7. CULTURAL HERITAGE

7.1 Introduction

This *Section* presents the cultural heritage impact assessment (CHIA) associated with the construction of the proposed Project. In accordance with *Clause 3.4.7* of the EIA Study Brief, a Marine Archaeological Investigation (MAI) was undertaken by a qualified marine archaeologist and the findings of the MAI are presented herein.

7.2 Legislative Requirements and Evaluation Criteria

The following legislation and guidelines are applicable to the assessment of sites of cultural heritage, marine archaeological and historic resources in Hong Kong:

- *Environmental Impact Assessment Ordinance (Cap. 499)* and the associated *Technical Memorandum on the EIA Process* (EIAO-TM);
- *Antiquities and Monuments Ordinance (Cap. 53) (AM Ordinance)*;
- *Hong Kong Planning Standards and Guidelines*; and
- *Guidelines for Marine Archaeological Investigation (MAI)* of the EIA Study Brief.

7.2.1 Environmental Impact Assessment Ordinance (Cap. 499)

Annex 10 of the *EIAO-TM* 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. In addition, adverse impacts on sites of cultural heritage shall be kept to the absolute minimum.

Annex 19 of the *EIAO-TM* 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.

7.2.2 Antiquities and Monuments Ordinance (Cap. 53)

The *Antiquities and Monuments Ordinance (Cap. 53) (AM Ordinance)* provides statutory protection against the threat of development on Declared Monuments to enable their preservation for posterity. The AM 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.

7.2.3 Hong Kong Planning Standards and Guidelines (HKPSG)

The *Chapter 10*, Conservation, of the HKPSG provides general guidelines and measures for the conservation of historical buildings, sites of archaeological interest and other antiquities.

7.2.4 Guidelines for Marine Archaeological Investigation (MAI)

Guidelines for MAI provided in *Appendix F* of the EIA Study Brief details the standard practice, procedures and methodology which must be undertaken in determining marine archaeological baseline and potential, presence of archaeological artefacts, evaluating the potential impact and establishing suitable mitigation measures.

7.3 Assessment Methodology

7.3.1 Introduction

The CHIA follows the criteria and guidelines in *Annexes 10* and *19* of the *EIAO-TM*. It also follows the Requirements for Guidelines for MAI as stated in Appendix F of the Study Brief. It should be noted that the Project is marine-based and thus potential impacts on built heritage and terrestrial archaeological resources are not anticipated. Findings of the MAI of this Project are presented in the following sections.

7.3.2 Assessment Area

The Study Area of the Project is indicatively shown in ***Figure 1.1***. As discussed in ***Section 2.6.2***, the Project will be developed within the Key Area in view of potential interaction with nearby facilities. According to *Clause 3.4.7.2* of the EIA Study Brief, the MAI Assessment Area is defined as the area to be affected by the marine works associated with the Project, i.e. the Key Area identified for potential CMP development under the Project, as presented in ***Figure 7.1***.

7.3.3 Baseline Review

A marine archaeological review has been conducted by the qualified marine archaeologist, Dr William Jeffery, and cultural heritage specialist, Ms Peggy Wong, based on the best available information such as review of available geotechnical survey data from previous geological research held by Geotechnical Engineering Office, historical documents and dredging history from relevant government departments, public library and libraries from tertiary institutions, hydrographic data, charts and 'wreck' files held by Hydrographic Office of Marine Department and United Kingdom Hydrographic Office (UKHO), and previous marine archaeological investigations conducted to identify known and potential existence of sites or objects of cultural heritage within the MAI Assessment Area. The baseline review covers a wider area to cover the indicative Study Area for the Contaminated Sediment Disposal Facility at West of Lamma Island (WL Facility) as shown in ***Figure 1.1***.

7.3.4 Geophysical Survey

A marine geophysical survey was conducted by CEDD Term Contractor to study the seabed features and shallow geology to the west of Lamma Island for the Project, which also provides information on the potential existence of sites or objects of cultural heritage. The survey findings were processed by their in-house geophysicists and reviewed by the qualified marine archaeologist, Dr William Jeffery, and cultural heritage specialist, Ms Peggy Wong.

The survey area fully covers the Key Area identified for potential CMP development and is shown in ***Figure 7.2*** (63).

The geophysical surveys were conducted using a boomer, side scan sonar and single beam and multi-beam echo sounders, all acquiring high resolution data, between February and March 2020. The side scan and multi-beam survey traverses were 50 m apart, and were reduced to 25 m spacing for the multi-beam in the northern area, with cross traverses every 200 m throughout the whole area. The geophysical survey allowed for a comprehensive investigation of the seabed and below the seabed in order to locate and define any sites of marine archaeological potential. The side scan sonar and echo sounding track plots are shown in ***Annex 7A***.

The following equipment in ***Table 7.1*** was employed during the geophysical survey.

(63) It should be noted that the southwestern corner of the Study Area was not covered by the geophysical survey due to potential marine traffic issue in view of the proximity to the nearby Traffic Separation Schemes (i.e. West Lamma Channel). As the potential CMPs and the marine works associated with the Project will be developed and conducted within the Key Area identified for potential CMP Development ("Key Area") respectively as shown in ***Figure 7.1***, and no marine works will be conducted outside the Key Area, the existing geophysical survey data are considered valid and sufficient to establish marine archaeological potential within and in the vicinity of the Key Area.

Legend

Indicative Study Area for the WL Facility

Key Area Identified for Potential CMP Development / MAI Assessment Area

LAMMA ISLAND

CHEUNG CHAU

N

Kilometres

0 0.5 1

Figure 7.1

Key Area Identified for Potential CMP Development / MAI Assessment Area

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Date: 18/1/2021

Environmental Resources Management

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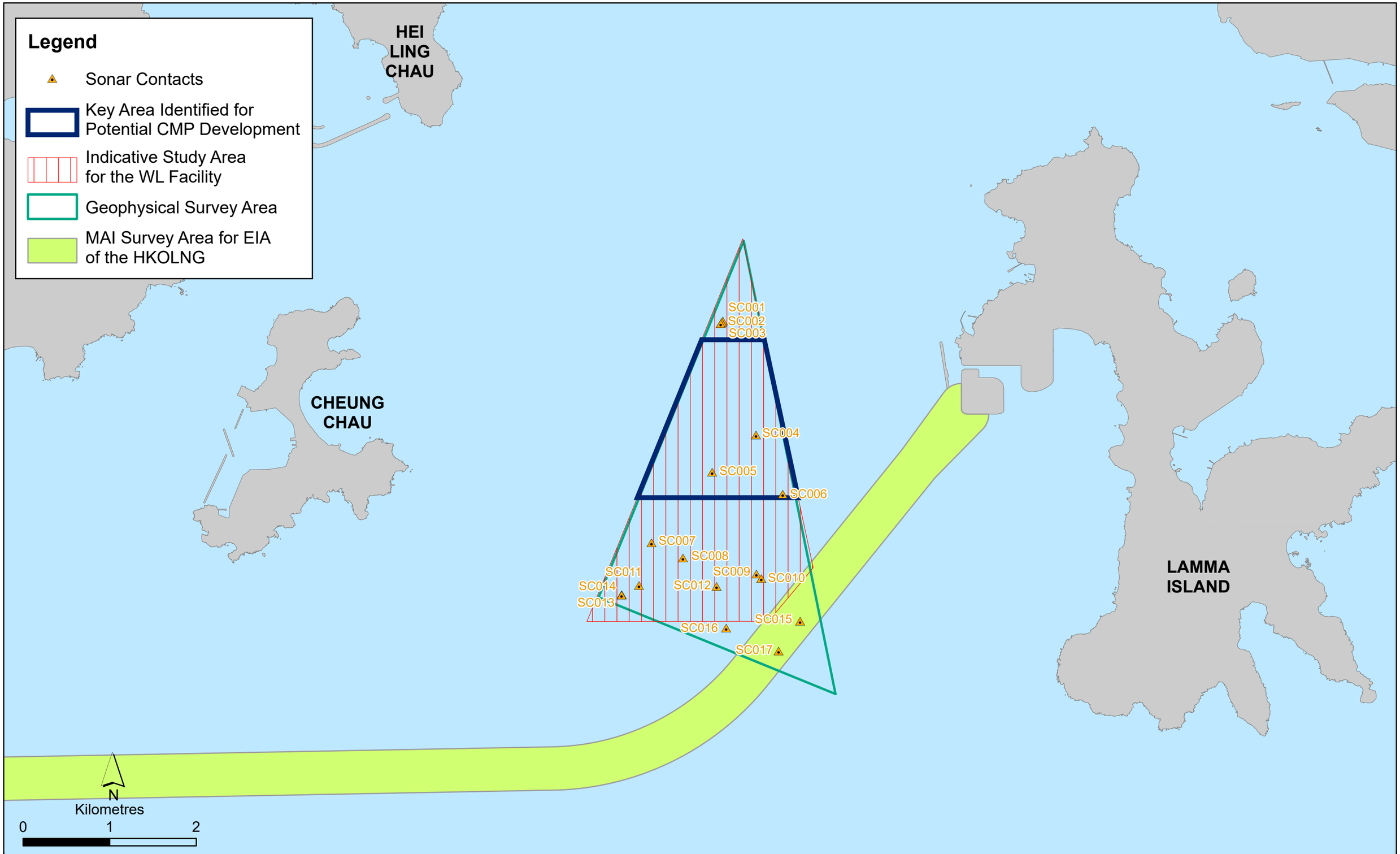

Figure 7.2

Geophysical Survey Area and Location of Sonar Contacts

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Date: 26/1/2021

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Table 7.1 Geophysical Survey Equipment

Type	Equipment
Horizontal Positioning	C-Nav Globally corrected GPS (GcGPS) system model 2050
Single beam echo sounding	Knudsen 320M dual frequency single beam echo sounder
Multi-beam echo sounding	R2 Sonic 2024 multi-beam echo sounder
Side scan sonar	Klein 4000 digital side scan sonar system
Sub-bottom profiler	C-Boom low voltage boomer system and C-Phone hydrophone system

The data received from the survey were analysed in detail to:

- define the areas of the greatest archaeological potential;
- assess the depth and nature of the seabed sediments for defining which areas consist of suitable material to bury and preserve archaeological material;
- examine the boomer and side scan sonar records for mapping anomalies on the seabed which may be archaeological material; and
- examine the multi-beam sonar data for assessing the archaeological potential of the sonar contacts.

7.3.5 Establishing Marine Archaeological Potential

The synthesis and analysis of the baseline review and the geophysical survey and the scope and nature of the proposed marine works of the Project were used to establish if there are any marine archaeological resources / sites within the MAI Assessment Area and determine the need for further investigation.

7.3.6 Remote Operated Vehicle (ROV) / Visual Diver Survey / Watching Brief

Should any areas of archaeological interest be identified that may be affected by the Project, they may be inspected by ROV or divers to record all seabed features of archaeological interest.

Owing to the heavy marine traffic in Hong Kong, the ROV / visual diver survey may not be feasible to achieve for the targeted area of archaeological interest. If that is the case, an archaeological watching brief as part of the construction work of the Project would be established as the most appropriate way to monitor the marine construction activities in areas of identified high potential, to obtain physical archaeological information.

If ROV / Visual Diver Survey / Watching Brief are required, a proposal to define the investigation strategy, scope, methodology, resources and programme would be established and agreed with the Antiquities and Monuments Office (AMO).

7.3.7 Impact Assessment and Recommendations

Based on the findings and analysis of the baseline conditions and result of the evaluation of the marine archaeological potential, an impact assessment was conducted to evaluate the potential marine impacts of the Project on marine archaeological resources / sites, and recommend necessary marine archaeological actions or mitigation measures.

7.4 Marine Archaeological Review

7.4.1 Baseline Review

7.4.1.1 Review of Historical Documents

Coates [64] stated that "definite archaeological traces of prehistoric activity have been found on the beach at Shek Pik, on the south coast of Lantao [Lantau] Island. From these finds it is clear that about three thousand years ago the islands in the HKSAR were used as a seasonal entrepôt for trade between the Yangtse mouth, the tribal states of what is to-day Guangdong Province, and Indonesia". The islands at the mouth of the Pearl River were seen as more suitable for trade between the Cantonese merchants and those from other regions, and "Temporary settlements were built near the beaches. Cooking utensils have been found from this period on Lamma and Lantao, but no trace of buildings".

Thirteen (13) sites of archaeological interest and many archaeological finds have been recorded on Lamma Island which although would not be affected by the Project could indicate some interest in the offshore area within or adjacent to the MAI Assessment Area. Studies show a rich heritage on the island, including thirteen sites of archaeological interest. Artefacts of note include lime kilns, shells, animal bones, ancient cultural relics, bronze weapons, bronze axe moulds, burials and a special 'Yazhang', a jade object from ritual purposes, which indicates that 3,000 years ago, the coastal area of Southern China had a cultural connection with the Yellow River basin.

In the 16th century, Lamma Island was known as Pok Liu Chou (博寮洲) in Chinese [65]. It is considered that the name originated from "Pok Liu Chou (舶寮洲)" which literally means "harbour for the foreigners". In the mid-17th century, Lamma Island was recorded on Western and Chinese charts and known at this time as "Nanya (南丫)". The Chinese character "Nan 南" (means "south") refers to the island's location (southern part of Hong Kong / Guangdong) and the character "Ya (丫)" refers to the "丫" shape of the island. Lamma Island appears to have been designated as a stopover place for the foreign merchants before proceeding to Guangzhou (廣州), an international port at that time, during Tang and Song Dynasty (i.e. 7th to 13th century) [66].

In the 1860s the first Chinese navy garrison on Lamma Island was established at Yung Shue Wan where ten soldiers were stationed [67].

7.4.1.2 Geological Conditions

The solid geology of the Assessment Area consists of Jurassic-Cretaceous medium-grained granite, while the superficial deposits mainly consists of very soft to soft sandy clay. The marine deposits are generally soft or very soft clay or silts. Patches of dumped materials were identified from the geophysical survey.

7.4.1.3 Review of Charts

Review of old admiralty charts identified no potential marine archaeological interest / wrecks in the MAI Assessment Area. ***Figure 7.3*** shows an example of a historic admiralty chart compiled through surveys conducted from 1841-1966 where no features are identified in the MAI Assessment Area. A recent Electronic Navigational Chart (ENC) (2020) [68] shows that there is an obstruction at a similar location to a Sonar Contact identified in the MAI Assessment Area (***Figure 7.4***). By comparing the old and new charts, it is concluded that the obstruction as shown in the 2020 ENC is a recent, post 1966 anomaly, and considered to have no marine archaeological interest.

(64) Braga, J. M., 1995, China Landfall 1513. Jorge Alvares Voyage to China. A compilation of some relevant material. Macao. Imprensa Nacional.
(65) 郭棐 1573-1620, 1997《粵大記》卷十三〈政事類·海防〉，〈廣東沿海圖〉，下冊，頁 916，廣洲，中山大學出版社。
(66) 鄭敏華、周穎欣 2008《南丫島故事》，香港，思網絡有限公司。
(67) 毛鴻賓 瑞麟 監修 1862-74《廣東圖說》卷十三〈新安〉，頁 9-10，廣州府衙。
(68) Hong Kong Electronic Navigational Chart C25C504S.

Legend

- Sonar Contacts
- Indicative Study Area for the WL Facility
- Key Area Identified for Potential CMP Development
- Geophysical Survey Area

N

Kilometres

0 1 2

HEI LING CHAU

CHEUNG CHAU

SC008

LAMMA ISLAND

POK LIU CHAU

WEST LAMMA CHANNEL

EAST LAMMA CHANNEL

Tidal Information

Place	Height above datum of soundings					
	Average Heights				Heights at Springs near the Solstices	
	High Water		Low Water		H.W.	L.W.
	Mean H^t	Mean L^t	Mean L^t	Mean H^t	Mean H^t	Mean L^t
Kap Shui Mun	7·5 feet	5·6 feet	2·4 feet	4·0 feet	9·2 feet	0·8 feet
Hong Kong Island						
Taitam Bay	9·5 ,,	4·4 ,,	1·9 ,,	3·5 ,,	8·7 ,,	0·5 ,,
Aberdeen	9·6 ,,	4·6 ,,	1·8 ,,	3·5 ,,	8·9 ,,	0·5 ,,
Hong Kong Hr.	7·7 ,,	5·1 ,,	2·6 ,,	3·7 ,,	8·4 ,,	0·4 ,,
Taikoo Shipyard	6·4 ,,	4·2 ,,	1·8 ,,	3·4 ,,	8·9 ,,	0·5 ,,

Figure 7.3

SC008 on historic Admiralty Chart dated 1966

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Date: 26/1/2021

Environmental Resources Management

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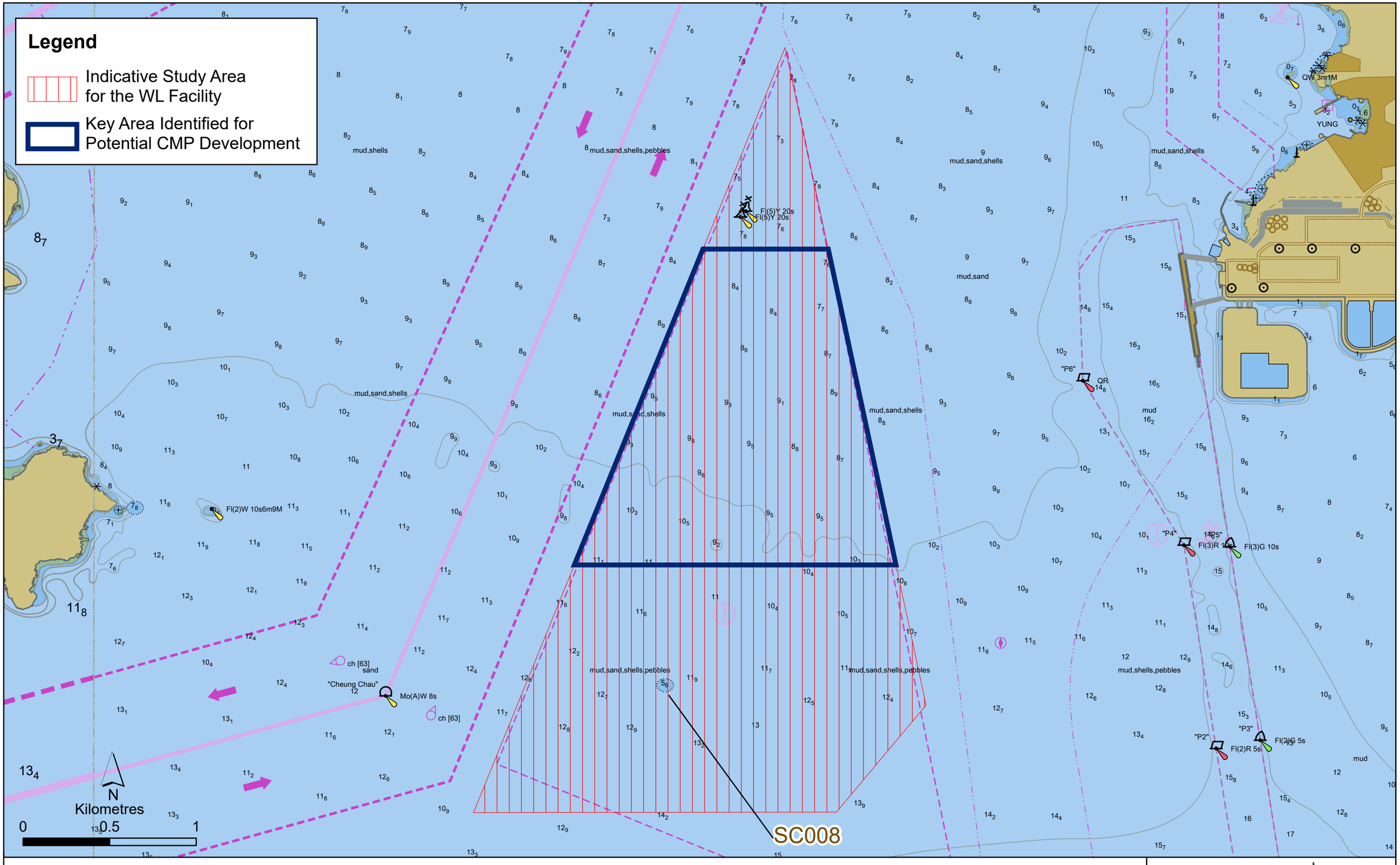

Figure 7.4

SC008 overlaid on 2020 Electronic Navigational Chart

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Date: 18/2/2021

Environmental Resources Management

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7.4.1.4 United Kingdom Hydrographic Office 'Wreck' Files

The United Kingdom Hydrographic Office in Taunton maintains a database of known shipwrecks / undefined sites in the HKSAR. This is the same data held by the Hong Kong Marine Department, Hydrographic Office. The review showed that no wrecks were found to be within the MAI Assessment Area.

7.4.1.5 Previous Marine Archaeological Investigations

MAI was conducted as part of the EIA Study [69] for the Hong Kong Offshore LNG Terminal (HKOLNG) Project. Part of the MAI Assessment Area under the EIA Study for HKOLNG overlaps with the Indicative Study Area for the WL Facility (see ***Figure 7.2***) and no marine archaeological deposits were identified in the overlapping area.

7.4.1.6 Summary of Marine Archaeological Potential

Based on the historical review, it is considered that Lamma Island was located in the vicinity of a busy marine sea route. The waters at the area were the main voyaging channel between Guangdong and the Southern China Sea and Southeast Asian countries as well as East and West for centuries. While on this basis the waters of the Assessment Area may have marine archaeological potential, no shipwrecks of marine archaeological potential could be identified from the Charts, the Wreck Databases, or Previous MAIs.

7.4.2 Geophysical Survey Results

Marine geophysical surveys as part of the site investigations of the Project were conducted to study the seabed features and shallow geology at the west of Lamma Island, in order to facilitate the planning of the Project. The survey findings were processed by the geophysicists and reviewed by the qualified marine archaeologist, Dr William Jeffery, and cultural heritage specialist, Ms Peggy Wong. ***Figure 7.2*** shows the marine geophysical surveys coverage. The surveys track plots are shown in ***Annex 7A***. The seabed is highly disturbed from anchors / trawling, and contains numerous depressions and dumped materials (see seabed features maps in ***Annex 7B***). Review of the survey findings identified 17 sonar contacts (SC001 to SC017) as listed in ***Table 7.2*** and shown in ***Figure 7.2***. The sonar contacts images are illustrated in ***Annex 7C***. Except SC008, the remaining sonar contacts are interpreted as debris, being associated / adjacent to areas of dumped materials, tires, and possible rope or chain without archaeological interest. The numerous dumped materials impacted the seismic data in those places in the northern section, but the quality of the data was acceptable elsewhere for sub-bottom interpretation. No sub-bottom anomalies were observed that could be interpreted as being of marine archaeological potential.

SC008 has outstanding dimensions of 10m x 7m x 6m and is at the same location on the 2020 ENC (see ***Figure 7.4***) as an obstruction. The Hong Kong Hydrographic Office was contacted regarding available information regarding the obstruction, but they could not provide any further information about its nature.

([69]) Reference source available from: https://www.epd.gov.hk/eia/register/report/eiareport/eia_2562018/HTML/0359722_HKOLNG%20EIA_12_CH_Rev%203.htm)

Table 7.2 Sonar Contact

Sonar Contact Number	Latitude / Longitude	Easting Northing	Water Depth (m)	Dimensions (m)	Description
SC001	22°13.348'N 114°4.441'E	825916.1E 809144.0N	9	4.5 x 2.5 x 1	Buoy clump weight
SC002	22°13.339'N 114°4.434'E	825903.4E 809127.8N	8.8	4 x 3 x 0.5	Debris
SC003	22°13.331'N 114°4.427'E	825891.3E 809112.5N	8.9	2 x 2 x 1	Buoy clump weight
SC004	22°12.636'N 114°4.665'E	826300.0E 807830.8N	9.8	1 x 1 x <0.5	Possible tire
SC005	22°12.403'N 114°4.471'E	825793.8E 807401.1N	11	1.5 x 1.5 x <0.5	Possible tire
SC006	22°12.266'N 114°4.845'E	826608.2E 807146.4N	11	3 x 1.5 x 1	Debris
SC007	22°11.962'N 114°3.963'E	825092.6E 806587.0N	13	4 x 4 x <0.5	Debris
SC008	22°11.867'N 114°4.175'E	825457.1E 806411.5N	10	10 x 7 x 6	High relief object
SC009	22°11.766'N 114°4.668'E	826304.4E 806224.5N	13	1.5 x 1.5 x <0.5	Possible tire
SC010	22°11.739'N 114°4.701'E	826361.0E 806174.3N	13	1.5 x 1 x <0.5	Possible tire
SC011	22°11.693'N 114°3.879'E	824947.6E 806090.2N	14	4 x 2 x <0.5	Debris
SC012	22°11.689'N 114°4.400'E	825843.3E 806082.2N	14	2.5 x 1 x 0.5	Debris
SC013	22°11.636'N 114°3.763'E	824748.3E 805986.1N	15	5 x 2 x 0.5	Debris
SC014	22°11.633'N 114°3.762'E	824746.0E 805979.4N	15	5 x 3 x 1	Rectangular Debris
SC015	22°11.472'N 114°4.962'E	826808.8E 805680.9N	15	4 x 0.5 x <0.5	Possible rope/chain
SC016	22°11.428'N 114°4.465'E	825954.7E 805601.1N	15	3 x 1.5 x <0.5	Possible tire
SC017	22°11.428'N 114°4.817'E	826559.9E 805336.1N	16	2.5 x 2 x <0.5	Debris

7.4.3 Establishment of Marine Archaeological Potential

There is one sonar contact (SC008) which is at the same location as an obstruction marked on 2020 ENC (C25C504S). There are no wrecks/obstructions for this location to be found on the UKHO

Wrecks database. A Notice to Mariners (20/2018) identified this anomaly as an obstruction, yet after consultation with the Marine Department (MD) of the Hong Kong Hydrographic Office, they have no information about its nature.

The qualified marine archaeologist, Dr William Jeffery, has assessed the available information on SC008. He considered that MD could not provide any further information about SC008's nature is probably because priority of survey of MD has been given onto other items that come with higher navigation hazard. For SC008, its depth is 5.6m (***Figure 7.4***) which is a potential navigation hazard but not along shipping lane, thus it is not considered as navigation hazard and therefore has not been surveyed by MD or there is no urgent need to do a survey on it. Whether SC008 is natural or man-made is unknown, but given the information gained from the review of the historic admiralty chart from surveys conducted between 1841-1966 did not identify any obstruction at this location, it suggests that SC008 is a recent deposition and of no marine archaeological interest. SC008 could be debris or dumped materials, natural or man-made, but not older than 1966, and it is not a wreck, as the UKHO has no wreck record in that location. Since SC008 is located away from the Key Area for potential CMP development and thus will not be impacted by the Project, further marine archaeological investigations are considered not necessary.

Except SC008, the remaining sonar contacts are interpreted as debris, tires, and possible rope or chain without marine archaeological potential. Further investigation by magnetic survey was not deemed necessary. The ROV/Visual Diver Survey/Watching Brief was also not deemed necessary.

7.5 Potential Sources of Impact

The dredging construction and disposal operation of the Project may have direct or indirect impacts to potential sites of cultural heritage. Such impacts may arise from the following activities:

- Direct loss of potential marine archaeological deposits due to dredging works;
- Indirect impact on access for future archaeological surveys; and
- Permanent access disturbance to marine archaeological deposits if they are conserved within the Project area.

7.6 Impact Assessment

The desktop review found no sites of archaeological interest, declared monuments, proposed monuments, graded historic sites / buildings, and government historic sites identified by the AMO fall within MAI Assessment Area.

Geophysical surveys identified SC004-SC006 are located within the Key Area for potential CMP development as shown in ***Figure 7.2***. They are interpreted as possible tire / debris and of no marine archaeological interest; therefore no marine archaeological impact is anticipated. No sub-bottom anomalies of marine archaeology potential were observed.

Geophysical surveys identified a sonar contact (SC008) that is considered to have no marine archaeological potential given it is post 1966, and through identification in a 2018 Notice to Mariners, potentially an obstruction of only a few years old. The design of the Project has identified the Key Area for potential CMP development where potential seabed disturbance would occur. SC008 is located ~700 m away from the Key Area for the potential CMP development. Potential impact to SC008 is therefore not anticipated. Therefore, no impact on any marine archaeological resources is expected due to the construction and operation of the Project. No mitigation measures are considered necessary. No cumulative impact or adverse residual impacts on marine archaeological resources are expected.

7.7 Mitigation Measures

As no impacts to marine archaeological resources are expected, no mitigation measure is required.

7.8 Cumulative Impacts

At present, there are no planned projects (see ***Annex 2A***) within the MAI Assessment Area that could have cumulative cultural heritage impacts with the proposed Project.

7.9 Conclusions

The desktop review supplemented with the results of geophysical survey conducted for the Project concluded that there are no sites of archaeological potential in the Key Area for potential CMP development for the Project. Further marine archaeological investigations are considered not necessary. No marine archaeological impact is identified and thus no marine archaeological mitigation measure is therefore required. No cumulative impact or adverse residual impacts on marine archaeological resources are expected.

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7.10.2 Chinese

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7.10.3 Charts

1966 Hong Kong Historic Admiralty Chart No. 1466, London Hydrographic Office.

2020 Hong Kong Electronic Navigational Chart C25C504S. Hong Kong Hydrographic Office, Marine Department, HKSAR.