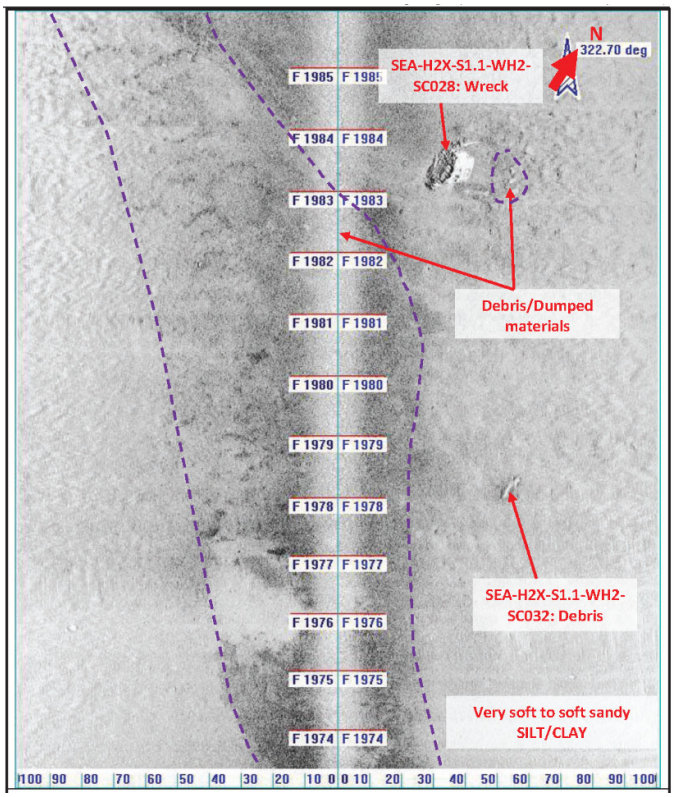

Figure E4.2 Rectified SSS data showing Sonar Contact Image of SEA-H2X-S1.1-WH2-SC028 (SC028)

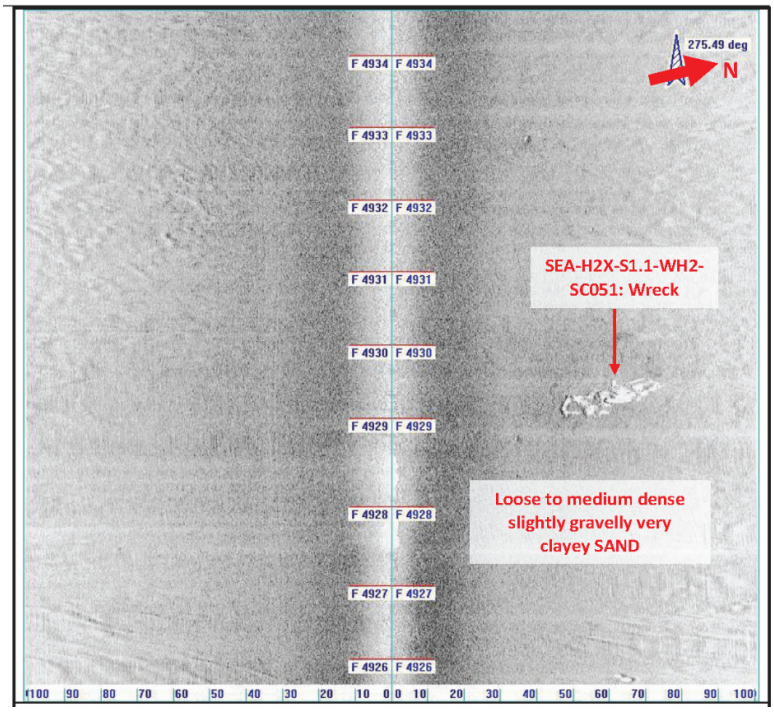

Figure E4.3 Rectified SSS data showing Sonar Contact Image of SEA-H2X-S1.1-WH2-SC051(SC051)

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 system is laid, the seabed will return to its original profile. Given this minimal disturbance area, an assessment area of 20 m on both sides of the proposed cable route (see ***Figure E4.1*** 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 6 m deep trench is relatively narrow and shallow, its impact will be localized and constrained to the immediate area of the trench itself. Sonar contacts within the MAI Assessment Area for this Project is listed in **Table E4.3**.

Table E4.3 Sonar Contacts in the MAI Assessment Area

Contact number	Latitude Longitude	Easting Northing	Water depth (m)	Distance from cable route (m)	Dimensions (m)	Description
SEA-H2X-S1.1-OPT-WH8-SC019	22° 16.919' N 114° 15.551' E	3455879.6E 7431860.1N	13.7	8	1.5x1.2x0.5	Debris/Tyre
SEA-H2X-S1.1-WH2-SC015	22° 15.036' N 114° 15.691' E	3456128.7E 7428252.6N	18.8	19	3x3x<0.5	Debris
SEA-H2X-S1.1-WH2-SC026	22° 13.468' N 114° 16.245' E	3457116.7E 7425247.2N	25.2	19	5x<1xnmh	Debris
SEA-H2X-S1.1-WH2-SC042	22° 12.655' N 114° 16.893' E	3458272.7E 7423689.2N	30.9	17	272x1xnmh	Linear debris
SEA-H2X-S1.1-WH2-SC046	22° 12.356' N 114° 17.080' E	3458606.6E 7423116.8N	28.8	12	3x1xnmh	Debris

Note: nmb=no measurable height

Of the five sonar contacts in the MAI Assessment Area (see **Figures E4.4** to **E4.8**), they are classified as debris, including linear debris, and possible a tyre. None of these sonar contacts have any magnetic values. This is illustrated with the sonar contacts: SEA-H2X-S1.1-WH2-SC015 (SC015) and SEA-H2X-S1.1-WH2-SC046 (SC046). In **Figures E4.4** to **E4.8**, no magnetic values are attributed to them. The closest magnetic contacts, SEA-H2X-S1.1-WH2-MC042 (MC042 and SEA-H2X-S1.1-WH2-MC121 (MC121), are about 60 m and 80 m away from the two sonar contacts respectively (see **Figures E4.9** and **E4.10**) and therefore are too far away to be related. The five sonar contacts are organic and/or non-ferrous in nature and are either recently deposited on the seabed or natural features, and such discrete and isolated objects lying on the seabed would have no marine archaeological value. Organic material would not survive for a long time, such as from an old shipwreck, therefore if they are wooden objects, they are recently deposited. They are not ferrous objects, therefore they are not a ship's cannon. Deposited material from a shipwreck would contain clusters of material, not isolated objects like this.

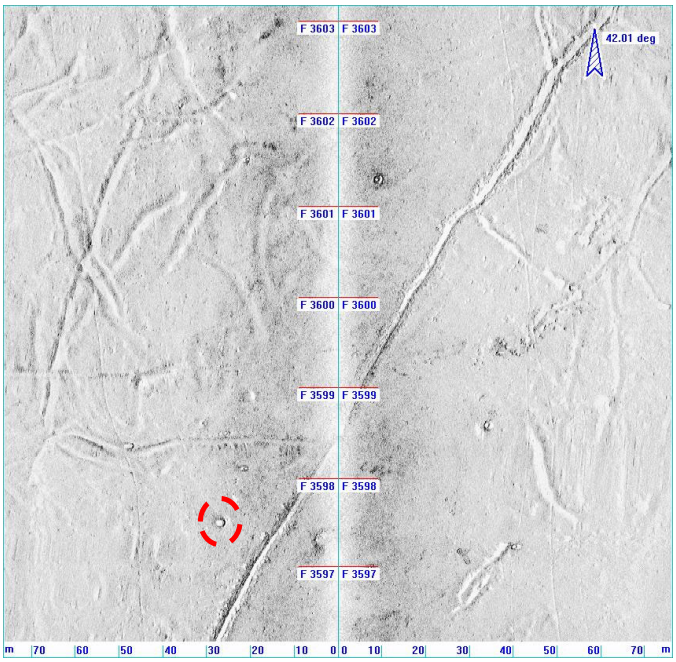

Figure E4.4 Rectified SSS data showing Sonar Contact Image of SEA-H2X-S1.1- OPT-WH8-SC019

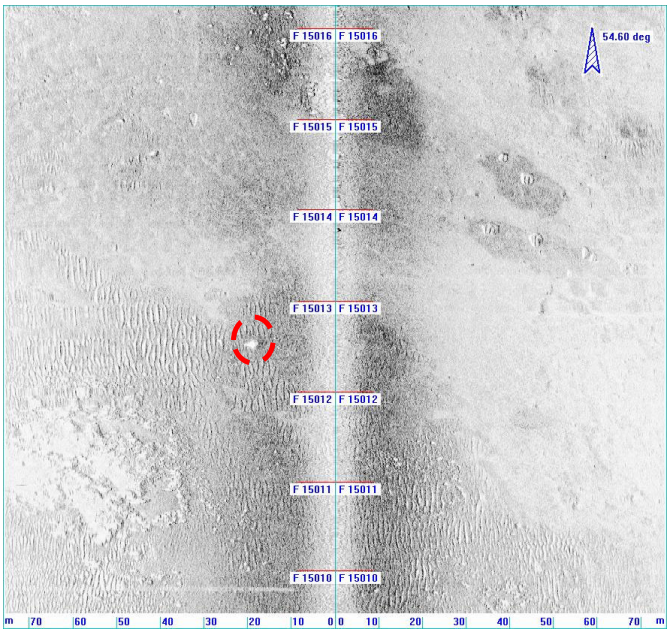

Figure E4.5 Rectified SSS data showing Sonar Contact Image of SEA-H2X-S1.1- WH2-SC015

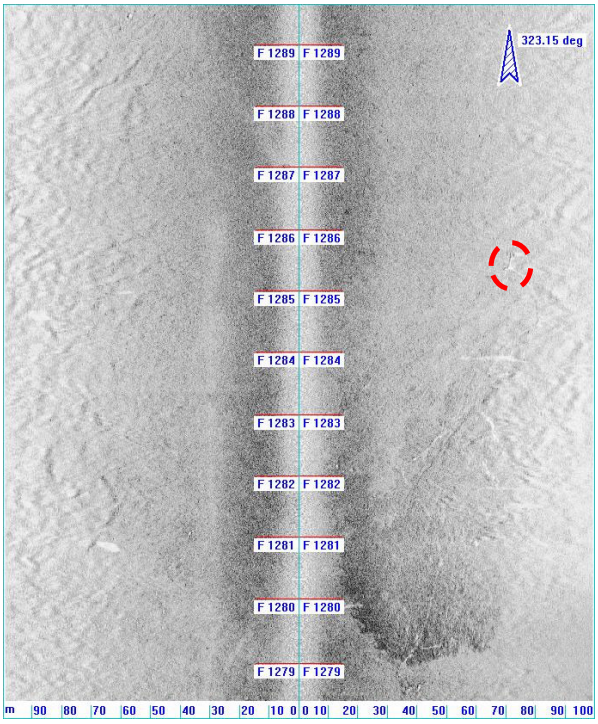

Figure E4.6 Rectified SSS data showing Sonar Contact Image of SEA-H2X-S1.1- WH2-SC026

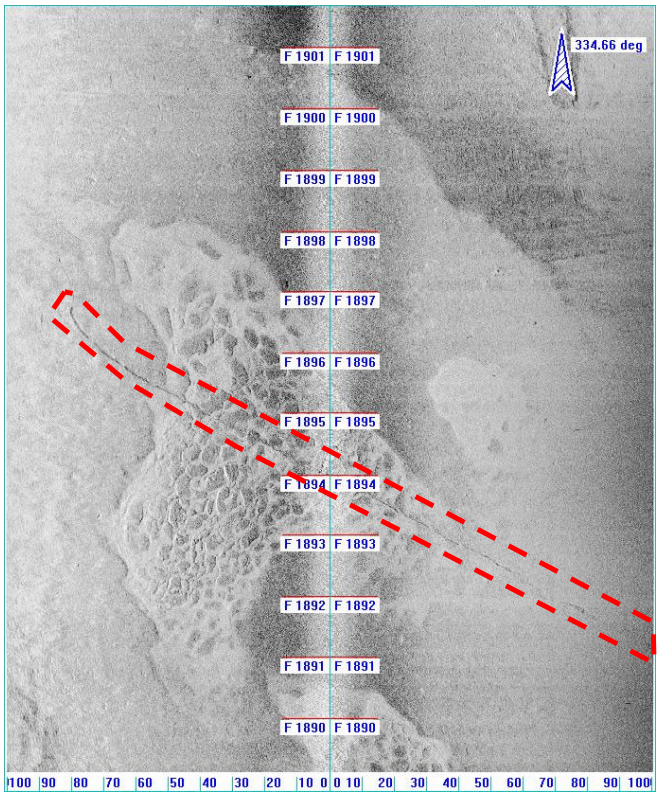

Figure E4.7 Rectified SSS data showing Sonar Contact Image of SEA-H2X-S1.1- WH2-SC042

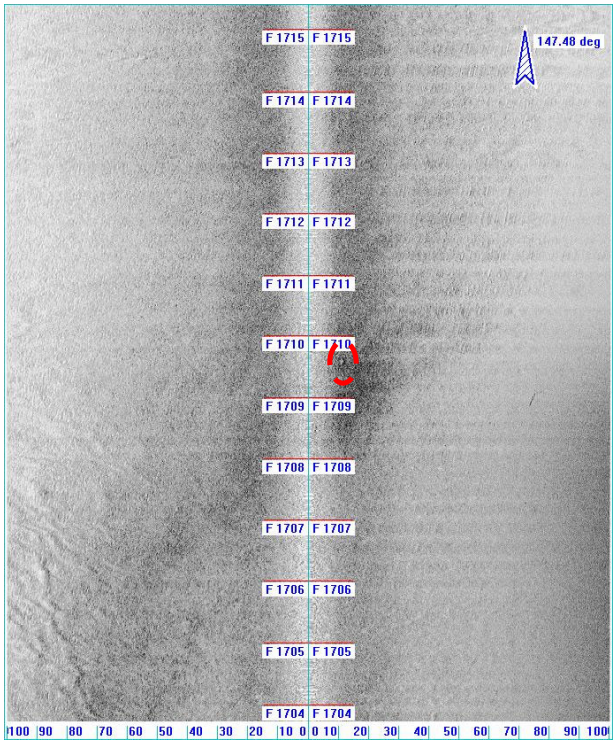

Figure E4.8 Rectified SSS data showing Sonar Contact Image of SEA-H2X-S1.1- WH2-SC046

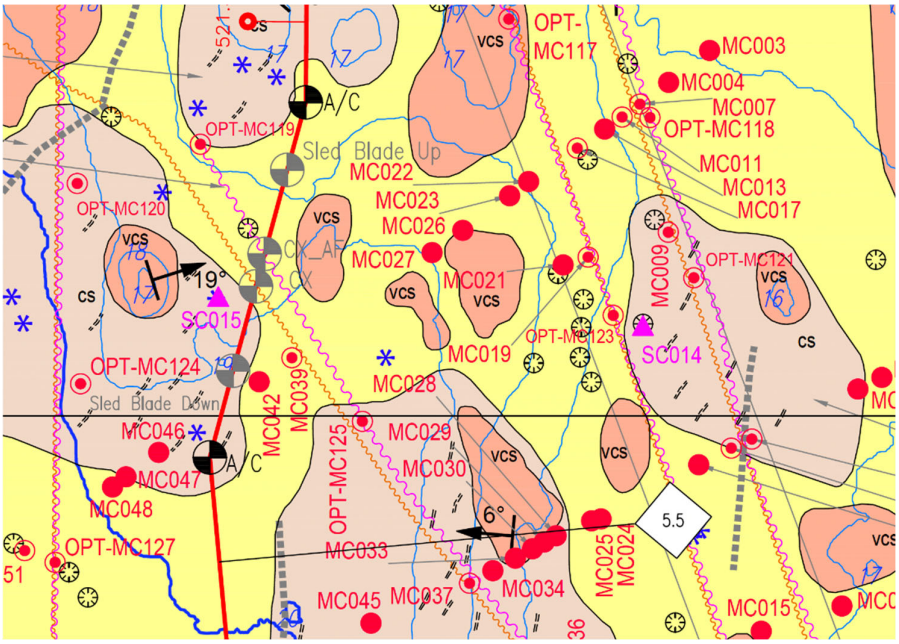

Figure E4.9 Extract of North Up Chart showing Locations of Sonar Contact WH2-SC015 (SC015) and Magnetic Contact MC042

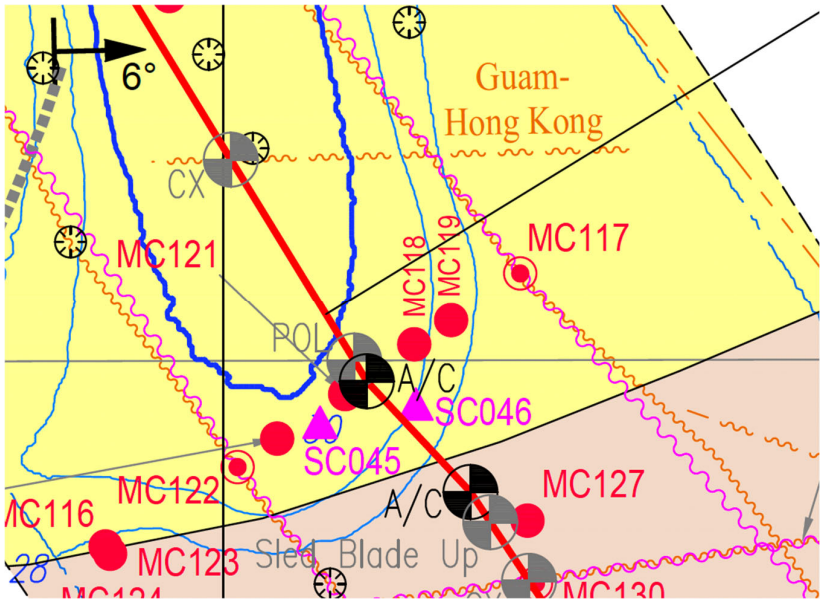

Figure E4.10 Extract of North Up Chart showing Locations of Sonar Contact WH2-SC046 (see "SC046") and Magnetic Contact MC121

A total of 336 magnetic contacts were identified in the surveyed area (their locations are shown in ***Annex E2***). Most of the magnetic contacts are interpreted as submarine cables or pipelines. There are 21 magnetic contacts located within MAI Assessment Area and they are listed in ***Table E4.4*** below. Their locations are shown in ***Annex E2***.

Table E4.4 Magnetic Contacts in the MAI Assessment Area

Contact number	Latitude Longitude	Easting Northing	Water depth (m)	Distance from cable route (m)	Anomaly (nT)	Description
SEA-H2X-S1.1-OPT-WH8-MC069	22° 16.311' N 114° 15.092' E	3455060.8E 7430695.0N	16.8	11	404.2	Unknown
SEA-H2X-S1.1-OPT-WH8-MC071	22° 16.302' N 114° 15.097' E	3455069.2E 7430678.0N	16.3	12	184	Unknown
SEA-H2X-S1.1-OPT-WH8-MC073	22° 16.288' N 114° 15.104' E	3455082.2E 7430651.0N	14.1	10	183.9	IS Ultra Link Express
SEA-H2X-S1.1-OPT-WH8-MC077	22° 16.257' N 114° 15.121' E	3455112.5E 7430592.5N	14.4	6	399.5	IS TKO Express
SEA-H2X-S1.1-OPT-WH8-MC095	22° 16.096' N 114° 15.429' E	3455660.8E 7430284.0N	20.1	14	302	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC042	22° 15.011' N 114° 15.705' E	3456153.2E 7428203.2N	19.2	17	16.1	Unknown
SEA-H2X-S1.1-WH2-MC063	22° 14.302' N 114° 15.703' E	3456149.5E 7426844.3N	23.3	15	4	Unknown
SEA-H2X-S1.1-WH2-MC121	22° 12.362' N 114° 17.051' E	3458554.3E 7423127.4N	29.9	17	2.1	Unknown
SEA-H2X-S1.1-WH2-MC130	22° 12.289' N 114° 17.130' E	3458695.5E 7422987.8N	27.2	4	12.9	IS C2C seg 2A1
SEA-H2X-S1.1-WH2-MC131	22° 12.272' N 114° 17.132' E	3458700.0E 7422955.2N	27.2	11	2	Unknown
SEA-H2X-S1.1-WH2-MC132	22° 12.266' N 114° 17.133' E	3458701.5E 7422944.1N	27.3	15	11.3	Unknown

Contact number	Latitude Longitude	Easting Northing	Water depth (m)	Distance from cable route (m)	Anomaly (nT)	Description
SEA-H2X-S1.1-WH2-MC144	22° 12.183' N 114° 17.148' E	3458728.0E 7422784.5N	27.2	18	25.1	IS APG seg 6
SEA-H2X-S1.1-WH2-MC155	22° 12.068' N 114° 17.182' E	3458788.4E 7422564.1N	27.1	14	24.4	OOS SHT B
SEA-H2X-S1.1-WH2-MC159	22° 12.049' N 114° 17.191' E	3458805.4E 7422528.3N	27.2	15	9.4	IS HK cable1
SEA-H2X-S1.1-WH2-MC168	22° 11.996' N 114° 17.212' E	3458841.8E 7422427.6N	26.9	13	18.1	Unknown
SEA-H2X-S1.1-WH2-MC169	22° 11.989' N 114° 17.215' E	3458846.9E 7422413.6N	26.9	13	62.5	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC171	22° 11.967' N 114° 17.225' E	3458865.4E 7422370.9N	26.8	14	2	Unknown
SEA-H2X-S1.1-WH2-MC176	22° 11.935' N 114° 17.240' E	3458892.3E 7422309.6N	26.8	17	36.8	IS AAE-1 seg 1H.1
SEA-H2X-S1.1-WH2-MC183	22° 11.883' N 114° 17.263' E	3458932.3E 7422210.0N	26.6	18	79.9	IS SEA-ME-WE 3 seg 1.10
SEA-H2X-S1.1-WH2-MC190	22° 11.819' N 114° 17.291' E	3458983.1E 7422087.8N	26.3	20	3.6	OOS Hong-Kong-Amoy
SEA-H2X-S1.1-WH2-MC234	22° 10.958' N 114° 29.858' E	3481401.9E 7420438.0N	31.1	20	0.9	Possible IS HK cable2

Among the 21 magnetic contacts, 12 of them are modern cable routes without archaeological value. Nine of them are regarded as “unknown” contacts. A review of the nine “unknown” magnetic contacts found MC042, SEA-H2X-S1.1-WH2-MC063 (MC063), MC121, SEA-H2X-S1.1-WH2-MC131(MC131) and SEA-H2X-S1.1-WH2-MC132 (MC132) are all regarded as old cables as they line up with other magnetic contacts in the near vicinity, and have similar magnetic values as the known cables, and therefore have no marine archaeological value. Of the other four magnetic contacts, SEA-H2X-S1.1-OPT-WH8-MC069 (OPT-MC069), SEA-H2X-S1.1-OPT-WH8-MC071 (OPT-MC071) (see **Figure E4.11**), SEA-H2X-S1.1-WH2-MC168 (MC168) and SEA-H2X-S1.1-WH2-MC171 (MC171) (see

Figure E4.12), they appear to be isolated debris (either of natural or man-made materials) and are 11 m, 12 m, 13 m and 13 m respectively off the cable route. Deposited material from a shipwreck would contain clusters of material, not isolated objects like this.

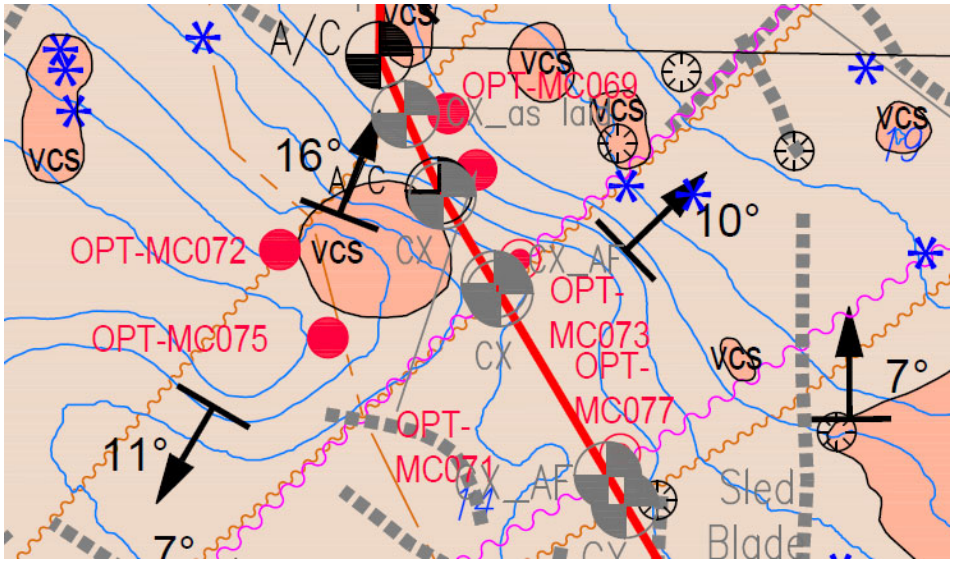

Figure E4.11 Extract of North Up Chart showing Locations of Magnetic Contacts OPT-MC069 and OPT-MC071

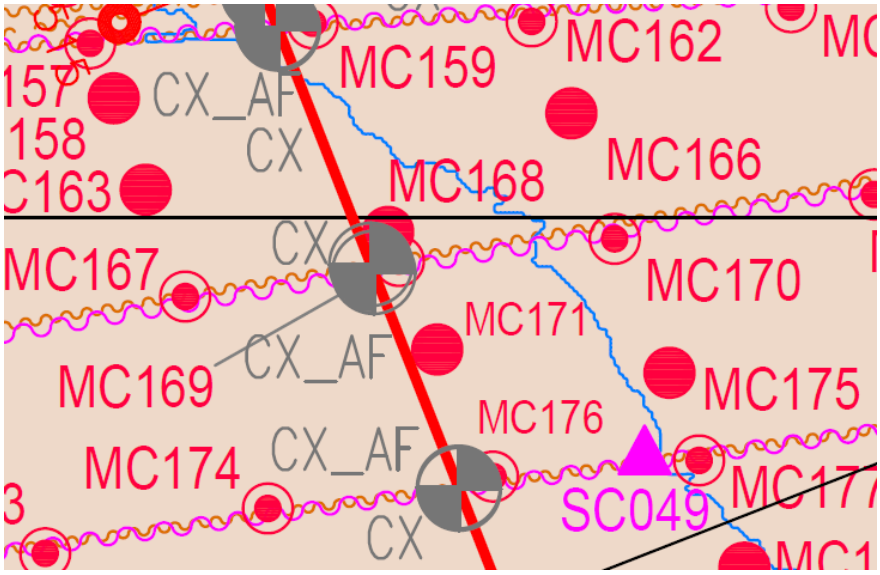

Figure E4.2 Extract of North Up Chart showing Locations of Magnetic Contacts MC168 and MC171

Seven seismic contacts are identified in the geophysical survey area for the Project but only one of the seismic contracts (SEA-H2X-S1.1-WH2-SEI004) is located in the MAI Assessment Area. They are part of the Hong Kong Electric gas pipeline buried around -3.4 m to -3.8 m below seabed crossing the proposed cable alignment at the eastern end (see "HKE Gas Pipe" in **Figure E4.1**) (their locations are shown in ***Annex E2***). The modern gas pipeline with these seismic contacts is of no marine archaeological value.

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.

To conclude, the desktop review and review and evaluation of the geophysical survey results of the Project by marine archaeologist identified no marine archaeological potential area within the MAI Assessment Area.

5. IMPACT ASSESSMENT

All the land based heritage sites identified including the Rock Carving at Cape Collinson (declared monument), Site of Chinese Customs Station, Fat Tau Chau (declared monument), the Cape Collinson Lighthouse (Grade 3 historic building), Fat Tau Chau SAI, and Fat Tau Chau Qing Dynasty Gravestone (SAI) are located with large separation distance (over 310 m) from the proposed submarine cable system. Furthermore, the land-based activities for the Project only involve pulling and guiding the cable into an existing duct, no direct and indirect construction and operation impacts arising from the Project to the land based heritage sites is anticipated.

Sonar contact (SC028) located 95 m away from the proposed cable system was identified as a wreck UKHO62014 according to the database of UKHO. 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.

Sonar contact (SC051) located 137 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 value. 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.

Of the five sonar contacts within the MAI Assessment Area, they are classified as debris, including linear debris, and possible a tyre. None of these sonar contacts have any magnetic values. This is illustrated with the sonar contacts SC015 and SC046. No magnetic values are attributed to them. The closest magnetic contacts, MC042 and MC121, are about 60 m and 80 m away from them respectively, which are too far away to be related. The five sonar contacts are organic and/or non-ferrous in nature, and such discrete and isolated objects lying on the seabed would have no marine archaeological value. Although they fall within the MAI Assessment Area at the distance between 8 m and 19 m from the proposed cable system, the actual area of disturbance is 0.5m when laying the cable and the contacts will therefore not be impacted by the laying of the cable.

A review of the nine “unknown” magnetic contacts found MC042, MC063, MC121, MC131 and MC132 are all regarded as old cables as they line up with other magnetic contacts in the near vicinity, and have similar magnetic values as the known cables, and therefore have no marine archaeological value. Of the other four magnetic contacts, OPT-MC069, OPT-MC071, MC168 and MC171, they appear to be isolated debris (either of natural or man-made materials) and are 11 m, 12 m, 13 m and 13 m respectively off the cable route. Deposited material from a shipwreck would contain clusters of material, not isolated objects like this. Although they fall within MAI Assessment Area at the distance between 6 m and 20 m from the proposed cable system, the actual area of disturbance is 0.5 m when laying the cable and the contacts will therefore not be impacted by the laying of the cable.

The seismic contact identified in the MAI Assessment Area is part of the gas pipeline of the Hong Kong Electric without marine archaeological value. No marine archaeological impact is anticipated due to the proposed works.

6. CONCLUSION AND RECOMMENDATION

The land based heritage sites including the Rock Carving at Cape Collinson (declared monument), Site of Chinese Customs Station, Fat Tau Chau (declared monument), the Cape Collinson Lighthouse (Grade 3 historic building), Fat Tau Chau SAI, and Fat Tau Chau Qing Dynasty Gravestone (SAI) are located with large separation distance (over 300m) from the proposed cable system and land-based activities for the Project only involve pulling and guiding the cable into an existing duct, no direct and indirect construction and operation impacts arising from the Project is anticipated. Therefore, no mitigation measure is required.

The identified two wrecks (SC028/UKHO62014 and SC051/UKHO57717) are located 95 m and 137 m respectively away from the proposed cable system. Due to large separation distance, no direct and indirect construction and operation impacts arising from the Project is anticipated. Therefore, no mitigation measure is required.

Although five (5) sonar contacts and twenty-one (21) magnetic contacts are identified at the distance between 6 and 20m from the proposed cable system in the MAI Assessment Area, they are either modern features or contacts without marine archaeological value. Furthermore, the actual area of disturbance is approximately 0.5 m when laying the cable, the contacts will not be impacted. Thus, no mitigation measure is required.

The seismic contact identified in the MAI Assessment Area is part of the gas pipeline of Hong Kong Electric without marine archaeological significance, therefore no marine archaeological impact is anticipated. Thus, no mitigation measure is required.

To conclude, the MAI including desktop review and review and evaluation of the geophysical survey results of the Project by marine archaeologist identified no marine archaeological potential area within the MAI Assessment Area. Potential impact to marine archaeological resource due to the Project is not anticipated. Therefore, no further field investigation or mitigation measures is required.

7. REFERENCES

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ANNEX E1 UNITED KINGDOM HYDROGRAPHIC OFFICE WRECK DATA

Latitude = 22 11’.630 N **Longitude =** 114 17’.738 E [WGD] **Square Number =** 1113 **State =** LIVE

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.

Latitude = 22 13’.406 N **Longitude =** 114 16’.379 E [WGD] **Square Number =** 1113
State = LIVE

Wreck Number 62014 **Classification =** Unclassified
Symbol WK 21.0 **Largest Scale Chart =** 4127
Charting Comments
Old Number
Category Dangerous wreck

WGS84 Position **Latitude =** 22 13’.406 N **Longitude =** 114 16’.379 E
WGS84 Origin Original
Horizontal Datum WGD WGS (1984)

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

Depth 21.0 metres
Drying Height
Height
General Depth 25 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 27/10/2008
Position Last Amended
Position Last **Latitude =** **Longitude =**

Name
Type
Flag
Dimensions **Length =** **Beam =** **Draught =**
Tonnage
Cargo
Date Sunk

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

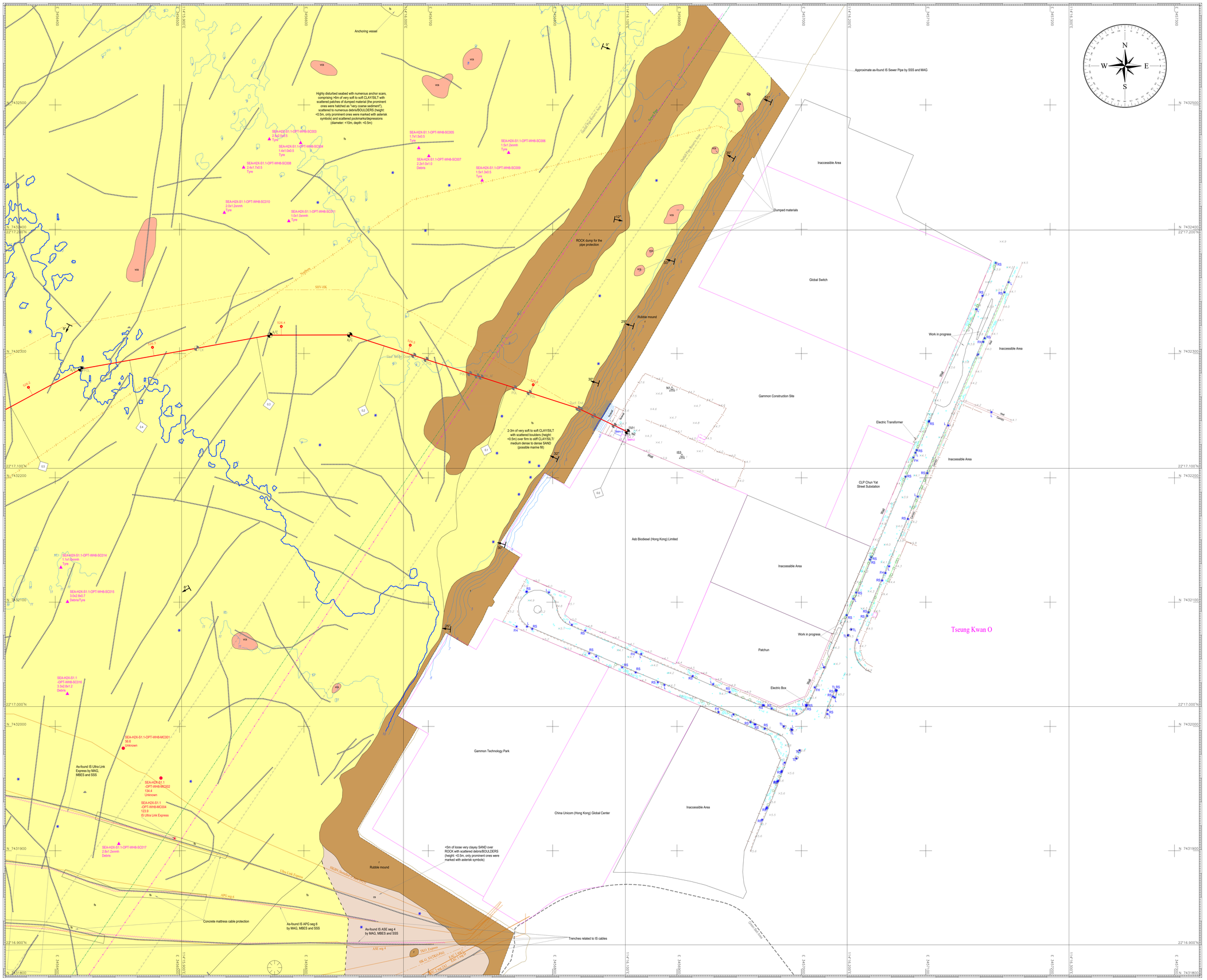
Magnetic Anomaly
Debris Field
Scour **Depth =** **Length =** **Orientation =**

Markers
General Comments

Circumstances of Loss

Surveying Details
**HH550/412/03 12.2.03 WK 20.4MTRS IN 2213.406N, 11416.379E [WGD]. (HONG KONG NM 3/9/03). - NM 1324/03.
**14.10.08 SHOWN AS WK 21MTRS ON HONG KONG 2502 [AUG ‘08 EDN, LARGEST SCALE ADOPTION]. NE 4127.

ANNEX E2 GEOPHYSICAL SURVEY NORTH UP CHARTS



CARTOGRAPHIC SYMBOLS

- Post survey route with kilometre post and reverse kilometre post
- Adjacent route
- Beach manhole / After 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

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
- Fence
- Building (permanent)
- Building (temporary)
- Vegetation area
- Rock area
- Sand area
- Low water mark
- High water mark
- Video line
- BP001 / BS001: Beach probe (BP); Beach sample (BS) location with reference number
- DP001 / DS001: Diver probe (DP); Diver sample (DS) location with reference number
- BMH: Surveyed beach manhole
- Manhole (stormwater drain)
- Manhole (foulwater drain)
- Manhole (sewage)
- Manhole (telephone)
- Manhole
- Tree
- Coconut Tree
- Palm Tree
- Pole
- Gate
- Control point
- X 12.5 / X -0.4: Spot levels above/ below survey datum
- 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:

	Along Final Route	Within Survey Corridor
BATHYMETRY		
Minimum depth (m)	5.7 (above LAT)	8.7 (above LAT)
Maximum depth (m)	10	14
Maximum gradient (°)	14	31

From the RPL BMH, the proposed route heads northwest, leaving the landing site perpendicular to a rubble mound seawall with very steep gradients. After crossing a pipeline, the route travels on a gently southwest-dipping seabed.

SEABED FEATURES

Dumped materials are mapped in the western portion of the chart.

Scattered BOULDERS/debris (general height: <0.8m) are mapped nearshore in the western and southern portions of the chart.

Numerous scars (possibly due to anchoring activity) are mapped throughout the western portion of the chart.

Sonar Contacts: SEA-H2X-S1.1-OPT-WHB-SC003 to SC011, SEA-H2X-S1.1-OPT-WHB-SC014 to SC017

Magnetometer Contacts: SEA-H2X-S1.1-OPT-WHB-MC001, MC002 and MC004

Seismic Contacts: Nil.

SHALLOW GEOLOGY

Areas of rubble mound seawall are mapped in the center of the chart.

ROCK armor is observed around an existing pipeline in the northern part of the chart.

2m to 3m of very soft to soft SILT/CLAY over possible firm to stiff CLAY/medium dense to dense SAND is mapped near the center of the chart.

Disturbed, very soft to soft CLAY/SILT is mapped in the western part of the chart, with numerous debris and scattered patches of dumped materials.

Sediment Samples: Nil.

CPT: Nil.

ADDITIONAL INFORMATION

The proposed route shares a BMH and runs parallel to the planned SHV-HK system inside a cable duct off the landing site.

The proposed route crosses an IS sewer pipeline near the center of the chart.

The proposed route crosses a planned power cable in the north-western part of the chart.

The proposed route runs inside Guangzhou VTS.

The proposed route runs inside Hong Kong SAR waters.

GENERAL NOTES

Inshore and Shallow Water

Survey vessel	MV Wing Hung 2
Surface positioning system	C-Nav 3050 GcGPS Gmsv Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Kongsberg EA440 Singlebeam Echo Sounder System R2Sonic Sonic 2024 MBES
Morphology and stratigraphy	EdgeTech 4205 Side Scan Sonar System Innomar SES-2000 medium-100 Sub-bottom Profiler C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong waters except 6m burial for KP0.176 to KP2.351

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

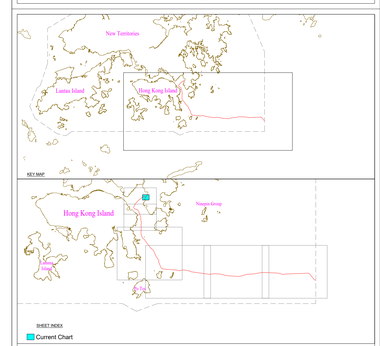
Projection : Mercator
False Northing (m) : 5 000 000
False Easting (m) : 3 000 000

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, 2022 and total measurements at the EGS tide gauge installed at Tai Miu Wan.

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



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Survey Date: Aug 2022, April - May 2023

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

(At mid-latitude of chart)
TRUE SCALE 1 : 962.82

0 20 40 60 80 100 m

Purchaser : Contractor : Surveyor :

Project Name: Southeast Asia-Hainan-HongKong Express Cable (SEA-H2X) - Hong Kong Waters Marine Route Survey

Document Title: SEGMENT 1.1 (TKO Hong Kong to BU1) NORTH UP CHART CHART NO. 001 OF 001 (KP 0.00 - KP 0.50)

Rev	Date	Prepared by	Checked by	Approved by	
2.1	Sep 2024	Chester Quek / K. F. Lai	Margie Chen	Even Mak	Final
2	Apr 2024	Chester Quek / K. F. Lai	Margie Chen	Even Mak	
1	Aug 2023	Chester Quek / K. F. Lai	Margie Chen	Even Mak	

Route Based Upon: SEA-H2X_S1.1_TKO (Hongkong) to BU1 RPL 2-Oct 240911.xls

File Name: SEA-H2X-S1.1-NU-TKO-001

Contact Name	Easting (m)	Northing (m)	Dimensions	Description
SEA+DX-S1.1-OPT-WHB-SC001	3456540.0	7432891.1	2.7x2.6emfr	Tyre
SEA+DX-S1.1-OPT-WHB-SC002	3456521.5	7432630.6	2.0x1.5emfr	Tyre
SEA+DX-S1.1-OPT-WHB-SC003	3456572.2	7432473.5	2.5x2.5x0.5	Tyre
SEA+DX-S1.1-OPT-WHB-SC004	3456597.3	7432469.5	1.4x1.0x0.5	Tyre
SEA+DX-S1.1-OPT-WHB-SC005	3456692.3	7432465.4	1.7x1.5x0.5	Tyre
SEA+DX-S1.1-OPT-WHB-SC006	3456764.6	7432481.6	1.5x1.2emfr	Tyre
SEA+DX-S1.1-OPT-WHB-SC007	3456700.4	7432458.8	2.2x1.0x1.0	Debris
SEA+DX-S1.1-OPT-WHB-SC008	3456551.5	7432449.8	2.4x1.7x0.5	Tyre
SEA+DX-S1.1-OPT-WHB-SC009	3456743.3	7432439.3	1.5x1.0x0.5	Tyre
SEA+DX-S1.1-OPT-WHB-SC010	3456536.0	7432413.4	2.0x1.2emfr	Tyre
SEA+DX-S1.1-OPT-WHB-SC011	3456507.9	7432406.6	1.0x0.5emfr	Tyre
SEA+DX-S1.1-OPT-WHB-SC012	3455768.1	7432220.2	0.8x1.5x0.5	Debris
SEA+DX-S1.1-OPT-WHB-SC013	3455789.3	7432020.1	7.9x5.2x1.1	Artificial object
SEA+DX-S1.1-OPT-WHB-SC014	3456404.5	7432127.5	1.1x1.0emfr	Tyre
SEA+DX-S1.1-OPT-WHB-SC015	3456409.9	7432100.3	3.0x2.8x0.7	Debris/Tyre
SEA+DX-S1.1-OPT-WHB-SC016	3456409.8	7432026.3	3.3x2.8x1.2	Debris
SEA+DX-S1.1-OPT-WHB-SC017	3456451.1	7431935.6	2.0x1.2emfr	Debris
SEA+DX-S1.1-OPT-WHB-SC018	3455998.0	7431891.0	1.8x1.5emfr	Tyre
SEA+DX-S1.1-OPT-WHB-SC019	3455978.6	7431880.1	1.5x1.2x0.5	Debris/Tyre
SEA+DX-S1.1-OPT-WHB-SC020	3456371.0	7431788.9	1.1x1.1emfr	Tyre
SEA+DX-S1.1-OPT-WHB-SC021	3456415.5	7431782.6	3.2x1.8x0.7	Debris
SEA+DX-S1.1-OPT-WHB-SC022	3456338.9	7431780.7	3.7x3.5x0.5	Buoy striker
SEA+DX-S1.1-OPT-WHB-SC023	3456681.7	7431692.1	2.3x1.7x0.7	Debris
SEA+DX-S1.1-OPT-WHB-SC024	3455217.0	7431608.3	3.6x2.7x0.5	Debris
SEA+DX-S1.1-OPT-WHB-SC025	3456981.2	7431483.2	2.0x2.0x0.5	Debris
SEA+DX-S1.1-OPT-WHB-SC026	3456117.8	7431298.2	2.9x1.2x0.6	Debris
SEA+DX-S1.1-OPT-WHB-SC027	3455331.9	7431131.9	2.2x0.6x1	Debris
SEA+DX-S1.1-OPT-WHB-SC028	3455888.8	7431005.4	3.5x2.6x1.1	Debris
SEA+DX-S1.1-OPT-WHB-SC029	3455732.5	7430528.9	9.5x4.1x0.6	Artificial object
SEA+DX-S1.1-OPT-WHB-SC030	3455695.8	7430521.8	3.5x1.8x0.5	Debris
SEA+DX-S1.1-OPT-WHB-SC031	3455686.6	7430499.8	4.5x3.8x1.0	Debris
SEA+DX-S1.1-OPT-WHB-SC032	3455691.7	7430482.8	3.0x3.0x1.0	Debris
SEA+DX-S1.1-OPT-WHB-SC033	3455716.2	7430471.1	2.5x1.7x0.8	Debris
SEA+DX-S1.1-OPT-WHB-SC034	3456541.3	7429898.8	3.9x2.2x2.3	Debris
SEA+DX-S1.1-OPT-WHB-SC035	3456403.6	7429774.3	3.1x2.1emfr	Artificial object
SEA+DX-S1.1-OPT-WHB-SC036	3456407.4	7429771.7	3.9x2.6emfr	Artificial object

Contact Name	Easting (m)	Northing (m)	Dimensions	Description
SEA+DX-S1.1-WHZ-SC001	3456687.8	7430565.5	1.5x1x0.8	Debris
SEA+DX-S1.1-WHZ-SC002	3456570.6	7430526.1	2.7x2.4x1.5	Debris
SEA+DX-S1.1-WHZ-SC003	3456987.2	7430496.3	2x1x0.8	Debris
SEA+DX-S1.1-WHZ-SC004	3457061.2	7430201.2	2.4x2.3x1.8	Debris

Contact Name	Easting (m)	Northing (m)	Amplitude (nT)	Description
SEA+DX-S1.1-OPT-WHB-MC001	3456454.8	7431982.5	56.6	Unknown
SEA+DX-S1.1-OPT-WHB-MC002	3456485.0	7431958.5	134.4	Unknown
SEA+DX-S1.1-OPT-WHB-MC003	3456158.3	7431961.0	184.1	Unknown
SEA+DX-S1.1-OPT-WHB-MC004	3456496.3	7431910.0	123.9	IS Ultra Link Express
SEA+DX-S1.1-OPT-WHB-MC005	3456167.3	7431905.5	74.4	Unknown
SEA+DX-S1.1-OPT-WHB-MC006	3456173.5	7431899.5	53.4	IS Ultra Link Express
SEA+DX-S1.1-OPT-WHB-MC007	3456204.8	7431868.0	441.8	Possible IS APG seg E
SEA+DX-S1.1-OPT-WHB-MC008	3456253.3	7431817.0	84.2	IS ASE seg 4
SEA+DX-S1.1-OPT-WHB-MC009	3455944.8	7431779.0	32.7	IS Ultra Link Express
SEA+DX-S1.1-OPT-WHB-MC010	3456528.0	7431775.5	100.3	IS TKO Express
SEA+DX-S1.1-OPT-WHB-MC011	3455978.8	7431756.5	31.9	Possible IS APG seg E
SEA+DX-S1.1-OPT-WHB-MC012	3456534.3	7431750.5	28.4	IS EAC 1 seg C
SEA+DX-S1.1-OPT-WHB-MC013	3456323.8	7431746.5	53.0	IS TKO Express
SEA+DX-S1.1-OPT-WHB-MC014	3456540.8	7431723.5	33.4	IS EAC 1 seg D
SEA+DX-S1.1-OPT-WHB-MC015	3456387.0	7431706.0	672.0	IS Sewer Pipe
SEA+DX-S1.1-OPT-WHB-MC016	3456040.0	7431698.5	14.4	IS ASE seg 4
SEA+DX-S1.1-OPT-WHB-MC017	3457110.3	7431681.0	52.8	Unknown
SEA+DX-S1.1-OPT-WHB-MC018	3456427.3	7431654.0	14.9	IS EAC 1 seg C
SEA+DX-S1.1-OPT-WHB-MC019	3456462.3	7431624.5	32.8	IS EAC 1 seg D
SEA+DX-S1.1-OPT-WHB-MC020	3456131.8	7431621.5	54.1	IS TKO Express
SEA+DX-S1.1-OPT-WHB-MC021	3455790.8	7431608.0	205.1	IS Ultra Link Express
SEA+DX-S1.1-OPT-WHB-MC022	3456490.0	7431602.5	33.4	IS EAC 2 leg 2A1
SEA+DX-S1.1-OPT-WHB-MC023	3455826.3	7431585.5	88.2	IS APG seg E
SEA+DX-S1.1-OPT-WHB-MC024	3455640.3	7431569.0	136.3	Unknown
SEA+DX-S1.1-OPT-WHB-MC025	3456355.3	7431562.0	53.1	Unknown
SEA+DX-S1.1-OPT-WHB-MC026	3456230.8	7431540.0	421.3	IS Sewer Pipe
SEA+DX-S1.1-OPT-WHB-MC027	3455573.3	7431519.0	92.0	Unknown
SEA+DX-S1.1-OPT-WHB-MC028	3455730.8	7431519.0	226.5	IS Ultra Link Express
SEA+DX-S1.1-OPT-WHB-MC029	3455756.1	7431482.5	406.3	IS APG seg E
SEA+DX-S1.1-OPT-WHB-MC030	3456355.0	7431478.5	110.3	IS EAC 1 seg C
SEA+DX-S1.1-OPT-WHB-MC031	3456033.3	7431448.5	32.6	IS TKO Express
SEA+DX-S1.1-OPT-WHB-MC032	3456359.8	7431440.5	32.9	IS EAC 1 seg D
SEA+DX-S1.1-OPT-WHB-MC033	3455837.0	7431387.5	171.7	IS ASE seg 4
SEA+DX-S1.1-OPT-WHB-MC034	3456143.5	7431381.0	954.7	IS Sewer Pipe
SEA+DX-S1.1-OPT-WHB-MC035	3455451.0	7431351.5	119.2	Unknown
SEA+DX-S1.1-OPT-WHB-MC036	3455858.8	7431339.0	222.8	IS APG seg E
SEA+DX-S1.1-OPT-WHB-MC037	3455947.5	7431334.0	27.1	IS TKO Express
SEA+DX-S1.1-OPT-WHB-MC038	3456218.5	7431325.5	49.2	IS EAC 1 seg C
SEA+DX-S1.1-OPT-WHB-MC039	3456237.3	7431320.0	38.5	Unknown
SEA+DX-S1.1-OPT-WHB-MC040	3455316.5	7431310.0	35.9	IS Ultra Link Express
SEA+DX-S1.1-OPT-WHB-MC041	3456257.5	7431302.0	28.5	IS EAC 1 seg D
SEA+DX-S1.1-OPT-WHB-MC042	3455733.0	7431290.0	17.8	IS TKO Express
SEA+DX-S1.1-OPT-WHB-MC043	3456356.8	7431213.0	20.3	IS EAC 2 leg 2A1
SEA+DX-S1.1-OPT-WHB-MC044	3455584.3	7431206.0	29.8	IS TKO Express
SEA+DX-S1.1-OPT-WHB-MC045	3455752.8	7431383.3	216.7	Unknown
SEA+DX-S1.1-OPT-WHB-MC046	3455652.0	7431344.5	1366.3	IS Sewer Pipe
SEA+DX-S1.1-OPT-WHB-MC047	3455775.8	7431232.5	312.4	IS ASE seg 4
SEA+DX-S1.1-OPT-WHB-MC048	3455971.3	7431198.5	607.7	Unknown
SEA+DX-S1.1-OPT-WHB-MC049	3455814.0	7431179.0	376.9	Unknown
SEA+DX-S1.1-OPT-WHB-MC050	3455736.5	7431159.5	138.5	IS ASE seg 4
SEA+DX-S1.1-OPT-WHB-MC051	3456177.8	7431150.0	184.2	IS EAC 1 seg D
SEA+DX-S1.1-OPT-WHB-MC052	3455768.8	7431137.5	239.6	Unknown
SEA+DX-S1.1-OPT-WHB-MC053	3456222.0	7431108.5	618.2	IS EAC 2 leg 2A1
SEA+DX-S1.1-OPT-WHB-MC054	3456250.8	7431085.0	1584.5	Unknown
SEA+DX-S1.1-OPT-WHB-MC055	3456273.0	7431074.0	916.6	Unknown
SEA+DX-S1.1-OPT-WHB-MC056	3455983.3	7431040.5	434.1	IS Sewer Pipe
SEA+DX-S1.1-OPT-WHB-MC057	3455947.5	7431011.0	390.3	Unknown
SEA+DX-S1.1-OPT-WHB-MC058	3455977.3	7430992.0	312.9	Unknown
SEA+DX-S1.1-OPT-WHB-MC059	3456036.3	7430958.5	287.0	IS EAC 1 seg C
SEA+DX-S1.1-OPT-WHB-MC060	3456061.5	7430934.0	30.1	IS EAC 1 seg D
SEA+DX-S1.1-OPT-WHB-MC061	3456117.3	7430894.5	117.0	IS EAC 2 leg 2A1
SEA+DX-S1.1-OPT-WHB-MC062	3455186.0	7430858.0	130.9	Unknown
SEA+DX-S1.1-OPT-WHB-MC063	3455255.8	7430824.0	60.7	IS Ultra Link Express
SEA+DX-S1.1-OPT-WHB-MC064	3455432.3	7430798.5	1101.1	Possible Unspecified Pipe
SEA+DX-S1.1-OPT-WHB-MC065	3455337.3	7430795.5	10.2	IS TKO Express
SEA+DX-S1.1-OPT-WHB-MC066	3454848.5	7430757.0	992.3	Possible Unspecified Pipe
SEA+DX-S1.1-OPT-WHB-MC067	3454513.5	7430739.5	283.4	IS APG seg E
SEA+DX-S1.1-OPT-WHB-MC068	3454869.8	7430722.5	1519.2	Possible Unspecified Pipe
SEA+DX-S1.1-OPT-WHB-MC069	3455060.8	7430695.0	404.2	Unknown
SEA+DX-S1.1-OPT-WHB-MC070	3455514.3	7430682.5	217.2	IS ASE seg 4
SEA+DX-S1.1-OPT-WHB-MC071	3455099.3	7430678.0	184.0	Unknown
SEA+DX-S1.1-OPT-WHB-MC072	3455010.0	7430654.0	1550.2	Unknown
SEA+DX-S1.1-OPT-WHB-MC073	3455082.3	7430651.0	183.9	IS Ultra Link Express
SEA+DX-S1.1-OPT-WHB-MC074	3455022.3	7430625.0	518.5	Unknown
SEA+DX-S1.1-OPT-WHB-MC075	3455034.5	7430607.5	45.9	Unknown
SEA+DX-S1.1-OPT-WHB-MC076	3455029.0	7430625.0	989.9	IS Sewer Pipe
SEA+DX-S1.1-OPT-WHB-MC077	3455112.5	7430592.5	399.5	IS TKO Express
SEA+DX-S1.1-OPT-WHB-MC078	3455031.5	7430589.5	80.7	IS APG seg E
SEA+DX-S1.1-OPT-WHB-MC079	3455067.8	7430552.5	377.0	IS TKO Express
SEA+DX-S1.1-OPT-WHB-MC080	3454977.5	7430547.0	168.3	IS Ultra Link Express
SEA+DX-S1.1-OPT-WHB-MC081	3455462.0	7430542.5	21.5	IS ASE seg 4
SEA+DX-S1.1-OPT-WHB-MC082	3454992.3	7430528.5	1059.8	Unknown
SEA+DX-S1.1-OPT-WHB-MC083	3455042.5	7430526.5	972.3	IS Sewer Pipe
SEA+DX-S1.1-OPT-WHB-MC084	3454994.3	7430518.0	477.9	IS TKO Express
SEA+DX-S1.1-OPT-WHB-MC085	3455010.0	7430510.0	29.5	IS EAC 1 seg D
SEA+DX-S1.1-OPT-WHB-MC086	3455098.5	7430481.0	91.5	IS EAC 2 leg 2A1
SEA+DX-S1.1-OPT-WHB-MC087	3455952.5	7430384.0	10.8	IS EAC 2 leg 2A1
SEA+DX-S1.1-OPT-WHB-MC088	3455977.5	7430382.0	46.6	IS EAC 1 seg C
SEA+DX-S1.1-OPT-WHB-MC089	3455724.5	7430380.0	58.8	IS EAC 1 seg C
SEA+DX-S1.1-OPT-WHB-MC090	3455481.0	7430377.5	94.2	IS ASE seg 4
SEA+DX-S1.1-OPT-WHB-MC091	3455331.0	7430376.5	148.8	IS APG seg E
SEA+DX-S1.1-OPT-WHB-MC092	3455394.0	7430373.5	198.8	Unknown
SEA+DX-S1.1-OPT-WHB-MC093	3455849.8	7430323.5	23.0	IS EAC 2 leg 2A1
SEA+DX-S1.1-OPT-WHB-MC094	3455784.5	7430311.5	210.7	IS EAC 1 seg C
SEA+DX-S1.1-OPT-WHB-MC095	3455950.8	7430284.0	302.0	IS EAC 1 seg C
SEA+DX-S1.1-OPT-WHB-MC096	3455592.5	7430267.5	328.5	Unknown
SEA+DX-S1.1-OPT-WHB-MC097	3455512.8	7430255.0	258.8	IS ASE seg 4
SEA+DX-S1.1-OPT-WHB-MC098	3454588.8	7430246.5	357.6	Unknown
SEA+DX-S1.1-OPT-WHB-MC099	3455376.5	7430226.0	76.4	IS APG seg E
SEA+DX-S1.1-OPT-WHB-MC100	3455303.5	7430208.0	899.7	Unknown
SEA+DX-S1.1-OPT-WHB-MC101	3455951.3	7429904.0	251.1	IS EAC 2 leg 2A1
SEA+DX-S1.1-OPT-WHB-MC102	3455924.0	7429891.0	20.0	IS EAC 1 seg D
SEA+DX-S1.1-OPT-WHB-MC103	3455834.8	7429867.5	69.4	IS EAC 1 seg C
SEA+DX-S1.1-OPT-WHB-MC104	3455737.5	7429798.5	61.4	IS ASE seg 4
SEA+DX-S1.1-OPT-WHB-MC105	3455870.3	7429770.0	350.7	IS APG seg E

Probe Number	Easting (m)	Northing (m)	Penetration (m)	Summary
SEA+DX-S1.1-TKO-BP001	3458710.7	7431117.0	0.1	Concrete
SEA+DX-S1.1-TKO-BP002	3458734.2	7431108.8	0.0	Gravelly SAND
SEA+DX-S1.1-TKO-BP003	3458697.8	7431102.6	0.0	Gravelly SAND
SEA+DX-S1.1-TKO-BP004	3458691.4	7431092.5	0.1	Gravelly SAND
SEA+DX-S1.1-TKO-BP005	3458692.4	7431082.3	0.1	Gravelly SAND
SEA+DX-S1.1-TKO-BP006	3458693.9	7431072.0	0.1	Soil
SEA+DX-S1.1-TKO-BP007	3458695.3	7431061.8	0.1	Soil
SEA+DX-S1.1-TKO-BP008	3458696.8	7431051.5	0.0	Gabion wall
SEA+DX-S1.1-TKO-BP009	3458698.3	7431041.2	0.0	Concrete
SEA+DX-S1.1-TKO-BP010	3458699.7	7431030.9	0.0	Concrete
SEA+DX-S1.1-TKO-BP011	3458701.2	7431020.6	0.1	Gravelly SAND
SEA+DX-S1.1-TKO-BP012	3458728.9	7430958.9	0.0	GRAVEL and COBBLES

Probe Number	Easting (m)	Northing (m)	Penetration (m)	Summary
SEA+DX-S1.1-TKO-DP001	3458708.7	7430653.5	1.6	CLAY/SILT
SEA+DX-S1.1-TKO-DP002	3458709.2	7430638.2	1.2	CLAY/SILT
SEA+DX-S1.1-TKO-DP003	3458771.8	7430622.8	1.1	CLAY/SILT
SEA+DX-S1.1-TKO-DP004	3458774.3	7430607.4	1.0	CLAY/SILT
SEA+DX-S1.1-TKO-DP005	3458708.5	7430577.9	2.0	CLAY/SILT
SEA+DX-S1.1-TKO-DP006	3458729.9	7430521.2	1.8	CLAY/SILT
SEA+DX-S1.1-TKO-DP007	3458732.4	7430516.6	1.6	CLAY/SILT
SEA+DX-S1.1-TKO-DP008	3458771.4	7430331.3	2.0	CLAY/SILT
SEA+DX-S1.1-TKO-DP009	3458811.9	7430634.6	0.3	CLAY/SILT with dumped materials
SEA+DX-S1.1-TKO-DP010	3458832.4	7430637.9	0.1	CLAY/SILT with dumped materials

SEA+DX-S1.1-OPT-WHB-GC001 Penetration: 1.50m Recovery: 1.25m

Seabed	kPa	kg/cm²	Description
0.00m	1		Very soft, grey, slightly gravelly, silty CLAY. GRAVEL fraction comprises 100% shell fragments up to 10mm in diameter
0.50m	2		Loose, grey, clayey SAND
1.00m			Very soft, grey, CLAY
			Very soft, grey, slightly gravelly, sandy CLAY. GRAVEL fraction comprises 100% shell fragments up to 32mm in diameter

SEA+DX-S1.1-OPT-WHB-GC002 Penetration: 1.20m Recovery: 1.00m

Seabed	kPa	kg/cm²	Description
0.00m	1		Very soft, grey, slightly gravelly, sandy CLAY. GRAVEL fraction comprises 100% pebbles up to 12mm in diameter
0.50m			Very soft, grey, CLAY
1.00m			Very soft, grey, slightly gravelly, sandy CLAY. GRAVEL fraction comprises 100% shell fragments up to 16mm in diameter
			Loose, grey, slightly gravelly, clayey SAND. GRAVEL fraction comprises 100% shell fragments up to 18mm in diameter

SEA+DX-S1.1-OPT-WHB-GC003a Penetration: 0.80m Recovery: 0.60m

Seabed	kPa	kg/cm²	Description
0.00m			Loose, grey, slightly gravelly, clayey SAND. GRAVEL fraction comprises 100% shell fragments up to 14mm in diameter
0.50m			Very soft, grey, slightly gravelly, sandy CLAY. GRAVEL fraction comprises 100% shell fragments up to 16mm in diameter
			Loose, grey, gravelly, clayey SAND with a piece of seaplant (not. GRAVEL fraction comprises 100% shell fragments up to 25mm in diameter

SEA+DX-S1.1-OPT-WHB-GC003 Penetration: 0.50m Recovery: 0.40m

Seabed	kPa	kg/cm²	Description
0.00m	2		Loose, grey, slightly gravelly, clayey SAND. GRAVEL fraction comprises 100% shell fragments up to 14mm in diameter
			Very soft, grey, slightly sandy CLAY
			Very soft, grey, gravelly, very sandy CLAY. GRAVEL fraction comprises 100% shell fragments up to 18mm in diameter

SEA+DX-S1.1-WHZ-GC001 Penetration: 0.80m Recovery: 0.64m

Seabed	kPa	kg/cm²	Description
0.00m	2		Very soft, grey, gravelly CLAY. GRAVEL fraction comprises 80% of concrete fragments up to 50mm diameter and 20% shell fragments up to 10mm diameter
0.50m	6		Very soft, grey, slightly gravelly, sandy CLAY. GRAVEL fraction comprises 100% shell fragments up to 8mm diameter
			Loose, light grey, sandy GRAVEL fraction comprises 100% shell fragments up to 8mm diameter
			Very soft, grey, CLAY

SEA+DX-S1.1-WHZ-GC001a Penetration: 0.20m Recovery: 0.10m

Seabed	kPa	kg/cm²	Description
0.00m			Very soft, grey, gravelly CLAY. GRAVEL fraction comprises 80% of concrete fragments up to 60mm diameter and 20% shell fragments up to 10mm diameter

SEA+DX-S1.1-TKO-GS001

Seabed	kPa	kg/cm²	Description
0.00m			Very soft, grey, CLAY

CARTOGRAPHIC SYMBOLS

Post survey route with kilometre post and reverse kilometre post

Adjacent route

Beach manhole / After 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

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 (underscore thickness < target burial depth)
- r — ROCK outcrop

- SC001 5x5x1 — Isolated scour contact with reference number (length x width x height in metres where measurable; nmh = no measurable height)
- 50x5 5x1 — Linear scour contact, dashed where partially buried
- SC001 20x10x7 — Located wreck with reference no. (length x width x height in metres where measurable)
- SD001 -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 (GG); 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 — Seabed depression or pockmark with diameter (d) and depth (D) in metres, where discernible

- 1.5/0.3 — Orientation of sandwave crest (with wavelength and height in metres)
- 1.4/0.8 — Orientation of megaripple crest (with wavelength and height in metres)
- 7.1 — Orientation of sediment ribbon
- 20 — 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

- 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)

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)	5.7 (above LAT)	8.7 (above LAT)
Maximum depth (m)	33	35
Mean depth (m)	19	20

From the BWH, the proposed route first heads northeast at it leaves the landing site. The route gently alters course inside the bay, settling on a south-westerly heading in the northern part of the chart, as it crosses very soft to soft sediments. The route then performs an S-turn towards east as it threads through several large patches of dumped materials in the southern part of the chart, while crossing a series of IS cables. The route redirects south-southwest near the southern margin on interbedded loose to medium dense SAND and very soft to firm CLAY/SILT.

The seabed gently dips towards south/SSW. Very steep slopes were mainly observed along the coast in the rocky areas in the eastern part and the southern margin of the chart. Localised moderate to steep slopes associated with dumped materials are observed in the southern part of the chart.

SEABED FEATURES

Dumped materials are mapped throughout the chart.

Scattered to numerous BOULDERS/debris/dumped materials (general height: <1m) are mapped throughout of the chart.

Scattered to numerous scars and scattered to numerous depressions [diameter: >7m, depth: <1m] are mapped throughout the chart.

Scattered to numerous scars are mapped throughout the chart.

Sonar Contacts: SEA-H2X-S1.1-OPT-WHB-SC001 to SC017, SEA-H2X-S1.1-WHZ-SC001 to SC004

Magnetometer Contacts: SEA-H2X-S1.1-OPT-WHB-MC001 to MC105

Boulder Contacts: Nil

SHALLOW GEOLOGY

Low to high relief ROCK is mapped in the eastern part and near the southern margin of the chart.

Tetrapod seawall is observed in the eastern part of the chart.

Rubble mound seawall is observed in the northern part of the chart.

ROCK armor is observed around an existing pipeline in the north-eastern and southern parts of the chart.

Subcropping ROCK areas are mapped near the southern margin of the chart.

Areas mainly consisting of GRAVEL and SAND are mapped in the southern part of the chart.

Sediment Samples: SEA-H2X-S1.1-TKO-BP001 to BP012, SEA-H2X-S1.1-TKO-DP001 to DP010, SEA-H2X-S1.1-TKO-GS001, SEA-H2X-S1.1-WHZ-GC001 and GC001a, SEA-H2X-S1.1-OPT-WHB-GC001 to GC003 a

CPT: Nil.

ADDITIONAL INFORMATION

The proposed route crosses an IS sewer pipeline in the northern part of the chart.

The proposed route crosses one planned power cable in the northern part of the chart.

The proposed route crosses six IS cables and one planned cable in the southern part of the chart.

The proposed route crosses the Traffic Separation Scheme corridor.

The proposed route crosses the TrafficSeparationScheme in the southern part of the chart.

The proposed route enters the Foul Area in the southern part of the chart.

The proposed route runs inside Guangzhou VTS.

The proposed route runs inside Hong Kong SAR waters.

GENERAL NOTES

Survey vessel	Inshore and Shallow Water
Surface positioning system	MV Wing Hung 2 C-Nav 3050 DGPS Qinsy Navigation System
Underwater positioning System	Kongsberg micronPAP 200 USBL System
Bathymetry	Kongsberg EA440 Singlebeam Echo Sounder System R2Sonic Sonic 2024 MBES
Morphology and stratigraphy	EdgeTech 4205 Side Scan Sonar System Innomar SES-2000 medium-100 Sub-bottom Profiler
Magnetometer survey	C-Boom Low Voltage Boomer System Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong waters except 6m burial for KP0.176 to KP2.351

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

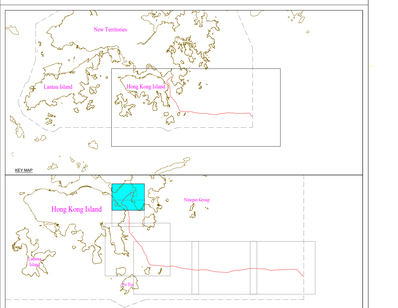
GEODETIC PARAMETERS

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, 2022 and tidal measurements at the EGS tide gauge installed at Tai Mu Wan.

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



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Survey Date: Aug 2022, April - May 2023

Scale :

NATURAL SCALE 1 : 5,000 at 16° N

(At mid-latitude of chart)
TRUE SCALE 1 : 4814.25

0 100 200 300 400 500 m

Purchaser : Contractor : Surveyor :

Project Name: Southeast Asia-Hainan-HongKong Express Cable (SEA-H2X) - Hong Kong Waters Marine Route Survey

Document Title: SEGMENT 1.1 (TKO Hong Kong to BU1) NORTH LIP CHART CHART NO. 001 OF 002 (KP 0.00 - KP 3.91)

2.1	Sep 2024	Chester Quek / K. F. Lai	Margie Chen	Even Mak
2	Apr 2024	Chester Quek / K. F. Lai	Margie Chen	Even Mak
1	Aug 2023	Chester Quek / K. F. Lai	Margie Chen	Even Mak
Rev	Date	Prepared by	Checked by	Approved by

Final

Route Based Upon: SEA-H2X_S1.1_TKO (Hongkong) to BU1 RPL 2-OTU 240911.ats

File Name: SEA-H2X-S1.1-TKO-NU-A-001

CARTOGRAPHIC SYMBOLS

- Post survey route with kilometre post and reverse kilometre post
- Adjacent route
- Beach manhole / After 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

- cor — Coral
- fs — Fine sediment (predominantly CLAY/SILT)
- cs — Coarse sediment (SAND and GRAVEL)
- vcs — Very coarse sediment (COBBLES and BOULDERS)
- fs/sa/vcs — Very dense/Very stiff sediment
- fs/sa/vcs — Subcropping ROCK with predominant sediment classification (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)
- Unidentified magnetic anomaly with reference number and amplitude (In nano-Tesla)
- Cable/Pipeline position, as determined by magnetometer, with reference number and amplitude (In nano-Tesla)
- SC001 5x5x1 — Isolated scour contact with reference number (length x width x height in metres where measurable; nmh = no measurable height)
- 50x5 5x1 — Linear scour contact, dashed where partially buried
- SC001 20x10x1 — Located wreck with reference no. (length x width x height in metres where measurable)
- SE001 -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
- dD — Seabed depression or pockmark with diameter (d) and depth (D) in metres, where discernible
- 1.5/0.3 — Orientation of sandwave crest (with wavelength and height in metres)
- 4.0/0.8 — Orientation of megaripple crest (with wavelength and height in metres)
- 77 — Orientation of sediment ribbon
- MC001 5.0 — 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)	15	3
Maximum depth (m)	33	35
Average depth (m)	23	23

The route performs an S turn towards east as it crosses a series of IS cables in the northern part of the chart. The route then adjusts its heading to south-southeast near the center, then towards south in the southern half of the chart.

The seabed generally descends towards south. Very steep slopes were mainly observed along the coast in the rocky areas in the western part of the chart. Localized moderate to steep slopes associated with dumped materials are observed in the southern part of the chart.

SEABED FEATURES

Dumped materials are mapped throughout the chart.

Scattered to numerous BOULDERS/debris/dumped materials (general height: <1m) are mapped throughout of the chart.

Scattered to numerous scars and scattered to numerous depressions (diameter: <7m, depth: <1m) are mapped throughout the chart.

Megaripples (wavelength: <2m, depth: <2m) are observed in the southern part of the chart.

Sonar Contacts: SEA-H2X-S1.3-WH2-SO03 to SO119

Magnetometer Contacts: SEA-H2X-S1.3-WH2-MC048 to MC131, SEA-H2X-S1.1-WH2-MC026 to MC055

Seismic Contacts: Nil

SHALLOW GEOLOGY

Low to high relief ROCK is mapped in the western part of the chart.

Low relief ROCK is observed in the north-eastern part of the chart.

Subcropping ROCK areas are mapped in western and southern parts of the chart.

Areas mainly consisting of GRAVEL and SAND are mapped throughout the chart.

Sediment Samples: SEA-H2X-S1.1-OPT-WHB-GC002 to GC004a, SEA-H2X-S1.1-TKO-GS001 to GS004, SEA-H2X-S1.1-WH2-GC001 to GC003a

OFI: Nil.

ADDITIONAL INFORMATION

The proposed route crosses six IS cables and one planned cable in the northern part of the chart.

The proposed route crosses one IS cable in the southern part of the chart.

Two SI and one planned cables run within the survey corridor.

The proposed route crosses the Fish Culture Zone between Sha Chau and the Lung Kwu Chau Anchorage in the northern part of the chart.

The proposed route enters Declared Minefield – Tathong Channel near the center of the chart.

The proposed route runs inside Southern Gazetted Waters.

The proposed route runs inside Hong Kong SAR waters.

GENERAL NOTES

Survey vessel	Inshore and Shallow Water MV Wing Hung 2
Surface positioning system	C-Nav 3050 GCGPS Qimry Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Kongsberg EA440 Single/dual-m Echo Sounder System R2Sonic Sonic 2024 MBES
Morphology and stratigraphy	EdgeTech 4205 Side Scan Sonar System Innomar SES-2000 medium +100 Sub-bottom Profiler
Magnetometer survey	C-Boom Low Voltage Boomer System Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong waters except 6m burial for KP0.176 to KP2.351

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) : 0.000 000	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, 2022 and tidal measurements at the EGS tide gauge installed at Tai Miu Wan.

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

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Survey Date: Aug 2022, April - May 2023

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

(At mid-latitude of chart) 0 100 200 300 400 500 m

TRUE SCALE 1 : 4814.97

Purchaser : Contractor : Surveyor :

Project Name: Southeast Asia-Hainan-HongKong Express Cable (SEA-H2X) - Hong Kong Waters Marine Route Survey

Document Title: SEGMENT 1.1 (TKO Hong Kong to BU1) NORTH UP CHART CHART NO. 002 OF 002 (KP 1.97 - KP 6.27)

Rev	Date	Prepared by	Checked by	Approved by	
2.1	Sep 2024	Chester Quek / K. F. Lai	Margie Chen	Even Mak	
2	Apr 2024	Chester Quek / K. F. Lai	Margie Chen	Even Mak	
1	Aug 2023	Chester Quek / K. F. Lai	Margie Chen	Even Mak	Final

Route Based Upon: SEA-H2X_S1.1_TKO (Hongkong) to BU1 RPL 2-OTU 240911.xls

File Name: SEA-H2X-S1.1-TKO-NU-A-002

Prone Number	Easting (m)	Northing (m)	Penetration (m)	Summary
SEA-H2X-S1.1-TKO-BP001	3458710.7	7431117.0	0.0	Concrete
SEA-H2X-S1.1-TKO-BP002	3458754.2	7431108.8	0.0	Gravelly SAND
SEA-H2X-S1.1-TKO-BP003	3458697.8	7431100.6	0.0	Gravelly SAND
SEA-H2X-S1.1-TKO-BP004	3458691.4	7431092.5	0.1	Gravelly SAND
SEA-H2X-S1.1-TKO-BP005	3458692.4	7431082.3	0.1	Gravelly SAND
SEA-H2X-S1.1-TKO-BP006	3458693.9	7431072.0	0.1	Soil
SEA-H2X-S1.1-TKO-BP007	3458695.3	7431061.8	0.1	Soil
SEA-H2X-S1.1-TKO-BP008	3458696.8	7431051.5	0.0	Gabion wall
SEA-H2X-S1.1-TKO-BP009	3458698.3	7431041.2	0.0	Concrete
SEA-H2X-S1.1-TKO-BP010	3458699.7	7431030.9	0.0	Concrete
SEA-H2X-S1.1-TKO-BP011	3458701.2	7431020.6	0.1	Gravelly SAND
SEA-H2X-S1.1-TKO-BP012	3458708.9	7430958.9	0.0	GRAVEL and COBBLES

Prone Number	Easting (m)	Northing (m)	Penetration (m)	Summary
SEA-H2X-S1.1-TKO-DP001	3456766.7	7430553.5	1.6	CLAY/SILT
SEA-H2X-S1.1-TKO-DP002	3456769.2	7430538.2	1.2	CLAY/SILT
SEA-H2X-S1.1-TKO-DP003	3456771.8	7430522.9	1.1	CLAY/SILT
SEA-H2X-S1.1-TKO-DP004	3456774.3	7430507.4	1.0	CLAY/SILT
SEA-H2X-S1.1-TKO-DP005	3456739.5	7430517.9	2.0	CLAY/SILT
SEA-H2X-S1.1-TKO-DP006	3456729.9	7430521.2	1.8	CLAY/SILT
SEA-H2X-S1.1-TKO-DP007	3456710.4	7430524.6	1.6	CLAY/SILT
SEA-H2X-S1.1-TKO-DP008	3456701.4	7430531.3	2.0	CLAY/SILT
SEA-H2X-S1.1-TKO-DP009	3456811.9	7430534.6	0.3	CLAY/SILT with dumped materials
SEA-H2X-S1.1-TKO-DP010	3456832.4	7430537.9	0.1	CLAY/SILT with dumped materials

SEA-H2X-S1.1-OPT-WHB-GC002 Penetration: 1.20m Recovery: 1.00m

Seabed	kPa	kg/cm²	Description
0.00m	1		Very soft, grey, slightly gravelly, sandy CLAY; GRAVEL fraction comprises 100% pebbles up to 12mm in diameter
0.50m			Very soft, grey, CLAY
1.00m			Very soft, grey, slightly gravelly, sandy CLAY; GRAVEL fraction comprises 100% shell fragments up to 16mm in diameter
			Loose, grey, slightly gravelly, clayey SAND; GRAVEL fraction comprises 100% shell fragments up to 18mm in diameter

SEA-H2X-S1.1-OPT-WHB-GC002a Penetration: 0.80m Recovery: 0.60m

Seabed	kPa	kg/cm²	Description
0.00m	2		Loose, grey, slightly gravelly, clayey SAND; GRAVEL fraction comprises 100% shell fragments up to 14mm in diameter
0.50m			Very soft, grey, slightly gravelly, sandy CLAY; GRAVEL fraction comprises 100% shell fragments up to 16mm in diameter
			Loose, grey, gravelly, clayey SAND with a piece of seaplant (root, GRAVEL fraction comprises 100% shell fragments up to 22mm in diameter

SEA-H2X-S1.1-OPT-WHB-GC003 Penetration: 0.50m Recovery: 0.40m

Seabed	kPa	kg/cm²	Description
0.00m	2		Loose, grey, slightly gravelly, clayey SAND; GRAVEL fraction comprises 100% shell fragments up to 14mm in diameter
			Very soft, grey, slightly sandy CLAY
			Very soft, grey, gravelly, very sandy CLAY; GRAVEL fraction comprises 100% shell fragments up to 18mm in diameter

SEA-H2X-S1.1-OPT-WHB-GC004 Penetration: 0.80m Recovery: 0.60m

Seabed	kPa	kg/cm²	Description
0.00m	3		Very soft, grey, slightly gravelly, sandy CLAY; GRAVEL fraction comprises 100% shell fragments up to 20mm in diameter
0.50m	3		Loose, brown, clayey SAND
			Very soft, grey, silty CLAY
			Very soft, grey, slightly gravelly, sandy CLAY; GRAVEL fraction comprises 100% shell fragments up to 8mm in diameter
			Loose, greenish grey, slightly gravelly, clayey SAND; GRAVEL fraction comprises 100% shell fragments up to 16mm in diameter

SEA-H2X-S1.1-OPT-WHB-GC004a Penetration: 0.60m Recovery: 0.40m

Seabed	kPa	kg/cm²	Description
0.00m	3		Very soft, grey, sandy CLAY
	4		Loose, brown, clayey SAND
			Very soft, grey, silty CLAY

SEA-H2X-S1.1-WH2-GC001 Penetration: 0.80m Recovery: 0.64m

Seabed	kPa	kg/cm²	Description
0.00m	2		Very soft, grey, gravelly CLAY; GRAVEL fraction comprises 20% of concrete fragments up to 50mm diameter and 20% shell fragments up to 10mm diameter
0.50m	8		Very soft, grey, slightly gravelly CLAY; GRAVEL fraction comprises 100% shell fragments up to 8mm diameter
			Loose, light grey, sandy GRAVEL; GRAVEL fraction comprises 100% shell fragments up to 8mm diameter
			Very soft, grey, CLAY

SEA-H2X-S1.1-WH2-GC001a Penetration: 0.22m Recovery: 0.10m

Seabed	kPa	kg/cm²	Description
0.00m			Very soft, grey, gravelly CLAY; GRAVEL fraction comprises 80% of concrete fragments up to 60mm diameter and 20% shell fragments up to 10mm diameter

SEA-H2X-S1.1-TKO-GS001

Seabed	kPa	kg/cm²	Description
0.00m			Very soft, grey, CLAY

SEA-H2X-S1.1-TKO-GS002

Seabed	kPa	kg/cm²	Description
0.00m			Very soft, grey, CLAY

SEA-H2X-S1.1-TKO-GS003

Seabed	kPa	kg/cm²	Description
0.00m			Very soft, grey, CLAY

SEA-H2X-S1.1-TKO-GS004

Seabed	kPa	kg/cm²	Description
0.00m			Loose, grey, gravelly SAND with sea plant root; GRAVEL fraction comprises 100% shell fragments up to 20mm diameter

SEA-H2X-S1.1-WH2-GC002a Penetration: 0.20m Recovery: 0.10m

Seabed	kPa	kg/cm²	Description
0.00m			Very soft, grey, gravelly, sandy CLAY; GRAVEL fraction comprises 100% shell fragments up to 20mm diameter

SEA-H2X-S1.1-WH2-GC002 Penetration: 0.30m Recovery: 0.15m

Seabed	kPa	kg/cm²	Description
0.00m			Very soft, grey, very sandy CLAY
			Loose, grey, gravelly, clayey SAND; GRAVEL fraction comprises 100% shell fragments up to 20mm diameter

Contact Name	Easting (m)	Northing (m)	Amplitude (nT)	Description
SEA-H2X-S1.1-OPT-WHB-MC048	3458671.3	7431198.0	607.7	Unknown
SEA-H2X-S1.1-OPT-WHB-MC049	3458614.0	7431179.0	376.9	Unknown
SEA-H2X-S1.1-OPT-WHB-MC050	3458738.5	7431159.5	138.5	IS ASE seg 4
SEA-H2X-S1.1-OPT-WHB-MC051	3458617.8	7431150.0	184.2	IS EAC 1 seg D
SEA-H2X-S1.1-OPT-WHB-MC052	3458709.8	7431137.5	239.6	Unknown
SEA-H2X-S1.1-OPT-WHB-MC053	3458622.0	7431108.5	818.2	IS EAC 2 seg 2A1
SEA-H2X-S1.1-OPT-WHB-MC054	3458250.8	7431085.0	1584.5	Unknown
SEA-H2X-S1.1-OPT-WHB-MC055	3458273.0	7431074.0	916.8	Unknown
SEA-H2X-S1.1-OPT-WHB-MC056	3458593.3	7431040.5	434.1	IS Sewer Pipe
SEA-H2X-S1.1-OPT-WHB-MC057	3458647.5	7431011.0	390.3	Unknown
SEA-H2X-S1.1-OPT-WHB-MC058	3458577.3	7430992.0	312.9	Unknown
SEA-H2X-S1.1-OPT-WHB-MC059	3458608.3	7430959.5	287.0	IS EAC 1 seg C
SEA-H2X-S1.1-OPT-WHB-MC060	3458069.5	7430934.0	30.1	IS EAC 1 seg D
SEA-H2X-S1.1-OPT-WHB-MC061	3458117.3	7430894.5	117.0	IS EAC 2 seg 2A1
SEA-H2X-S1.1-OPT-WHB-MC062	3458196.0	7430858.0	130.9	Unknown
SEA-H2X-S1.1-OPT-WHB-MC063	3458255.8	7430824.0	62.7	IS Ultra Link Express
SEA-H2X-S1.1-OPT-WHB-MC064	3458402.3	7430798.5	1101.1	Possible Unspecified Pipe
SEA-H2X-S1.1-OPT-WHB-MC065	3458397.3	7430795.5	10.2	IS TKO Express
SEA-H2X-S1.1-OPT-WHB-MC066	3458468.5	7430757.0	992.3	Possible Unspecified Pipe
SEA-H2X-S1.1-OPT-WHB-MC067	3458413.5	7430739.5	263.4	IS APG seg 6
SEA-H2X-S1.1-OPT-WHB-MC068	3458468.9	7430722.5	1519.2	Possible Unspecified Pipe
SEA-H2X-S1.1-OPT-WHB-MC069	3458560.8	7430695.0	404.2	Unknown
SEA-H2X-S1.1-OPT-WHB-MC070	3458514.3	7430662.0	217.2	IS ASE seg 4
SEA-H2X-S1.1-OPT-WHB-MC071	3458589.3	7430678.0	184.0	Unknown
SEA-H2X-S1.1-OPT-WHB-MC072	3458210.0	7430654.0	1550.2	Unknown
SEA-H2X-S1.1-OPT-WHB-MC073	3458580.0	7430651.0	183.9	IS Ultra Link Express
SEA-H2X-S1.1-OPT-WHB-MC074	3458622.3	7430635.0	518.5	Unknown
SEA-H2X-S1.1-OPT-WHB-MC075	3458524.5	7430627.5	45.9	Unknown
SEA-H2X-S1.1-OPT-WHB-MC076	3458626.0	7430625.0	999.9	IS Sewer Pipe
SEA-H2X-S1.1-OPT-WHB-MC077	3458112.5	7430592.5	399.5	IS TKO Express
SEA-H2X-S1.1-OPT-WHB-MC078	3458373.5	7430558.5	90.7	IS APG seg 6
SEA-H2X-S1.1-OPT-WHB-MC079	3458507.8	7430552.5	377.0	IS TKO Express
SEA-H2X-S1.1-OPT-WHB-MC080	3458477.5	7430547.0	168.3	IS Ultra Link Express
SEA-H2X-S1.1-OPT-WHB-MC081	3458492.0	7430542.5	21.5	IS ASE seg 4
SEA-H2X-S1.1-OPT-WHB-MC082	3458492.3	7430528.5	1059.8	Unknown
SEA-H2X-S1.1-OPT-WHB-MC083	3458542.5	7430528.5	1672.3	IS Sewer Pipe
SEA-H2X-S1.1-OPT-WHB-MC084	3458494.3	7430518.0	477.9	IS TKO Express
SEA-H2X-S1.1-OPT-WHB-MC085	3458940.0	7430510.0	29.5	IS EAC 1 seg D
SEA-H2X-S1.1-OPT-WHB-MC086	3458481.0	7430509.0	91.5	IS EAC 2 seg 2A1
SEA-H2X-S1.1-OPT-WHB-MC087	3458582.5	7430384.0	10.8	IS EAC 2 seg 2A1
SEA-H2X-S1.1-OPT-WHB-MC088	3458577.0	7430382.0	46.6	IS EAC 1 seg D
SEA-H2X-S1.1-OPT-WHB-MC089	3458724.5	7430380.0	58.8	IS EAC 1 seg C
SEA-H2X-S1.1-OPT-WHB-MC090	3458481.0	7430377.5	94.2	IS ASE seg 4
SEA-H2X-S1.1-OPT-WHB-MC091	3458331.0	7430378.5	148.8	IS APG seg 6
SEA-H2X-S1.1-OPT-WHB-MC092	3458539.4	7430375.5	198.8	Unknown
SEA-H2X-S1.1-OPT-WHB-MC093	3458549.8	7430325.0	23.0	IS EAC 2 seg 2A1
SEA-H2X-S1.1-OPT-WHB-MC094	3458794.5	7430311.5	210.7	IS EAC 1 seg D
SEA-H2X-S1.1-OPT-WHB-MC095	3458560.8	7430294.0	302.0	IS EAC 1 seg C
SEA-H2X-S1.1-OPT-WHB-MC096	3458582.5	7430287.5	328.5	Unknown
SEA-H2X-S1.1-OPT-WHB-MC097	3458512.8	7430285.0	239.8	IS ASE seg 4
SEA-H2X-S1.1-OPT-WHB-MC098	3458548.8	7430248.5	357.6	Unknown
SEA-H2X-S1.1-OPT-WHB-MC099	3458378.5	7430239.0	76.4	IS APG seg 6
SEA-H2X-S1.1-OPT-WHB-MC100	3458330.5	7430208.0	868.7	Unknown
SEA-H2X-S1.1-OPT-WHB-MC101	3458593.3	7429904.0	251.1	IS EAC 2 seg 2A1
SEA-H2X-S1.1-OPT-WHB-MC102	3458634.0	7429891.0	20.0	IS EAC 1 seg D
SEA-H2X-S1.1-OPT-WHB-MC103	3458634.8	7429847.5	68.4	IS EAC 1 seg C
SEA-H2X-S1.1-OPT-WHB-MC104	3458737.5	7429798.0	61.4	IS ASE seg 4
SEA-H2X-S1.1-OPT-WHB-MC105	3458670.3	7429770.0	260.7	IS APG seg 6
SEA-H2X-S1.1-OPT-WHB-MC106	3458170.3	7429238.5	171.9	IS EAC 2 seg 2A1
SEA-H2X-S1.1-OPT-WHB-MC107	3458152.5	7429216.5	78.0	IS EAC 1 seg C
SEA-H2X-S1.1-OPT-WHB-MC108	3458051.3	7429205.0	60.4	IS EAC 1 seg C
SEA-H2X-S1.1-OPT-WHB-MC109	3458594.0	7429219.0	403.2	Unknown
SEA-H2X-S1.1-OPT-WHB-MC110	3458665.5	7429216.5	454.1	IS ASE seg 4
SEA-H2X-S1.1-OPT-WHB-MC111	3458582.3	7429214.5	67.7	IS APG seg 6
SEA-H2X-S1.1-OPT-WHB-MC112	3458582.3	7429187.5	16.0	IS EAC 1 seg D
SEA-H2X-S1.1-OPT-WHB-MC113	3458358.8	7429464.0	8.9	IS EAC 2 seg 2A1
SEA-H2X-S1.1-OPT-WHB-MC114	3458035.5	7429444.5	55.7	IS EAC 1 seg C
SEA-H2X-S1.1-OPT-WHB-MC115	3458597.8	7429442.0	115.2	IS ASE seg 4
SEA-H2X-S1.1-OPT-WHB-MC116	3457588.5	7429422.5	160.0	Unknown
SEA-H2X-S1.1-OPT-WHB-MC117	3458152.8	7429420.5	28.4	IS EAC 1 seg D
SEA-H2X-S1.1-OPT-WHB-MC118	3458367.3	7429381.5	174.2	IS EAC 2 seg 2A1
SEA-H2X-S1.1-OPT-WHB-MC119	3458118.0	7429345.5	67.7	IS ASE seg 4
SEA-H2X-S1.1-OPT-WHB-MC120	3458564.3	7429322.0	23.1	Possible IS EAC 1 seg C
SEA-H2X-S1.1-OPT-WHB-MC121	3458413.5	7429285.5	399.8	IS EAC 2 seg 2A1
SEA-H2X-S1.1-OPT-WHB-MC122	3458068.5	7429249.5	35.9	IS APG seg 6
SEA-H2X-S1.1-OPT-WHB-MC123	3458358.3	7429243.0	135.2	IS EAC 1 seg D
SEA-H2X-S1.1-OPT-WHB-MC124	3458046.3	7429202.0	19.0	Possible IS EAC 1 seg C
SEA-H2X-S1.1-OPT-WHB-MC125	3458215.5	7429179.5	32.2	IS ASE seg 4
SEA-H2X-S1.1-OPT-WHB-MC126	3458553.0	7429121.0	13.5	IS APG seg 6
SEA-H2X-S1.1-OPT-WHB-MC127	3458031.0	7429095.0	5.8	IS EAC 1 seg D
SEA-H2X-S1.1-OPT-WHB-MC128	3458068.0	7429089.5	5.7	IS APG seg 6
SEA-H2X-S1.1-OPT-WHB-MC129	3457592.0	7427590.5	9.3	IS APG seg 6
SEA-H

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

- cor — Coral
- fs — Fine sediment (predominantly CLAY/SILT)
- cs — Coarse sediment (SAND and GRAVEL)
- vcs — Very coarse sediment (COBBLES and BOULDERS)
- fs/sa/vcs — Very dense/Very stiff sediment
- fs/sa/vcs — Subcropping ROCK with predominant sediment classification (sediment thickness < target burial depth)
- r — ROCK outcrop
- Sediment or feature boundary
- Inferred 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)
- 50x5 5x1 — Linear sonar contact, dashed where partially buried
- SC001 20x10x1 — Located wreck with reference no. (length x width x height in metres where measurable)
- SE001 -2.5 — Seismic 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
- sSD — 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
- BP001 — Fault with depth below seafloor (Hachures on down side)
- BS001 — Beach probe (BP); Beach sample (BS) location with reference number
- DP001 — 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)	23	8
Maximum depth (m)	33	36
Maximum gradient (°)	11	70

The proposed route first heads to south to southeast in general, turning east in the southern part of the chart.
The nearshelly dips towards southeast. Very large slope gradients are mainly observed along the coast of the islands. Localized moderate to very steep slopes associated with seabed materials are observed in the chart area.

SEABED FEATURES

Dumped materials are mapped in the center and in the northern parts of the chart.
Numerous debris/dumped materials (general height: <1m) are mapped throughout of the chart.
Scattered scars and scattered to numerous depressions (diameter: <7m, depth: <1m) are mapped throughout the chart.
Scattered BOULDERS are observed in the southern part of the chart.
Megaripples (wavelength: <1m, depth: <1m) are observed in the northern part of the chart.

Sonar Contacts: SEA-H2X-S1.1-WH2-SO218 to SO255

Magnetometer Contacts: SEA-H2X-S1.1-OPT-WHB-MC129 to MC131, SEA-H2X-S1.1-WH2-MC053 to SEA-H2X-S1.1-WH2-MC213, SEA-H2X-S1.1-WH2-MC213

Seismic Contacts: Nil.

SHALLOW GEOLOGY

Areas of low to high relief ROCK and subcropping ROCK are mapped in the northern, the center and the southeastern parts of the chart.
<5m of very soft to soft sandy SILT/CLAY is observed in the northern part of the chart.
1m to 5m of very soft to soft slightly gravelly very sandy CLAY is mapped in the center of the chart.
3m to 5m of loose to medium dense slightly gravelly very clayey SAND is mapped in the southeastern part of the chart.
3m to 5m of very soft to soft CLAY over medium dense to dense SAND/firm to stiff CLAY is mapped in the southeastern part of the chart.

Sediment Samples: SEA-H2X-S1.1-WH2-GC002, SEA-H2X-S1.1-WH2-GC003, SEA-H2X-S1.1-WH2-GC002a, SEA-H2X-S1.1-WH2-GC003a

CPT: Nil.

ADDITIONAL INFORMATION

The proposed route crosses thirteen (I) cables, six (OD) cables and two planned cables.
The proposed route exits the Declared Minefield – Taitung Channel near the center of the chart.
The proposed route runs inside Guangzhou VTS.
The proposed route runs inside Hong Kong SAR waters.

GENERAL NOTES

Survey vessel	Inshore and Shallow Water
Surface positioning system	MV Wing Hung 2 C-Nav 3050 GcGPS
Underwater positioning System	Qinsy Navigation System Kongsberg microNAP 200 USBL System
Bathymetry	Kongsberg EA440 Singlebeam Echo Sounder System R2Sonic Sonic 2024 MBES
Morphology and stratigraphy	EdgeTech 4205 Side Scan Sonar System Innomar SES-2000 medium-100 Sub-bottom Profiller
Magnetometer survey	C-Boom Low Voltage Boomer System Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong waters except 6m burial for KP0.176 to KP2.351
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

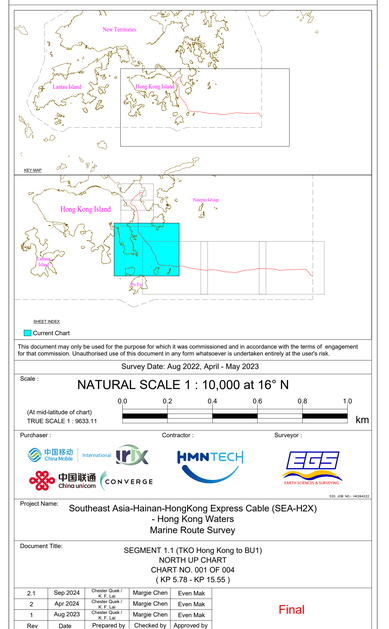
Map Projection Parameters
Projection : Mercator
Central Meridian (m) : 5 000 000
False Easting (m) : 3 000 000

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 (711) as stated in Admiralty Tide Tables, Volume 6, 2022 and total measurements at the EGS tide gauge installed at Tai Miu Wan.

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



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Survey Date: Aug 2022, April - 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 : Contractor : Surveyor :

China Mobile International · IRX · HMN TECH · China unicom · CONVERGE · EGS Earth & Ocean Sciences

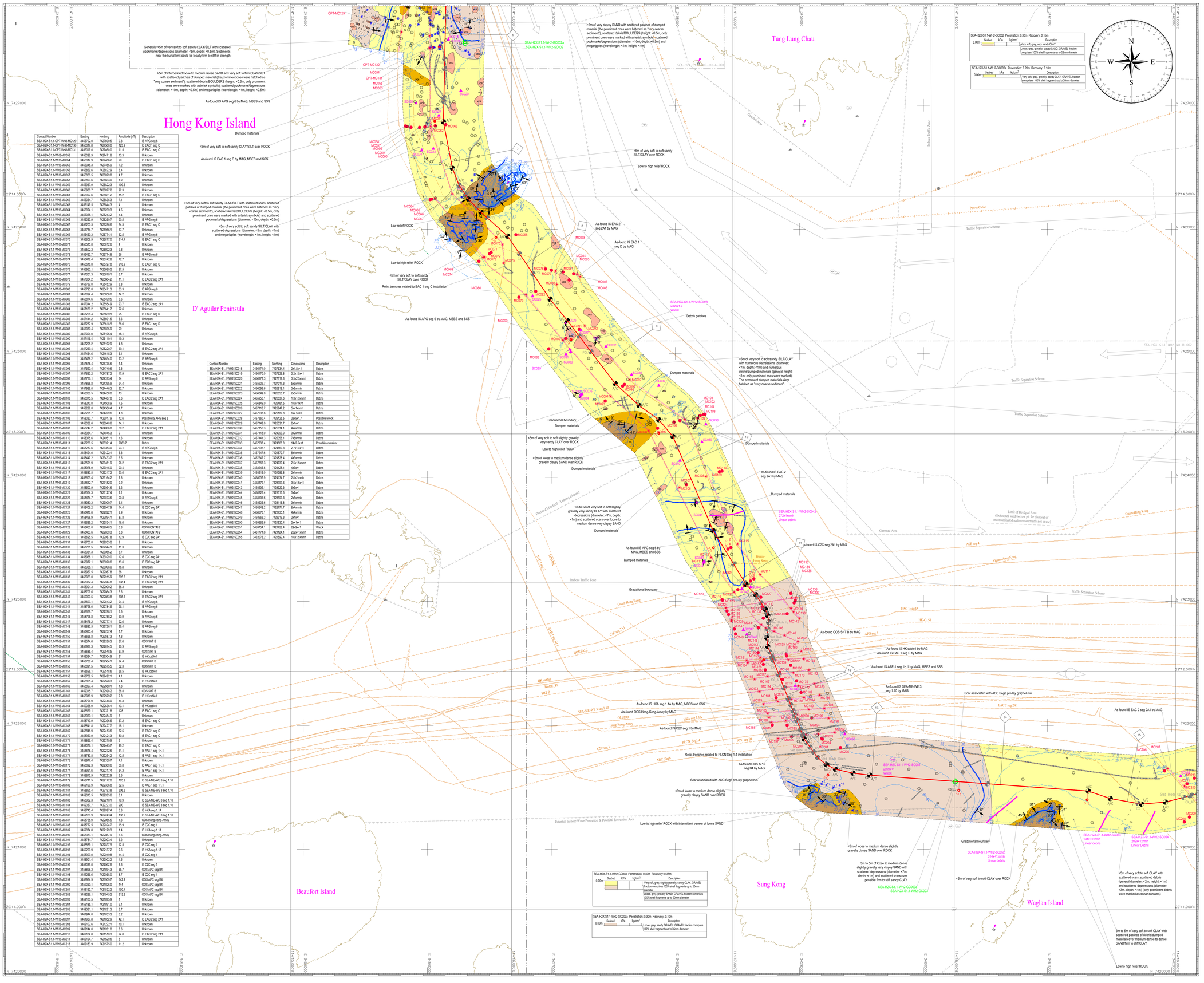
EGS JOB NO.: HK044222

Project Name:
Southeast Asia-Hainan-HongKong Express Cable (SEA-H2X)
- Hong Kong Waters
Marine Route Survey

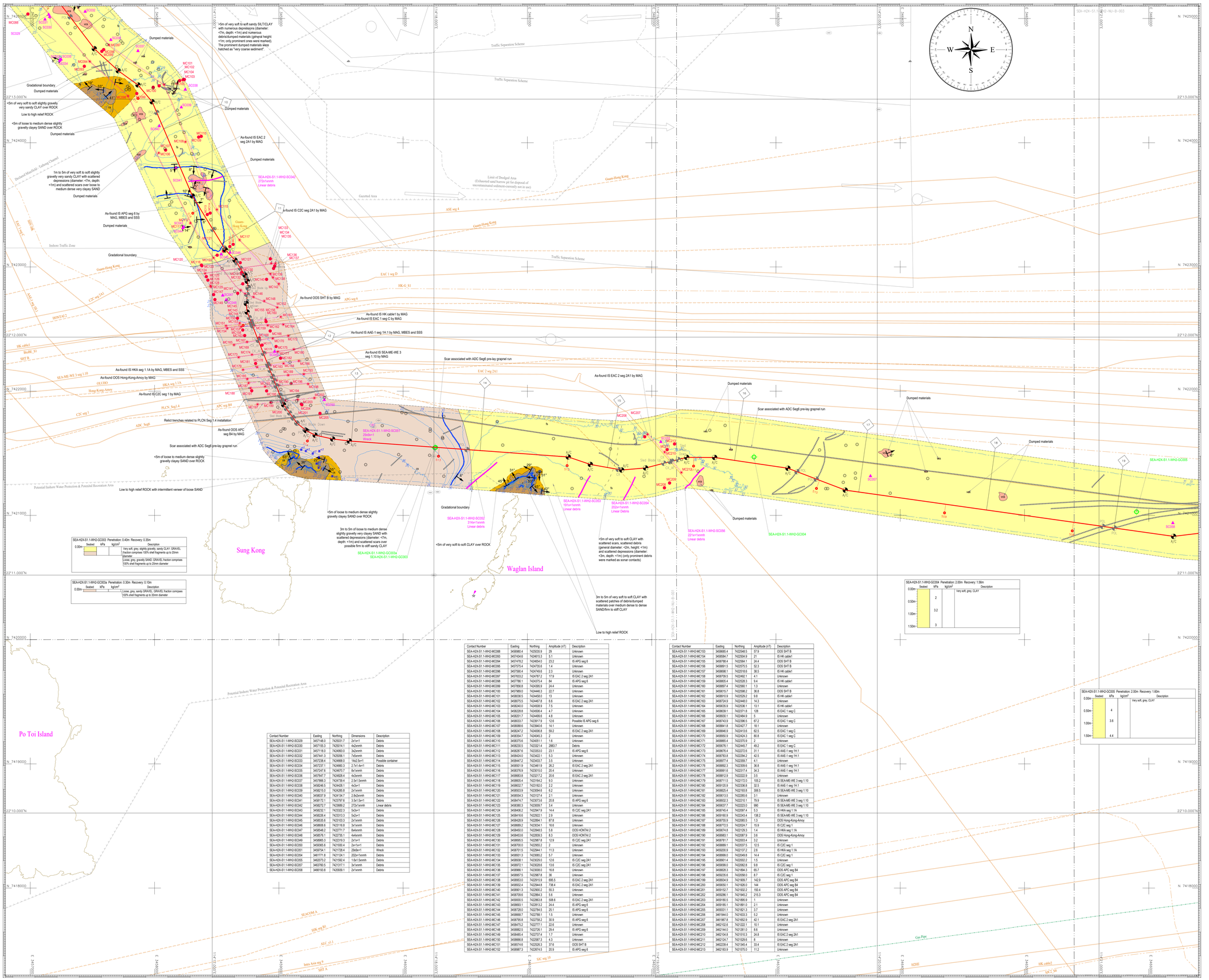
Document Title:
SEGMENT 1.1 (TKO Hong Kong to BU1)
NORTH UP CHART
CHART NO. 001 OF 004
(KP 5.78 - KP 15.55)

Rev	Date	Prepared by	Checked by	Approved by	
2.1	Sep 2024	Chester Quek / K. F. Lai	Margie Chen	Even Mak	
2	Apr 2024	Chester Quek / K. F. Lai	Margie Chen	Even Mak	
1	Aug 2023	Chester Quek / K. F. Lai	Margie Chen	Even Mak	Final

Route Based Upon: SEA-H2X_S1.1_TKO (Hongkong) to BU1 RPL 2-07d 240911.xls
File Name: SEA-H2X-S1.1-WH2-NU-B-001



Contact Number	Easting	Northing	Amplitude (nT)	Description
SEA-H2X-S1.1-OPT-WHB-MC129	3455782.0	7427590.5	9.3	IS APG seg 6
SEA-H2X-S1.1-OPT-WHB-MC130	3456017.8	7427560.0	123.9	IS EAC 1 seg C
SEA-H2X-S1.1-OPT-WHB-MC131	3456019.0	7427460.0	11.5	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC053	3456098.9	7427471.8	13.3	Unknown
SEA-H2X-S1.1-WH2-MC054	3456017.9	7427466.2	20	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC055	3456046.3	7427465.9	7.2	Unknown
SEA-H2X-S1.1-WH2-MC056	3455869.6	7426922.9	6.4	Unknown
SEA-H2X-S1.1-WH2-MC057	3455836.5	7426829.8	4.7	Unknown
SEA-H2X-S1.1-WH2-MC058	3455833.6	7426803.0	1.9	Unknown
SEA-H2X-S1.1-WH2-MC059	3455937.9	7426822.3	109.5	Unknown
SEA-H2X-S1.1-WH2-MC060	3455986.7	7426827.2	92.3	Unknown
SEA-H2X-S1.1-WH2-MC061	3456027.6	7426831.2	15.2	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC062	3456064.7	7426835.3	7.1	Unknown
SEA-H2X-S1.1-WH2-MC063	3456148.5	7426844.3	4	Unknown
SEA-H2X-S1.1-WH2-MC064	3456024.1	7426239.3	4.5	Unknown
SEA-H2X-S1.1-WH2-MC065	3456038.1	7426243.2	1.4	Unknown
SEA-H2X-S1.1-WH2-MC066	3456063.9	7426250.7	20.5	IS APG seg 6
SEA-H2X-S1.1-WH2-MC067	3456200.5	7426286.8	84.5	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC068	3456714.7	7425956.1	67.7	Unknown
SEA-H2X-S1.1-WH2-MC069	3456450.3	7425774.1	52.5	IS APG seg 6
SEA-H2X-S1.1-WH2-MC070	3456606.9	7425877.0	214.4	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC071	3456515.0	7425812.6	4	Unknown
SEA-H2X-S1.1-WH2-MC072	3456502.3	7425802.3	9.3	Unknown
SEA-H2X-S1.1-WH2-MC073	3456463.7	7425774.8	56	IS APG seg 6
SEA-H2X-S1.1-WH2-MC074	3456416.4	7425742.8	72.7	Unknown
SEA-H2X-S1.1-WH2-MC075	3456616.0	7425727.8	210.9	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC076	3456953.1	7425680.2	87.5	Unknown
SEA-H2X-S1.1-WH2-MC077	3457001.3	7425670.1	3.7	Unknown
SEA-H2X-S1.1-WH2-MC078	3457034.2	7425664.2	11.1	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC079	3456739.0	7425462.9	3.8	Unknown
SEA-H2X-S1.1-WH2-MC080	3456795.8	7425471.3	33.3	IS APG seg 6
SEA-H2X-S1.1-WH2-MC081	3457094.4	7425656.5	14.2	Unknown
SEA-H2X-S1.1-WH2-MC082	3456874.6	7425499.5	3.6	Unknown
SEA-H2X-S1.1-WH2-MC083	3457044.2	7425554.9	23.7	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC084	3457180.2	7425647.1	22.8	Unknown
SEA-H2X-S1.1-WH2-MC085	3457206.4	7425639.1	25	IS EAC 1 seg D
SEA-H2X-S1.1-WH2-MC086	3457144.2	7425591.5	5.6	Unknown
SEA-H2X-S1.1-WH2-MC087	3457233.9	7425618.5	36.6	IS EAC 1 seg D
SEA-H2X-S1.1-WH2-MC088	3456980.4	7425030.9	29	Unknown
SEA-H2X-S1.1-WH2-MC089	3457094.0	7425105.4	16.1	IS APG seg 6
SEA-H2X-S1.1-WH2-MC090	3457116.4	7425119.1	19.3	Unknown
SEA-H2X-S1.1-WH2-MC091	3457225.2	7425192.9	4.8	Unknown
SEA-H2X-S1.1-WH2-MC092	3457289.4	7425220.7	39.1	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC093	3457434.6	7424815.3	5.1	Unknown
SEA-H2X-S1.1-WH2-MC094	3457479.2	7424854.0	23.2	IS APG seg 6
SEA-H2X-S1.1-WH2-MC095	3457575.4	7424735.6	1.4	Unknown
SEA-H2X-S1.1-WH2-MC096	3457590.4	7424749.8	2.3	Unknown
SEA-H2X-S1.1-WH2-MC097	3457633.2	7424787.2	17.9	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC098	3457786.1	7424375.4	84	IS APG seg 6
SEA-H2X-S1.1-WH2-MC099	3457858.8	7424265.9	24.4	Unknown
SEA-H2X-S1.1-WH2-MC100	3457989.0	7424446.3	22.7	Unknown
SEA-H2X-S1.1-WH2-MC101	3458036.5	7424468.0	13	Unknown
SEA-H2X-S1.1-WH2-MC102	3458075.5	7424467.8	6.6	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC103	3458240.0	7424508.9	7.5	Unknown
SEA-H2X-S1.1-WH2-MC104	3458228.8	7424308.4	4.7	Unknown
SEA-H2X-S1.1-WH2-MC105	3458201.7	7424499.6	4.8	Unknown
SEA-H2X-S1.1-WH2-MC106	3458033.7	7423917.9	12.6	Possible IS APG seg 6
SEA-H2X-S1.1-WH2-MC107	3458088.6	7423940.8	14.1	Unknown
SEA-H2X-S1.1-WH2-MC108	3458247.2	7424068.8	59.2	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC109	3458354.7	7424045.3	2	Unknown
SEA-H2X-S1.1-WH2-MC110	3458375.6	7424031.1	1.6	Unknown
SEA-H2X-S1.1-WH2-MC111	3458230.5	7423321.4	2883.7	Debris
SEA-H2X-S1.1-WH2-MC112	3458287.6	7423303.0	23.1	IS APG seg 6
SEA-H2X-S1.1-WH2-MC113	3458424.0	7423422.1	5.3	Unknown
SEA-H2X-S1.1-WH2-MC114	3458447.2	7423433.7	3.5	Unknown
SEA-H2X-S1.1-WH2-MC115	3458501.9	7423461.9	26.2	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC116	3458578.9	7423515.0	20.4	Unknown
SEA-H2X-S1.1-WH2-MC117	3458683.8	7423317.2	20.6	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC118	3458805.4	7423164.2	9.3	Unknown
SEA-H2X-S1.1-WH2-MC119	3458632.7	7423182.0	2.2	Unknown
SEA-H2X-S1.1-WH2-MC120	3458503.9	7423094.6	6.2	Unknown
SEA-H2X-S1.1-WH2-MC121	3458570.0	7423072.4	2.1	Unknown
SEA-H2X-S1.1-WH2-MC122	3458474.7	7423073.8	20.8	IS APG seg 6
SEA-H2X-S1.1-WH2-MC123	3458383.5	7423009.7	3.4	Unknown
SEA-H2X-S1.1-WH2-MC124	3458406.2	7422947.9	14.4	IS C2C seg 2A1
SEA-H2X-S1.1-WH2-MC125	3458416.6	7422922.1	2.9	Unknown
SEA-H2X-S1.1-WH2-MC126	3458428.9	7422894.1	87.8	Unknown
SEA-H2X-S1.1-WH2-MC127	3458688.2	7423034.1	16.6	Unknown
SEA-H2X-S1.1-WH2-MC128	3458403.0	7422846.5	5.6	OOS HONTAI 2
SEA-H2X-S1.1-WH2-MC129	3458403.0	7422839.3	8.3	OOS HONTAI 2
SEA-H2X-S1.1-WH2-MC130	3458695.5	7423087.8	12.9	IS C2C seg 2A1
SEA-H2X-S1.1-WH2-MC131	3458700.0	7423095.2	2	Unknown
SEA-H2X-S1.1-WH2-MC132	3458701.5	7422944.1	11.3	Unknown
SEA-H2X-S1.1-WH2-MC133	3458931.3	7423065.2	5.7	Unknown
SEA-H2X-S1.1-WH2-MC134	3458938.1	7423029.0	12.8	IS C2C seg 2A1
SEA-H2X-S1.1-WH2-MC135	3458972.1	7423028.8	13.6	IS C2C seg 2A1
SEA-H2X-S1.1-WH2-MC136	3458966.1	7423008.5	16.8	Unknown
SEA-H2X-S1.1-WH2-MC137	3458957.5	7422987.8	36	Unknown
SEA-H2X-S1.1-WH2-MC138	3458953.0	7423010.9	695.5	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC139	3458953.4	7422944.8	738.4	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC140	3458901.3	7422900.2	55.3	Unknown
SEA-H2X-S1.1-WH2-MC141	3458709.6	7422864.3	5.6	Unknown
SEA-H2X-S1.1-WH2-MC142	3459000.5	7422880.8	508.6	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC143	3458933.1	7423013.2	24.4	IS APG seg 6
SEA-H2X-S1.1-WH2-MC144	3458739.0	7422794.5	25.1	IS APG seg 6
SEA-H2X-S1.1-WH2-MC145	3458668.7	7422788.1	1.5	Unknown
SEA-H2X-S1.1-WH2-MC146	3458756.8	7422758.2	30.9	IS APG seg 6
SEA-H2X-S1.1-WH2-MC147	3458475.2	7422777.1	22.6	Unknown
SEA-H2X-S1.1-WH2-MC148	3458682.5	7422726.1	29.4	IS APG seg 6
SEA-H2X-S1.1-WH2-MC149	3458405.4	7422737.4	1.7	Unknown
SEA-H2X-S1.1-WH2-MC150	3458668.8	7422587.3	4.3	Unknown
SEA-H2X-S1.1-WH2-MC151	3458574.6	7422526.3	37.8	OOS SHT B
SEA-H2X-S1.1-WH2-MC152	3458967.3	7422674.5	20.9	IS APG seg 6
SEA-H2X-S1.1-WH2-MC153	3458685.4	7422548.5	57.9	OOS SHT B
SEA-H2X-S1.1-WH2-MC154	3458594.7	7422504.9	21	IS HK cable1
SEA-H2X-S1.1-WH2-MC155	3458798.4	7422556.1	24.4	OOS SHT B
SEA-H2X-S1.1-WH2-MC156	3458891.5	7422575.5	52.3	OOS SHT B
SEA-H2X-S1.1-WH2-MC157	3458698.1	7422318.6	38.5	IS HK cable1
SEA-H2X-S1.1-WH2-MC158	3458709.5	7422492.1	4.1	Unknown
SEA-H2X-S1.1-WH2-MC159	3458805.4	7422528.3	9.4	IS HK cable1
SEA-H2X-S1.1-WH2-MC160	3458897.4	7422560.1	1.3	Unknown
SEA-H2X-S1.1-WH2-MC161	3459015.7	7422598.2	36.8	OOS SHT B
SEA-H2X-S1.1-WH2-MC162	3459010.9	7422529.2	9.8	IS HK cable1
SEA-H2X-S1.1-WH2-MC163	3458724.9	7422440.5	14.3	Unknown
SEA-H2X-S1.1-WH2-MC164	3459035.9	7422536.1	13.1	IS HK cable1
SEA-H2X-S1.1-WH2-MC165	3459839.1	7422371.8	128	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC166	3458930.1	7422484.9	5	Unknown
SEA-H2X-S1.1-WH2-MC167	3458743.9	7422396.5	67.2	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC168	3459841.8	7424427.7	18.1	Unknown
SEA-H2X-S1.1-WH2-MC169	3458846.9	7424413.8	62.5	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC170	3458950.9	7422424.3	80.8	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC171	3458865.4	7422370.9	2	Unknown
SEA-H2X-S1.1-WH2-MC172	3459076.1	7422440.7	49.2	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC173	3458676.4	7422272.8	31.1	IS AAE-1 seg 1H.1
SEA-H2X-S1.1-WH2-MC174	3458783.8	7422294.2	42.5	IS AAE-1 seg 1H.1
SEA-H2X-S1.1-WH2-MC175	3458977.4	7422359.7	4.1	Unknown
SEA-H2X-S1.1-WH2-MC176	3458992.3	7422309.6	36.8	IS AAE-1 seg 1H.1
SEA-H2X-S1.1-WH2-MC177	3458991.6	7422317.4	34.3	IS AAE-1 seg 1H.1
SEA-H2X-S1.1-WH2-MC178	3459812.9	7422222.9	3.5	Unknown
SEA-H2X-S1.1-WH2-MC179	3458711.5	7422172.0	105.2	IS SEA-ME-WE 3 seg 1.10
SEA-H2X-S1.1-WH2-MC180	3459120.9	7422336.8	32.5	IS AAE-1 seg 1H.1
SEA-H2X-S1.1-WH2-MC181	3458825.4	7422193.8	306.5	IS SEA-ME-WE 3 seg 1.10
SEA-H2X-S1.1-WH2-MC182	3459013.5	7422265.6	3.1	Unknown
SEA-H2X-S1.1-WH2-MC183	3458932.3	7422210.1	79.9	IS SEA-ME-WE 3 seg 1.10
SEA-H2X-S1.1-WH2-MC184	3459037.7	7422223.0	990	IS SEA-ME-WE 3 seg 1.10
SEA-H2X-S1.1-WH2-MC185	3458745.4



Contact Number	Easting	Northing	Amplitude (nT)	Description
SEA-H2X-S1.1-WH2-MC088	3456980.4	7425035.9	29	Unknown
SEA-H2X-S1.1-WH2-MC093	3457434.6	7424613.3	5.1	Unknown
SEA-H2X-S1.1-WH2-MC094	3457478.2	7424654.0	23.2	IS APG seg 6
SEA-H2X-S1.1-WH2-MC095	3457576.4	7424735.6	1.4	Unknown
SEA-H2X-S1.1-WH2-MC096	3457580.4	7424749.6	2.3	Unknown
SEA-H2X-S1.1-WH2-MC097	3457633.2	7424787.2	17.9	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC098	3457786.1	7424375.4	84	IS APG seg 6
SEA-H2X-S1.1-WH2-MC099	3457858.8	7424395.9	24.4	Unknown
SEA-H2X-S1.1-WH2-MC100	3457989.0	7424446.3	22.7	Unknown
SEA-H2X-S1.1-WH2-MC101	3458036.5	7424458.0	13	Unknown
SEA-H2X-S1.1-WH2-MC102	3458075.5	7424467.8	6.6	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC103	3458240.0	7424508.9	7.5	Unknown
SEA-H2X-S1.1-WH2-MC104	3458229.8	7424084.4	4.7	Unknown
SEA-H2X-S1.1-WH2-MC105	3458201.7	7424469.6	4.8	Unknown
SEA-H2X-S1.1-WH2-MC106	3458033.7	7423917.9	12.6	Possible IS APG seg 6
SEA-H2X-S1.1-WH2-MC107	3458084.6	7423940.6	14.1	Unknown
SEA-H2X-S1.1-WH2-MC108	3458247.2	7424008.8	59.2	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC109	3458354.7	7424045.3	2	Unknown
SEA-H2X-S1.1-WH2-MC110	3458375.6	7424051.1	1.6	Unknown
SEA-H2X-S1.1-WH2-MC111	3458230.5	7423321.4	2883.7	Debris
SEA-H2X-S1.1-WH2-MC112	3458287.6	7423333.0	23.1	IS APG seg 6
SEA-H2X-S1.1-WH2-MC113	3458424.0	7423422.1	5.3	Unknown
SEA-H2X-S1.1-WH2-MC114	3458447.2	7423433.2	3.5	Unknown
SEA-H2X-S1.1-WH2-MC115	3458501.9	7423461.9	26.2	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC116	3458376.9	7423010.0	20.4	Unknown
SEA-H2X-S1.1-WH2-MC117	3458683.8	7423717.2	23.6	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC118	3458655.4	7423164.2	9.3	Unknown
SEA-H2X-S1.1-WH2-MC119	3458632.7	7423182.0	2.2	Unknown
SEA-H2X-S1.1-WH2-MC120	3458613.0	7423094.6	6.2	Unknown
SEA-H2X-S1.1-WH2-MC121	3458554.3	7423127.4	2.1	Unknown
SEA-H2X-S1.1-WH2-MC122	3458474.7	7423073.8	20.8	IS APG seg 6
SEA-H2X-S1.1-WH2-MC123	3458380.3	7423009.7	3.4	Unknown
SEA-H2X-S1.1-WH2-MC124	3458406.2	7422947.9	14.4	IS C2C seg 2A1
SEA-H2X-S1.1-WH2-MC125	3458418.6	7422922.1	2.9	Unknown
SEA-H2X-S1.1-WH2-MC126	3458428.9	7422864.1	87.8	Unknown
SEA-H2X-S1.1-WH2-MC127	3458689.2	7423034.1	16.6	Unknown
SEA-H2X-S1.1-WH2-MC128	3458403.0	7422845.5	5.8	OOS HONTAI 2
SEA-H2X-S1.1-WH2-MC129	3458453.6	7422839.3	8.3	OOS HONTAI 2
SEA-H2X-S1.1-WH2-MC130	3458695.5	7422997.3	12.9	IS C2C seg 2A1
SEA-H2X-S1.1-WH2-MC131	3458700.0	7422955.2	2	Unknown
SEA-H2X-S1.1-WH2-MC132	3458701.5	7422944.1	11.3	Unknown
SEA-H2X-S1.1-WH2-MC133	3458581.3	7423065.2	5.7	Unknown
SEA-H2X-S1.1-WH2-MC134	3458938.1	7423029.0	12.6	IS C2C seg 2A1
SEA-H2X-S1.1-WH2-MC135	3458872.1	7423028.6	13.6	IS C2C seg 2A1
SEA-H2X-S1.1-WH2-MC136	3458996.1	7423008.0	16.8	Unknown
SEA-H2X-S1.1-WH2-MC137	3458957.5	7422987.8	38	Unknown
SEA-H2X-S1.1-WH2-MC138	3459053.0	7422915.2	695.5	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC139	3459032.4	7422944.8	738.4	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC140	3458981.3	7422900.2	55.3	Unknown
SEA-H2X-S1.1-WH2-MC141	3458709.6	7422864.3	5.6	Unknown
SEA-H2X-S1.1-WH2-MC142	3459000.5	7422863.8	508.6	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC143	3458693.1	7422813.2	24.4	IS APG seg 6
SEA-H2X-S1.1-WH2-MC144	3458728.0	7422784.5	25.1	IS APG seg 6
SEA-H2X-S1.1-WH2-MC145	3458668.7	7422788.1	1.5	Unknown
SEA-H2X-S1.1-WH2-MC146	3458766.8	7422758.2	30.9	IS APG seg 6
SEA-H2X-S1.1-WH2-MC147	3458475.2	7422777.1	22.6	Unknown
SEA-H2X-S1.1-WH2-MC148	3458882.5	7422726.1	29.4	IS APG seg 6
SEA-H2X-S1.1-WH2-MC149	3458485.4	7422737.4	1.7	Unknown
SEA-H2X-S1.1-WH2-MC150	3458868.8	7422587.3	4.3	Unknown
SEA-H2X-S1.1-WH2-MC151	3458574.6	7422535.3	37.6	OOS SHT B
SEA-H2X-S1.1-WH2-MC152	3458987.3	7422674.5	20.9	IS APG seg 6

Contact Number	Easting	Northing	Amplitude (nT)	Description
SEA-H2X-S1.1-WH2-MC153	3458680.4	7422548.5	57.9	OOS SHT B
SEA-H2X-S1.1-WH2-MC154	3458593.7	7422558.9	21	IS HK cable1
SEA-H2X-S1.1-WH2-MC155	3458708.4	7422566.1	24.4	OOS SHT B
SEA-H2X-S1.1-WH2-MC156	3458891.5	7422575.5	52.3	OOS SHT B
SEA-H2X-S1.1-WH2-MC157	3458698.1	7422518.6	38.5	IS HK cable1
SEA-H2X-S1.1-WH2-MC158	3458709.5	7422482.1	4.1	Unknown
SEA-H2X-S1.1-WH2-MC159	3458805.4	7422528.3	9.4	IS HK cable1
SEA-H2X-S1.1-WH2-MC160	3458897.4	7422560.1	1.3	Unknown
SEA-H2X-S1.1-WH2-MC161	3459016.7	7422598.2	36.8	OOS SHT B
SEA-H2X-S1.1-WH2-MC162	3458910.9	7422529.2	9.6	IS HK cable1
SEA-H2X-S1.1-WH2-MC163	3458724.9	7422448.0	14.3	Unknown
SEA-H2X-S1.1-WH2-MC164	3459035.9	7422536.1	13.1	IS HK cable1
SEA-H2X-S1.1-WH2-MC165	3458639.1	7422371.8	128	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC166	3458830.1	7422484.9	5	Unknown
SEA-H2X-S1.1-WH2-MC167	3458743.9	7422396.5	67.2	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC168	3458841.8	7422427.7	18.1	Unknown
SEA-H2X-S1.1-WH2-MC169	3458846.9	7422413.6	62.5	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC170	3458955.9	7422424.3	80.8	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC171	3458895.4	7422370.9	2	Unknown
SEA-H2X-S1.1-WH2-MC172	3459076.1	7422445.7	49.2	IS EAC 1 seg C
SEA-H2X-S1.1-WH2-MC173	3458876.4	7422272.6	31.1	IS AAE-1 seg 1H.1
SEA-H2X-S1.1-WH2-MC174	3458758.8	7422294.2	42.5	IS AAE-1 seg 1H.1
SEA-H2X-S1.1-WH2-MC175	3458977.4	7422359.7	4.1	Unknown
SEA-H2X-S1.1-WH2-MC176	3458952.3	7422309.6	36.8	IS AAE-1 seg 1H.1
SEA-H2X-S1.1-WH2-MC177	3458991.8	7422317.4	34.3	IS AAE-1 seg 1H.1
SEA-H2X-S1.1-WH2-MC178	3458812.9	7422222.9	3.3	Unknown
SEA-H2X-S1.1-WH2-MC179	3458711.5	7422172.0	105.2	IS SEA-ME-WE 3 seg 1.10
SEA-H2X-S1.1-WH2-MC180	3459120.9	7422336.8	32.5	IS AAE-1 seg 1H.1
SEA-H2X-S1.1-WH2-MC181	3458820.4	7422183.8	306.5	IS SEA-ME-WE 3 seg 1.10
SEA-H2X-S1.1-WH2-MC182	3459013.5	7422265.6	3.1	Unknown
SEA-H2X-S1.1-WH2-MC183	3458833.3	7422210.1	79.9	IS SEA-ME-WE 3 seg 1.10
SEA-H2X-S1.1-WH2-MC184	3459037.7	7422223.0	990	IS SEA-ME-WE 3 seg 1.10
SEA-H2X-S1.1-WH2-MC185	3459745.4	7422097.4	5.3	IS HKA seg 1.1A
SEA-H2X-S1.1-WH2-MC186	3459193.9	7422343.4	139.2	IS SEA-ME-WE 3 seg 1.10
SEA-H2X-S1.1-WH2-MC187	3458755.9	7422065.5	1.3	OOS Hong-Kong-Amoy
SEA-H2X-S1.1-WH2-MC188	3459772.5	7422024.7	15.9	IS C2C seg 1
SEA-H2X-S1.1-WH2-MC189	3459014.8	7422129.3	1.4	IS HKA seg 1.1A
SEA-H2X-S1.1-WH2-MC190	3458983.1	7422087.9	3.6	OOS Hong-Kong-Amoy
SEA-H2X-S1.1-WH2-MC191	3458973.7	7422003.4	3.2	Unknown
SEA-H2X-S1.1-WH2-MC192	3458889.1	7422037.5	12.5	IS C2C seg 1
SEA-H2X-S1.1-WH2-MC193	3459220.9	7422137.2	2.6	IS HKA seg 1.1A
SEA-H2X-S1.1-WH2-MC194	3458999.0	7422049.8	14.4	IS C2C seg 1
SEA-H2X-S1.1-WH2-MC195	3458901.4	7422002.2	1.5	Unknown
SEA-H2X-S1.1-WH2-MC196	3459099.0	7422062.8	9.8	IS C2C seg 1
SEA-H2X-S1.1-WH2-MC197	3458828.3	7421994.3	65.7	OOS APC seg B4
SEA-H2X-S1.1-WH2-MC198	3459235.6	7422058.0	8.7	IS C2C seg 1
SEA-H2X-S1.1-WH2-MC199	3458934.9	7421909.7	142.9	OOS APC seg B4
SEA-H2X-S1.1-WH2-MC200	3459050.1	7421926.0	144	OOS APC seg B4
SEA-H2X-S1.1-WH2-MC201	3459152.7	7421932.2	150.4	OOS APC seg B4
SEA-H2X-S1.1-WH2-MC202	3459286.1	7421945.2	215.3	OOS APC seg B4
SEA-H2X-S1.1-WH2-MC203	3459180.5	7421895.9	1	Unknown
SEA-H2X-S1.1-WH2-MC204	3459185.1	7421891.9	2.1	Unknown
SEA-H2X-S1.1-WH2-MC205	3459331.1	7421921.3	3.7	Unknown
SEA-H2X-S1.1-WH2-MC206	3461944.0	7421633.3	5.2	Unknown
SEA-H2X-S1.1-WH2-MC207	3461967.8	7421602.9	42.1	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC208	3462102.6	7421222.1	10.1	Unknown
SEA-H2X-S1.1-WH2-MC209	3462144.0	7421281.0	8.6	Unknown
SEA-H2X-S1.1-WH2-MC210	3462104.8	7421510.3	24.8	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC211	3462124.7	7421529.6	8	Unknown
SEA-H2X-S1.1-WH2-MC212	3462239.4	7421345.4	33.4	IS EAC 2 seg 2A1
SEA-H2X-S1.1-WH2-MC213	3462183.9	7421575.0	11.2	Unknown

Contact Number	Easting	Northing	Dimensions	Description
SEA-H2X-S1.1-WH2-SG029	3457148.0	7425031.7	2x1x<1	Debris
SEA-H2X-S1.1-WH2-SG030	3457155.3	7425014.1	4x2xnnnh	Debris
SEA-H2X-S1.1-WH2-SG031	3457118.6	7424993.0	3x2xnnnh	Debris
SEA-H2X-S1.1-WH2-SG032	3457441.3	7425056.1	7x5xnnnh	Debris
SEA-H2X-S1.1-WH2-SG033	3457238.4	7424668.0	14x2.5x<1	Possible container
SEA-H2X-S1.1-WH2-SG034	3457237.1	7424660.3	2.7x1.4x<1	Debris
SEA-H2X-S1.1-WH2-SG035	3457247.6	7424670.7	8x1xnnnh	Debris
SEA-H2X-S1.1-WH2-SG036	3457447.7	7424628.4	4x3xnnnh	Debris
SEA-H2X-S1.1-WH2-SG037	3457866.3	7424739.4	2.5x1.5xnnnh	Debris
SEA-H2X-S1.1-WH2-SG038	3458246.5	7424428.1	4x3x<1	Debris
SEA-H2X-S1.1-WH2-SG039	3458219.0	7424230.8	2x1xnnnh	Debris
SEA-H2X-S1.1-WH2-SG040	3458037.9	7424134.7	2.8x2xnnnh	Debris
SEA-H2X-S1.1-WH2-SG041	3459172.1	7423787.6	3.5x1.5x<1	Debris
SEA-H2X-S1.1-WH2-SG042	3458272.7	7424889.2	272x1xnnnh	Linear debris
SEA-H2X-S1.1-WH2-SG043	3458032.1	7423322.3	5x3x<1	Debris
SEA-H2X-S1.1-WH2-SG044	3458239.4	7423313.3	5x2x<1	Debris
SEA-H2X-S1.1-WH2-SG045	3458535.6	7423103.3	2x1xnnnh	Debris
SEA-H2X-S1.1-WH2-SG046	3458606.6	7423116.8	3x1xnnnh	Debris
SEA-H2X-S1.1-WH2-SG047	3458546.2	7423771.7	8x4xnnnh	Debris
SEA-H2X-S1.1-WH2-SG048	3458576.1	7422735.1	4x4xnnnh	Debris
SEA-H2X-S1.1-WH2-SG049	3458995.3	7422319.3	2x1x<1	Debris
SEA-H2X-S1.1-WH2-SG050	3459265.6	7421930.4	2x<1x<1	Debris
SEA-H2X-S1.1-WH2-SG051	3459754.1	7421728.4	29x9x<1	Wreck
SEA-H2X-S1.1-WH2-SG054	3461771.8	7421424.1	202x1xnnnh	Debris
SEA-H2X-S1.1-WH2-SG055	3462073.2	7421592.4	1.6x1.5xnnnh	Debris
SEA-H2X-S1.1-WH2-SG057	3463760.5	7421317.1	3x1xnnnh	Debris
SEA-H2X-S1.1-WH2-SG058	3468193.6	7420938.1	2x1xnnnh	Debris

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

- cor — Coral
- fs — Fine sediment (predominantly CLAY/SILT)
- cs — Coarse sediment (SAND and GRAVEL)
- vcs — Very coarse sediment (COBBLES and BOULDERS)
- fs/sa/vs — Very dense/Very stiff sediment
- fs/sa/vs — Subcropping ROCK with predominant sediment classification (sediment thickness < target burial depth)
- r — ROCK outcrop
- 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; nnnh = no measurable height)
- 50x5 5x1 — Linear sonar contact, dashed where partially buried
- SC001 20x10x? — Located wreck with reference no. (length x width x height in metres where measurable)
- SE001 -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 — Seabed depression or pockmark with diameter (⌀) 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)
- 70 — Orientation of sediment ribbon
- 09 — 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)	10	10
Maximum depth (m)	33	63
Maximum gradient (°)	>5	63

The proposed route heads southeast in the north-western quadrant of the chart, then turns to the east in the western part of the chart, travelling across the chart and exiting in the east.
The seabed is generally gentle except the coastal areas, where very steep slopes are observed along the rocky coastline. Localized moderate to very steep slopes associated with dumped materials are observed in the western portion of the chart.

SEABED FEATURES:
Dumped materials are mapped in the northwestern part and the eastern portion of the chart.
Numerous debris/dumped materials (general height: <1m) are mapped in the northwestern part of the chart.
Scattered scars and scattered to numerous depressions (diameter: <8m, depth: <1m) are mapped throughout the chart.
Wreck: SEA-H2X-S1.1-WH2-SC087 (28x9x<1 m) in the NE of the chart.
Magnetometer Contacts: SEA-H2X-S1.1-WH2-MC088, SEA-H2X-S1.1-WH2-MC093 to SEA-H2X-S1.1-WH2-MC213
Seismic Contacts: Nil.
SHALLOW GEOLOGY
Areas of low to high relief ROCK and subcropping ROCK are mapped in the northwestern, the center and the western parts of the chart, associated with small islets.
<5m of very soft to soft sandy SILT/CLAY is observed in the northwestern corner of the chart.
1m to 5m of very soft to soft slightly gravelly very sandy CLAY is mapped in the northwestern of the chart, over loose to medium dense SAND.
3m to 5m of loose to medium dense slightly gravelly very clayey SAND is mapped in the western part of the chart.
1m to 5m of very soft to soft slightly gravelly very sandy CLAY over loose to dense SAND/firm to stiff CLAY is mapped in the western part of the chart.
<5m of very soft to soft CLAY over ROCK is observed in the eastern portion of the chart.
Sediment Samples: SEA-H2X-S1.1-WH2-GC003 to GC005
CPT: Nil.
ADDITIONAL INFORMATION
The proposed route crosses thirteen (13) cables, six (6) OOS cables and one planned cable.
The proposed route exits Declared Minefield - Tathong Channel in the north-western corner of the chart.
The proposed route exits the Inshore Traffic Area zone in the north-western part of the chart.
The proposed route runs inside Guangzhou VTS.
The proposed route runs inside Hong Kong SAR waters.

GENERAL NOTES

	Inshore and Shallow Water
Survey vessel	M/V Wing Hung 2
Surface positioning system	C-Nav 3050 GeGPS Qinay Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Kongsberg EA440 Singlebeam Echo Sounder System R2Sonic Sonic 2024 MBES
Morphology and stratigraphy	EdgeTech 4205 Side Scan Sonar System Innomar SES-2000 medium-100 Sub-bottom Profiller
Magnetometer survey	C-Boom Low Voltage Boomer System Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong waters except 6m burial for KP0.176 to KP2.351
Descriptive Terms and Definitions: The criteria used for interpretations and descriptions are presented in survey reports

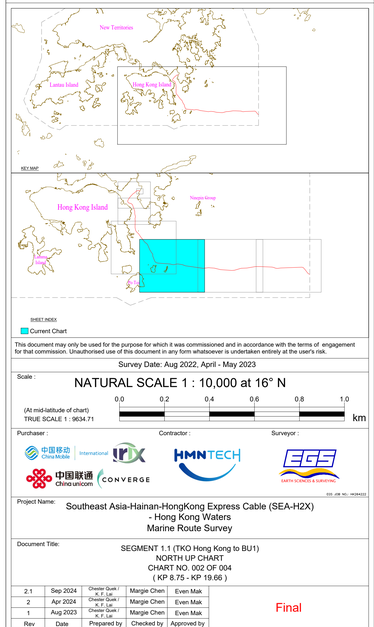
GEODETIC PARAMETERS

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) : 0.000 000	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, 2022 and total measurements at the EGS tide gauge installed at Tai Miu Wan.

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



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Survey Date: Aug 2022, April - 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 : 中国移动 China Mobile International, 中国联通 China unicom

Contractor : HMN TECH, CONVERGE

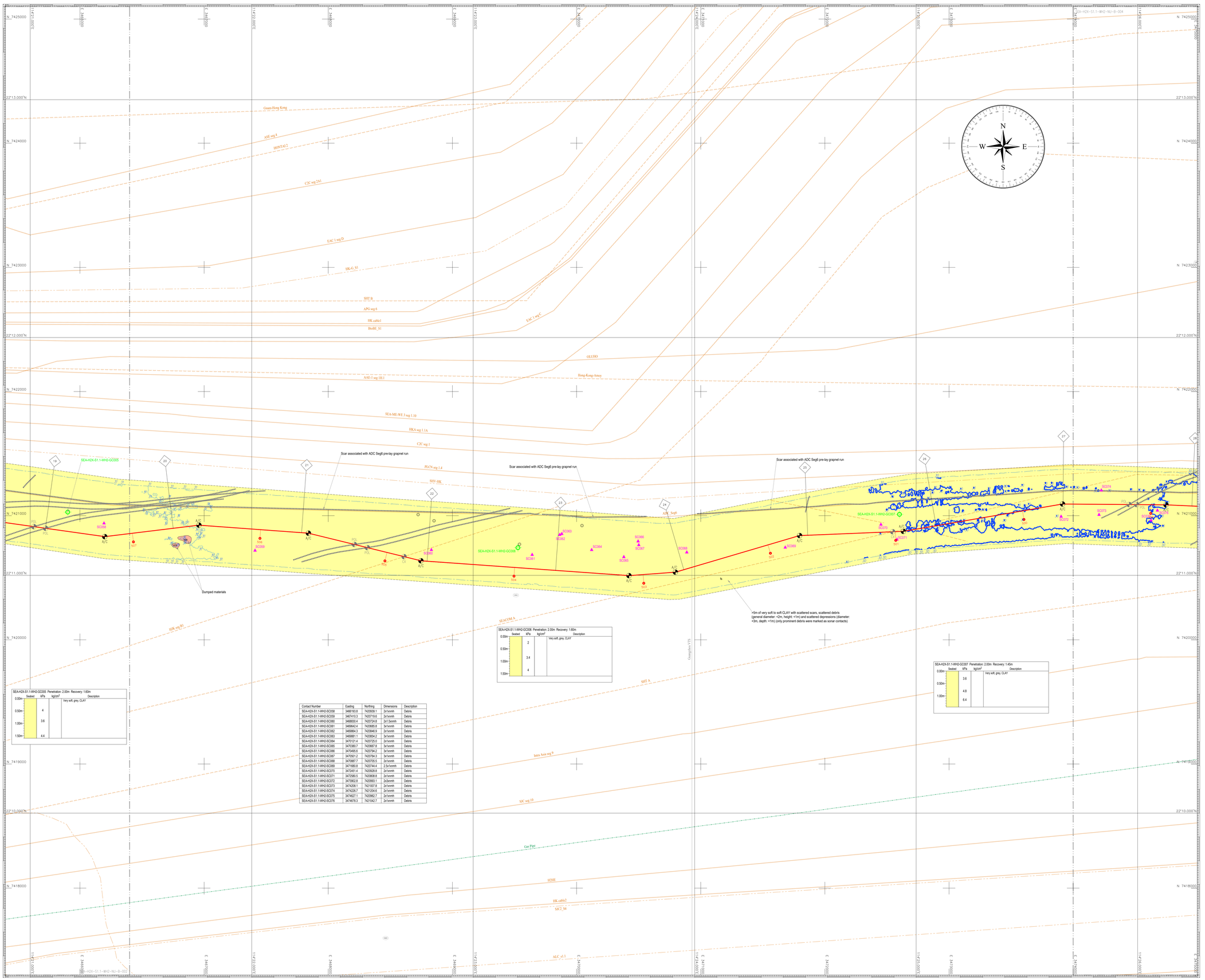
Surveyor : EGS

EGS JOB NO.: HK044222

Project Name:	Southeast Asia-Hainan-HongKong Express Cable (SEA-H2X) - Hong Kong Waters Marine Route Survey
Document Title:	SEGMENT 1.1 (TKO Hong Kong to BU1) NORTH UP CHART CHART NO. 002 OF 004 (KP 8.75 - KP 19.66)

Rev	Date	Prepared by	Checked by	Approved by	
2.1	Sep 2024	Chester Quek / K. F. Lai	Margie Chen	Even Mak	
2	Apr 2024	Chester Quek / K. F. Lai	Margie Chen	Even Mak	
1	Aug 2023	Chester Quek / K. F. Lai	Margie Chen	Even Mak	Final

Route Based Upon: SEA-H2X_S1.1_TKO (Hongkong) to BU1 RPL 2-OTd 240911.xls
File Name: SEA-H2X-S1.1-WH2-NU-B-002



Contact Number	Easting	Northing	Dimensions	Description
SEA-H2X-S1.1-WH2-SC058	3468193.8	7420939.1	2x1xmm	Debris
SEA-H2X-S1.1-WH2-SC059	3467410.3	7420719.6	2x1xmm	Debris
SEA-H2X-S1.1-WH2-SC060	3468830.4	7420724.8	2x1.5xmm	Debris
SEA-H2X-S1.1-WH2-SC061	3469642.4	7420685.8	3x1xmm	Debris
SEA-H2X-S1.1-WH2-SC062	3469864.3	7420648.9	2x1xmm	Debris
SEA-H2X-S1.1-WH2-SC063	3469881.1	7420854.2	3x1xmm	Debris
SEA-H2X-S1.1-WH2-SC064	3470121.4	7420725.0	2x1xmm	Debris
SEA-H2X-S1.1-WH2-SC065	3470380.7	7420687.8	3x1xmm	Debris
SEA-H2X-S1.1-WH2-SC066	3470495.6	7420794.2	3x1xmm	Debris
SEA-H2X-S1.1-WH2-SC067	3470501.2	7420764.3	3x1xmm	Debris
SEA-H2X-S1.1-WH2-SC068	3470887.7	7420705.5	2x1xmm	Debris
SEA-H2X-S1.1-WH2-SC069	3471680.8	7420744.4	2.5x1xmm	Debris
SEA-H2X-S1.1-WH2-SC070	3472451.4	7420608.8	2x1xmm	Debris
SEA-H2X-S1.1-WH2-SC071	3472580.5	7420808.8	2x1xmm	Debris
SEA-H2X-S1.1-WH2-SC072	3473902.8	7420693.1	2x3xmm	Debris
SEA-H2X-S1.1-WH2-SC073	3474208.1	7421007.8	2x1xmm	Debris
SEA-H2X-S1.1-WH2-SC074	3474226.7	7421204.6	2x1xmm	Debris
SEA-H2X-S1.1-WH2-SC075	3474027.1	7420962.7	2x1xmm	Debris
SEA-H2X-S1.1-WH2-SC076	3474078.3	7421042.7	2x1xmm	Debris

CARTOGRAPHIC SYMBOLS

- Post survey route with kilometre post and reverse kilometre post
- Adjacent route
- BM/AC/BU — Beach manhole / Alter course / Branching Unit
- PDU/DX/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

- 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/sa/vs — Very dense/Very stiff sediment
- fs/sa/vs — 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; mnh = no measurable height)
- 50x0.5x1 — Linear sonar contact, dashed where partially buried
- SC001 20x10x1 — Located wreck with reference no. (length x width x height in metres where measurable)
- SE001 -2.5 — Seismic 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 — Seabed depression or pockmark with diameter (⌀) 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
- -20 — 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)	30	30
Maximum depth (m)	31	31
Maximum gradient (°)	<5	<5

The proposed route heads to the east on a very gentle seabed.

SEABED FEATURES

Scattered scars, scattered depressions (diameter: <3m, depth: <1m) and scattered debris are mapped throughout the chart.

Localized dumped materials are mapped in the western portion of the chart.

Sonar Contacts: SEA-H2X-S1.1-WH2-SC057 to SEA-H2X-S1.1-WH2-SC076

Magnetometer Contacts: Nil.

Seismic Contacts: Nil.

SHALLOW GEOLOGY

>5m of very soft to soft CLAY is observed throughout the chart.

Sediment Samples: SEA-H2X-S1.1-WH2-GC005 to SEA-H2X-S1.1-WH2-GC007

CPT: Nil.

ADDITIONAL INFORMATION

The proposed route crosses two OOS cables.

The proposed route exits Guangzhou VTS near the center of the chart.

The proposed route runs inside Hong Kong SAR waters.

GENERAL NOTES

Survey vessel	Inshore and Shallow Water
Surface positioning system	MV Wing Hung 2 C-Nav 3050 GcGPS Qimzy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Kongsberg EA440 Single|beam Echo Sounder System R2Sonic Sonic 2024 MBES
Morphology and stratigraphy	EdgeTech 4205 Side Scan Sonar System Innomar SES-2000 medium-100 Sub-bottom Profiler
Magnetometer survey	C-Boom Low Voltage Boomer System Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong waters except 6m burial for KP0.176 to KP2.351

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

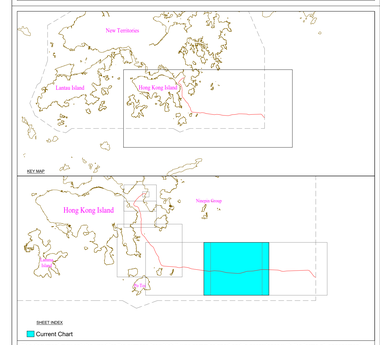
Map Projection Parameters

Projection : Mercator
False Northing (m) : 0.000 000
False Easting (m) : 0.000 000
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, 2022 and tidal measurements at the EGS tide gauge installed at Tai Miu Wan.

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



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Survey Date: Aug 2022, April - 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 :

Project Name: Southeast Asia-Hainan-HongKong Express Cable (SEA-H2X)
- Hong Kong Waters
Marine Route Survey

Document Title: SEGMENT 1.1 (TKO Hong Kong to BU1)
NORTH UP CHART
CHART NO. 003 OF 004
(KP 18.69 - KP 28.04)

Rev	Date	Prepared by	Checked by	Approved by	
2.1	Sep 2024	Chester Quek / K.F. Lai	Margie Chen	Even Mak	Final
2	Apr 2024	Chester Quek / K.F. Lai	Margie Chen	Even Mak	
1	Aug 2023	Chester Quek	Margie Chen	Even Mak	

Route Based Upon: SEA-H2X_S1.1_TKO (Hongkong) to BU1 RPL 2-OTU-240911.xls

File Name: SEA-H2X-S1.1-WH2-NU-B-003

Contact Number	Easting	Northing	Amplitude (nT)	Description
SEA-H2X-S1.1-WH2-MC214	3480773.2	7420702.2	31.6	IS SJC seg 10
SEA-H2X-S1.1-WH2-MC215	3480782.7	7420722.7	1.4	Unknown
SEA-H2X-S1.1-WH2-MC216	3480979.7	7420809.3	1.6	Debris
SEA-H2X-S1.1-WH2-MC217	3480993.1	7420791.3	1.9	Unknown
SEA-H2X-S1.1-WH2-MC218	3481002.7	7420789.7	36.2	IS SJC seg 10
SEA-H2X-S1.1-WH2-MC219	3481181.4	7420915.3	6.5	Unknown
SEA-H2X-S1.1-WH2-MC220	3481002.8	7420778.8	34.6	IS SJC seg 10
SEA-H2X-S1.1-WH2-MC221	3481191.2	7420878.9	23.7	IS SJC seg 10
SEA-H2X-S1.1-WH2-MC222	3481222.8	7420940.0	2.2	Unknown
SEA-H2X-S1.1-WH2-MC223	3481075.7	7420868.4	4.2	Unknown
SEA-H2X-S1.1-WH2-MC224	3480920.6	7420379.5	2.1	IS HK cable2
SEA-H2X-S1.1-WH2-MC225	3481178.2	7420562.5	2.1	Unknown
SEA-H2X-S1.1-WH2-MC226	3481028.9	7420493.3	3.3	IS HK cable2
SEA-H2X-S1.1-WH2-MC227	3481120.0	7420463.7	1.2	Unknown
SEA-H2X-S1.1-WH2-MC228	3481145.1	7420451.5	5.2	IS HK cable2
SEA-H2X-S1.1-WH2-MC229	3481390.0	7420523.6	3.4	Unknown
SEA-H2X-S1.1-WH2-MC230	3480988.4	7420289.3	67.3	Unknown
SEA-H2X-S1.1-WH2-MC231	3481191.9	7420372.8	8.8	Unknown
SEA-H2X-S1.1-WH2-MC232	3481278.8	7420430.3	2.5	Possible IS HK cable2
SEA-H2X-S1.1-WH2-MC233	3481307.0	7420460.9	1.9	Unknown
SEA-H2X-S1.1-WH2-MC234	3481401.9	7420438.0	0.9	Possible IS HK cable2
SEA-H2X-S1.1-WH2-MC235	3481517.3	7420471.3	2	Possible IS HK cable2

Contact Number	Easting	Northing	Dimensions	Description
SEA-H2X-S1.1-WH2-SC073	3474208.1	7421007.8	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC074	3474226.7	7421234.6	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC075	3474627.1	7420982.7	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC076	3474678.3	7421042.7	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC077	3475426.7	7421189.3	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC078	3475816.6	7421122.2	3x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC079	3476438.0	7420921.5	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC080	3476909.3	7420816.0	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC081	3477057.2	7420779.1	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC082	3477306.4	7420778.5	3x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC083	3477442.6	7420515.4	3x2xmnh	Debris
SEA-H2X-S1.1-WH2-SC084	3477797.9	7420974.0	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC085	3478738.6	7420852.6	5.5x4xmnh	Debris
SEA-H2X-S1.1-WH2-SC091	3479448.2	7420927.7	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC092	3480308.7	7421111.5	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC093	3480520.2	7420709.2	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC094	3480975.1	7420510.2	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC095	3481073.0	7420402.8	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC096	3481516.2	7420336.7	3x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC097	3481493.7	7419958.3	2x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC098	3481686.5	7419681.8	3x1xmnh	Debris
SEA-H2X-S1.1-WH2-SC099	3481803.8	7419848.8	2x1xmnh	Debris

SEA-H2X-S1.1-WH2-GC009 Penetration: 2.00m Recovery: 1.34m

	Seabed	kPa	kg/cm²	Description
0.00m				Very soft, grey, CLAY
0.50m		3		
1.00m		3		
		3		

SEA-H2X-S1.1-WH2-GC008 Penetration: 2.00m Recovery: 1.50m

	Seabed	kPa	kg/cm²	Description
0.00m				Very soft, grey, CLAY
0.50m		2		
1.00m		5		
1.50m		4		

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
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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)
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- fs/sa/vs — Subcropping ROCK with predominant sediment classification (sediment thickness < target burial depth)
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- 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)
- SE001 -2.5 — Seismic contact with reference number (level at the top of contact is stated in metres, +/- equivalent to above or below ambient seabed)
- GC001 — Gravity core (GG); 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 — Seabed depression or pockmark with diameter (⌀) and depth (D) in metres, where discernible
- 50/3 — Orientation of sandwave crest (with wavelength and height in metres)
- 400/0.8 — Orientation of megaripple crest (with wavelength and height in metres)
- 20 — Orientation of sediment ribbon
- 20 — Fault with depth below seafloor (Hachures on down side)
- BP001 — Beach probe (BP); Beach sample (BS) location with reference number
- DP001 — 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)	30	30
Maximum depth (m)	31	31
Maximum gradient (°)	<5	<5

The proposed route first heads to the east and then changes to a southeastern heading on a very gentle seabed.

SEABED FEATURES

Scattered scars, scattered depressions (diameter: <3m, depth: <1m) and scattered debris are mapped throughout the chart.

Sonar Contacts: SEA-H2X-S1.1-WH2-SC073 to SEA-H2X-S1.1-WH2-SC099
Magnetometer Contacts: SEA-H2X-S1.1-WH2-MC214 to SEA-H2X-S1.1-WH2-MC235
Seismic Contacts: SEA-H2X-S1.1-WH2-SE001 to SEA-H2X-S1.1-WH2-SE007.

SHALLOW GEOLOGY

>5m of very soft to soft *CLAY* is observed in the chart area.
Sediment Samples: SEA-H2X-S1.1-WH2-GC008 to SEA-H2X-S1.1-WH2-GC009
CPT: Nil.
ADDITIONAL INFORMATION

The proposed route crosses one pipeline, two IS cables, three OOS cables and one planned cable.
The proposed route enters a 3NM radius within a Navy Point near the eastern margin of the chart.
The proposed route exits Hong Kong SAR waters near the eastern margin of the chart.

GENERAL NOTES

Survey vessel	Inshore and Shallow Water
Surface positioning system	MV Wing Hung 2 C-Nav 3050 GcGPS Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Kongsberg EA440 Singlebeam Echo Sounder System R2Sonic Sonic 2024 MBES
Morphology and stratigraphy	EdgeTech 4205 Side Scan Sonar System Innomar SES-2000 medium-100 Sub-bottom Profiler
Magnetometer survey	C-Boom Low Voltage Boomer System Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong waters except 6m burial for KP0.176 to KP2.351
Descriptive Terms and Definitions: The criteria used for interpretations and descriptions are presented in survey reports

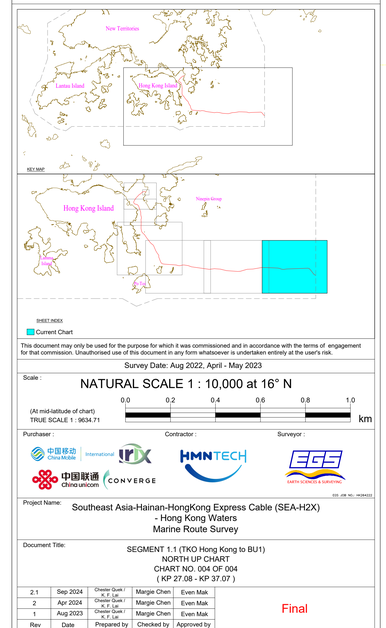
GEODETIC PARAMETERS

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, 2022 and tidal measurements at the EGS tide gauge installed at Tai Mu Wan.

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



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Survey Date: Aug 2022, April - 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.: HK2304/22

Project Name: Southeast Asia-Hainan-HongKong Express Cable (SEA-H2X)
- Hong Kong Waters
Marine Route Survey

Document Title: SEGMENT 1.1 (TKO Hong Kong to BU1)
NORTH UP CHART
CHART NO. 004 OF 004
(KP 27.08 - KP 37.07)

Rev	Date	Prepared by	Checked by	Approved by	
2.1	Sep 2024	Chester Quek / K. F. Lai	Margie Chen	Even Mak	Final
2	Apr 2024	Chester Quek / K. F. Lai	Margie Chen	Even Mak	
1	Aug 2023	Chester Quek / K. F. Lai	Margie Chen	Even Mak	

Route Based Upon: SEA-H2X_S1.1_TKO (Hongkong) to BU1 RPL 2-OTU 240511.ds

File Name: SEA-H2X-S1.1-WH2-NU-B-004

APPENDIX F ENVIRONMENTAL MONITORING AND AUDIT

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1. EM&A PROGRAMME

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

- 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/ operation 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.

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

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 responsible for liaising with the Project Proponents of projects that may interface with the proposed SEA-H2X 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.) will also be appointed by the Project Proponent, so as to avoid any concurrent works.

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 repairinging operation 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, salinity, DO saturation, water temperature, time, weather conditions, sea conditions, tidal stage, 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*** – A portable, weatherproof turbidity-measuring instrument complete with comprehensive operation manual. The equipment shall use a DC power source. It shall have a photoelectric sensor capable of measuring turbidity between 0-1000 NTU.

- ***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*** – A portable, battery-operated echo sounder shall be used for the determination of water depth at each designated monitoring station. This unit can either be handheld or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

- ***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. Wet bulb calibration for a DO meter shall be carried out before measurement at each monitoring location.

For the on-site calibration of field equipment, the BS 127: 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 24 hours 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)

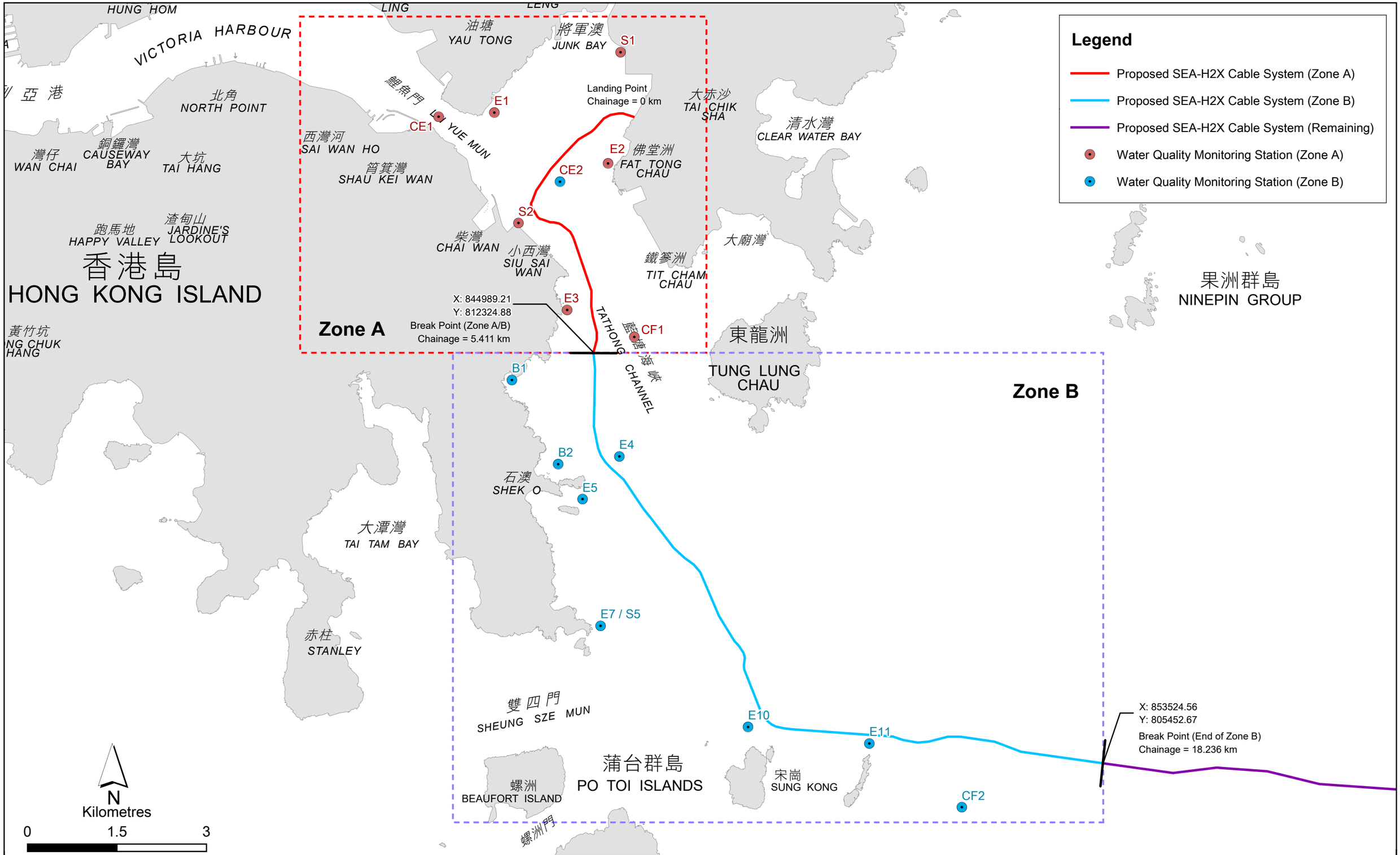

Figure F1

Proposed Water Quality Monitoring Station

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Date: 25/11/2024

should any exceedances occur due to the Project, and monitoring at these stations would allow water 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 repairing operation.

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 844989.21E 812324.88N / At 5.4106 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 844989.21E 812324.88N / At 5.4106 km from the landing point and 853524.56E 805452.67N/ At 18.2356 km from the landing point). Outside Zone A and Zone B, the cable works are considered too far away from any identified water sensitive receivers for any potential water quality 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/ repairing operation).

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 5.4106 km.				
S1	WSD Junk Bay Seawater Intake	1,130	845445	817366
S2	WSD Siu Sai Wan Flushing Water Intake	380	843732	814502
E1	Coral communities of high ecological value at South West Junk Bay	1,250	843328	816357
E2	Coral communities of high ecological value at Fat Tong Chau	440	845264	815549
E3	Coral communities of high ecological value at Cape Collinson and Ngan Wan	350	844548	813046
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 5.4106 km and 18.2356 km.				
B1 [2]	Big Wave Bay Beach	1,480	843624	811873
B2 [2]	Rocky Bay Beach	1,140	844399	810465
E4	Coral communities of high ecological value at Tai Long Pai	210	845422	810592
E5 [2]	Shek O Headland SSSI	810	844806	809875
E7 / S5 [2] [3]	Cape D'Aguilar Marine Reserve SSSI / Seawater Intake for the Swire Institute of Marine Science	1,830	845108	807755
E10 [3]	Coral communities of high ecological value along the coast of Sung Kong	290	847579	806062
E11 [3]	Coral communities of high ecological value along the coast of Waglan Island	270	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 straight line distance between two locations, without regard on the physical obstacles in between. Distances have been rounded to the nearest 10 m.
(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/ repairing operation 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/ repairing work relative to installation 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/ repairing operation work 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 Post Project Monitoring

After completion of the cable marine installation/ repairing operation 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, i.e. three days in the week, with the interval between two sets of monitoring not less than 36 hours and samples taken daily during a 4-hour window of 2 hours before and 2 hours after a mid-flood and mid-ebb tidal state.

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

Table F2.2 Summary of Monitoring Frequency

Zone	Baseline	Impact	Post
Zone A: Impact stations S1, S2, E1, E2, E3 and and Control stations CE1 and CF1. **Zone B**: Impact stations B1, B2,	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/repairing works is in Zone A.	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.

Zone	Baseline	Impact	Post
E4, E5, E7 / S5, E10, and E11, and Control stations CE2 and CF2.	Maintenance/ Repairing 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/repairing 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***. Monitoring stations S1 and S2 represent the WSD Seawater Intakes of Junk Bay and Siu Sai Wan, and thus their corresponding Action and Limit Levels were developed based on the corresponding water quality criteria (provided under ***Table A2.2***).

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:** 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
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

Parameter	Action Level	Limit Level
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.
e. No Action and Limit Levels are proposed for salinity.

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/ repairing operation contractor the most appropriate method of reducing suspended solids during cable installation/ repairing operation (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/ repairing operations.

Event	Contractor
Limit Level Exceedance	**Step 1** - Suspend cable installation/repairing operations 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/ repairing operation contractor the most appropriate method of reducing suspended solids during cable installation/ repairing operation (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/ repairing operations, 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 one week 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).

The draft Baseline Monitoring Report, reviewed by the IEC, shall be provided to EPD no later than two weeks before the cable installation/ repairing operation work, for agreement on the Action/Limit Levels prior to installation work commencing.

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/ repairing operation work, having been reviewed by the IEC. The Post Project Monitoring Report to review the environmental status after cable installation/ repairing operation and 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.

The Baseline Monitoring Report shall include the following details:

- brief project background information;
- drawings showing locations of the baseline monitoring stations;
- an updated construction/ repairing operation 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.

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

- Basic Project Information - construction/ repairing operation 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/ repairing machinery during sampling (including position, and cable burial depth during installation and repairing operations 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.

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/ repairing operation 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/ repairing operation 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

Cable installation/ repairing operation 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 repairing operations. The cable installation works will be short-term and temporary, and be carried out by one cable installation barge within up to 90 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 repairing 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.

However, additional precautionary measure will be implemented for marine mammals during the cable installation works and as required during cable repairing operations.

A marine mammal exclusion zone within a radius of 250 m from the cable installation/ repairing operation vessel will be implemented during the cable installation/repairing operation works taking place in daylight hours along the section starting from Zone 2 (Chainage distance 5.4106 km) to the east boundary of Hong Kong along the cable alignment (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/repairing operation vessel. The viewpoint will be proposed by the IEC.

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/repairing 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/ repairing works. If marine mammals are observed in the exclusion zone, cable installation/repairing works will be delayed until they have left the area. This measure will confirm that the area in the vicinity of the cable installation/repairing 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.

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

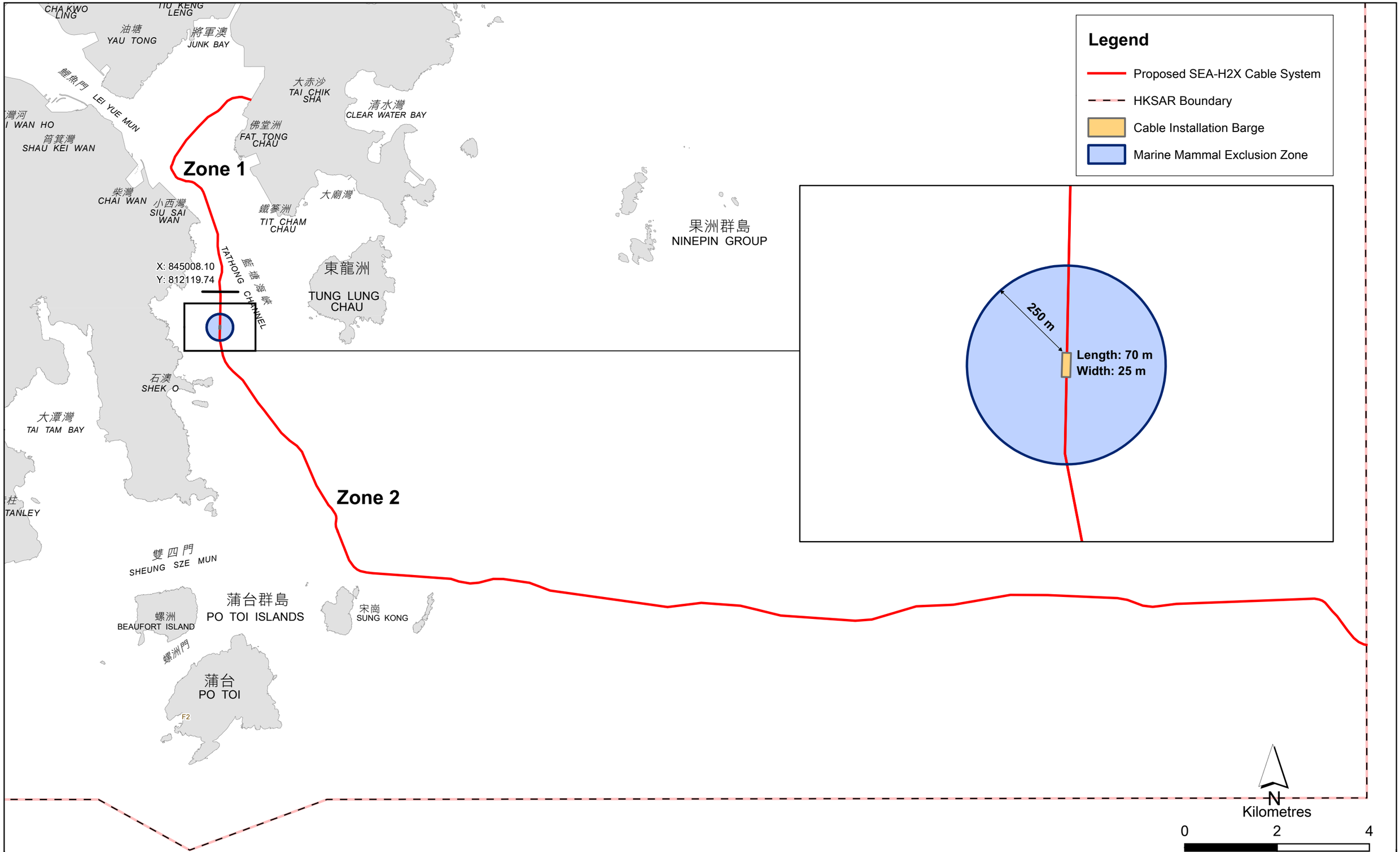

Figure F2

Marine Mammal Exclusion Zone

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Date: 13/11/2024

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;

ii. investigate the complaint and discuss with 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 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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