

Civil Engineering and Development
Department

**Tung Chung New Town
Development Extension**

Marine Diver Survey Report

219844-REP-044-01

Final | March 2013

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1 INTRODUCTION

1.1 General

- 1.1.1** According to the 2007 Revised Concept Plan for Lantau, Tung Chung New Town is to accommodate a population of 220,000. The engineering infrastructure works for Phases 1, 2 and 3A of Tung Chung New Town development have been completed to support a population capacity of about 108,000 (the current population of Tung Chung New Town is about 78,400). At present, the various plans already made for Tung Chung are being implemented by phases. Examples include public rental housing in Areas 39 and 56, private residential development in Area 55 near the waterfront and the North Lantau Hospital in Area 25. At the same time, there are several adjoining large-scale infrastructure projects in the pipeline. For example, the Hong Kong-Zhuhai-Macao Bridge (HZMB) scheduled to complete by end 2016, the Tuen Mun-Chek Lap Kok Link as well as other related projects in the vicinity of Tung Chung, including the adoption of a three runway system being planned for the Airport. Given the strategic location of Tung Chung, such infrastructure would bring about the so-called “Bridgehead Economy” benefits and there are potentials to develop Tung Chung into an attractive regional shopping and tourism node. Also, as part of the Government’s enhanced efforts to increase housing land supply, there is a need to review and establish the planning and engineering aspects of expanding the Tung Chung New Town to Tung Chung East and Tung Chung West to meet the long-term housing need of our community and the aspirations of Tung Chung residents for more commercial and public facilities.
- 1.1.2** PlanD and CEDD jointly commissioned the Tung Chung New Town Development Extension Study (the Study) in January 2012. The Study will explore the development potential and opportunities of Tung Chung and its adjacent areas (in the form of fallow land, foreshore and sea-bed), determine the scope of Tung Chung extension and improve the community and regional facilities. The overall objective is to recommend a preferred development scheme for the continued development of Tung Chung New Town to meet the territorial long-term housing, social, economic and environmental needs. Specifically, through the Study, we hope to further increase land supply to meet housing and other development needs, enhance community facilities and provide more job opportunities.
- 1.1.3** Adjoining the tentative potential new town development extension area at Tung Chung East there lies a possible site of about 40 ha for a theme park/major recreational uses for long term planning purpose as indicated on the Revised Concept Plan. This Project would however only include the reclamation for the possible theme park/major recreational uses. The construction and operation of the possible

theme park/major recreational uses would be done by other project proponents. Hence, the future operator would need to apply for the respective EP under the EIAO. However, the Study will assess in broad terms the nature and technical feasibility of the possible theme park/major recreational uses and their compatibility/interface with developments in the vicinity. The environmental and technical feasibility of reclaiming this possible site together with the tentative potential New Town extension area at Tung Chung East in one go will also be examined in the Study as a separate scenario.

1.2 Location and Scale of Project and History of the Site

1.2.1 The tentative potential Tung Chung new town development extension areas are shown in **Figure 1.1**.

1.2.2 The existing edges of the Tung Chung New Town are fronting the sea at the east and the estuary of Tung Chung River at the west. At its southern and western sides, the New Town is surrounded by the Lantau North (Extension) Country Park. The total area of the tentative potential new town development extension (245 ha) and the possible theme park/major recreational uses (about 40 ha) is about 285 ha. The potential new town development extension areas in Tung Chung East and West (about 175 ha and 70 ha respectively) comprise about 120 ha is reclamation area and 125 ha existing land. Including about 40 ha for the possible theme park/major recreational uses, the total reclamation is about 160 ha. It should be emphasised that the scale of reclamation is indicative only and subject to the outcome of the Study. The fallow land interspersed with existing villages at Tung Chung West is also included as part of the study site for the tentative potential new town development extension areas.

1.3 Scope of Diver Survey Report

1.3.1 As discussed in **Section 1.1**, the tentative potential new town development extension areas include 2 parts, one at the Tung Chung East and the other area at the Tung Chung West. Previous geophysical surveys in other Marine Archaeological Investigations (MAIs) have covered the entire area of Tung Chung East (see **Section 2** for detailed discussion).

1.3.2 MAI was required to cover the seabed which may be impacted by possible development at Tung Chung Bay. Geophysical survey data was absent for this area due to the extremely shallow water across the Bay. The aim of the MAI is to assess the impact of the works on marine archaeological resources and recommend any mitigation measures, if necessary.

2 REVIEW OF PREVIOUS MARINE ARCHAEOLOGICAL FINDINGS

2.1 Marine Archaeological Review

2.1.1.1 Three previous MAIs (namely the Lantau Logistic Park Development – Feasibility Study, Hong Kong - Zhuhai - Macao Bridge, and New Contaminated Mud Marine Disposal Facility at South Brothers) were conducted in the vicinity of Tung Chung area. They were all examined in detail to reveal information relevant to this study.

2.1.2 Lantau Logistics Park Development – Feasibility Study (LLP)

2.1.2.1 The study area of LLP was 112ha off the North Lantau Coast designated for reclamation where dredging would be conducted with an approximately additional 100m buffer beyond these works.

2.1.2.2 The Baseline Review for LLP did not locate any specific archaeological sites but established high archaeological potential for submerged terrestrial sites (pre 6000 BP) that will be impacted by the proposed dredging. The results are summarized in **Section 2.1.2.3 to 2.1.2.6**.

2.1.2.3 Two separate geophysical surveys were conducted for the LLP western and eastern portions in 2004 and 2005 respectively as part of the MAI^(1&2). **Figure 2.1** shows the extent of the previous geophysical surveys.

2.1.2.4 The geophysical surveys employed side-scan sonar, seismic reflection survey and echo sounding and were conducted at different times.

2.1.2.5 Analysis of the survey data located 28 seabed anomalies (as shown in **Figure 2.2**) across the two survey areas. These were unusual as they were found in an area remarkably devoid of dumped material. They could also be dispersed wreckage. The small patches of debris in the area may be associated with these unidentified objects.

2.1.2.6 In December 2005, a diver survey was completed on 12 of the anomalies that would be directly impacted by the proposed reclamation and dredging works for LLP, the majority of objects found during the visual diver survey composed of modern materials such as concrete or rubber, which were interpreted to be of minimal cultural significance. The locations of 12 anomalies directly impacted by the proposed reclamation for LLP are shown in **Figure 2.2**.

2.1.3 Approved Reports for HZMB (HKBCF and HKLR)

2.1.3.1 The geophysical survey covered the footprint of the HZMB (HKBCF and HKLR) and associated installations plus a buffer zone of 100m (as shown in **Figure 2.1**) to allow for the impact of working vessels during construction.

- 2.1.3.2 The respective baseline review did not locate any specific archaeological sites but established high archaeological potential based on historical evidence.
- 2.1.3.3 Three geophysical surveys were carried out during May to June 2004, November to December 2005 and November to December 2008. Subsequently, two separate diver surveys were conducted in April and May 2009 for HKLR and HKBCF respectively.
- 2.1.3.4 A diver survey was completed for 26 HKLR seabed anomalies and 3 HKBCF anomalies (as shown in **Figure 2.2**) were also investigated and they were identified as modern materials. Further investigation is thus not required.
- 2.1.4 New Contaminated Mud Marine Disposal Facility at South Brothers
- 2.1.4.1 In 2002, the respective project proponent evaluated two potential locations at East of Sha Chau and South Brothers. Only the South Brothers study is relevant to this assignment. The baseline review of South Brothers study did not locate any specific marine archaeological resources.
- 2.1.4.2 In July 2005, a comprehensive geophysical survey comprising the multi beam echo sounder, seismic reflection and side scan sonar was conducted. The geophysical survey data located three anomalies in the seismic profiler data. Diver survey was not recommended in the report as they were deeply buried. A watching brief was proposed at that time and there were no unidentified objects on the seabed.
- 2.1.5 Summary
- 2.1.5.1 A desktop study has been conducted to consolidate the previous MAIs conducted that are relevant to this Study. These studies include LLP, HZMB (HKBCF and HKLR) and the New Contaminated Mud Marine Disposal Facility at South Brothers. All previous geophysical surveys in MAIs conducted have completely covered all the potential new town development extension areas on seabed in this study where boat access was possible. **Figure 2.1** shows the coverage of each previous geophysical survey and also the area for which there is no data in the shallow area of Tung Chung Bay.

2.2 Baseline Review

2.2.1.1 A Baseline Review was completed and included study of the following sources:

- Marine charts and records held in British Library and National Maritime Museum Library in London;
- Publications on local historical, anthropological, archaeological and other cultural studies; and
- Unpublished papers, records, archival and historical documents held in local libraries and other government departments.

2.2.2 Qin Dynasty (221-206 B.C.E.) to Song Dynasty (960-1279)

2.2.2.1 The early maritime history of the region is linked with international trade, defence and salt dating from as early as the Qin Dynasty (221-206 BC) to Song Dynasty (960-1279). The intensity of shipping in the Lantau area increased dramatically from the time of the Qin Dynasty (221-206 BC) centered on Guangzhou. Around this time Guangzhou became the starting point of the maritime trade route over the South China Sea as well as a meeting place for the exchange of goods, a position, which it has maintained up to today.

2.2.2.2 From around 200 B.C.E. until the advent of steam power, monsoon winds brought trading vessels from South East Asia towards the region. Strong currents brought the vessels past the north west coast of Lantau before turning northwards to follow close to the eastern coast of the Pearl River. Vessels also made their way to and from the Pearl River from the east towards northern China, via the waterway that separates Lantau and the mainland.

2.2.2.3 The destination for these trading vessels has always been the rich trading port of Guangzhou. During the Tang (618-907 C.E.) and Song (960-1279 C.E.) Dynasties, Guangzhou had grown into the largest commercial port in China. It was the first Chinese city to have a government office to administer foreign trade. The importance of this centre and the volume of foreign shipping in the Pearl River delta was always a concern for the Imperial Government. From as early as 411 C.E. a pirate band named the Lo Ting had established itself on Lantau and harassed shipping in the area. To safeguard the seaward approaches to Guangzhou and minimise piracy, the Government established war junk patrols and forts at suitable anchorages. The initial base for the war junk patrols was situated at Tuen Mun.

2.2.2.4 There are several historical references to Lantau regarding salt production on the Island. During the Tang Dynasty, an Assistant to the Imperial Salt Commissioner based in Guangzhou was responsible for salt production, control of smuggling and shipping on Lantau. Salt pans and works may have been established around Tung Chung at this time as there is archaeological evidence of settlement at Tung Chung during the Tang Dynasty. Tung Chung may also have served as auxiliary anchorage for war junks based at Tuen Mun due to that

harbour's exposure to the south, the direction from which most of Hong Kong's typhoons originate.

2.2.2.5 During the 12th century the Song Dynasty established its capital at Hangzhou. As a result government interest and presence in Lantau increased. This resulted in a 50 year rebellion as the government sought to control fishing and salt working activities and in 1197 an attempt was made to stop private trading in salt on Lantau. The islanders successfully repulsed a government invasion force by mining their harbours with wooden stakes and engaging them in a sea battle capturing merchant ships, and killing more than three hundred people. Tung Chung is very likely to have been one of the harbours involved in the rebellion.

2.2.2.6 In the second half of the 13th century, as the lands of the Southern Song were being overrun by the Mongols, the fleeing Imperial court on several occasions took refuge on Lantau. Before finally leaving Lantau, the young Emperor, Tak Yau (德祐) died and his half brother, Prince Tai Ping (帝昺) was enthroned. These events took place in north Lantau and most likely at Tung Chung.

2.2.3 Middle to Late Ming (1500-1644) to Qing (1644-1911)

2.2.3.1 In 1511, the first Europeans, the Portuguese, arrived in their vessels at the Pearl River (Braga, 1995)⁽³⁾ and it is suggested that they established forts at Tung Chung or Tai O between 1514 and 1521. In 1521 they were expelled after a sea battle – thought to have taken place between Lantau and Sha Chau.

2.2.3.2 Six guard stations were established around Hong Kong during this period to control European incursions as well as piracy – one located on the North Lantau coast at Tai O (Siu, 1988)⁽⁵⁾. These stations were tasked not only to prevent further European incursions but also to try and control piracy. During the 16th century pirate attacks were becoming more frequent. The government became incapable of dealing with the threat and issued a coastal edict in 1662, which expelled all coastal inhabitants to the hinterland until rescinded in 1668, Lantau was effectively uninhabited except for pirates and smugglers.

2.2.3.3 The present villages around Tai Ho were founded from the mid 18th century onwards, with earliest recorded village, Pak Mong, being settled in 1740. The presence of two small cannons at Tin Liu, which is a small hamlet adjacent to Tai Ho suggest defence against pirates.

2.2.3.4 The troubles with piracy and the anti trade tendencies in the Ming and Qing periods affected trade out of Guangzhou but did not stop it. When China enforced a policy which closed ports to foreign trade, an exception was made for Guangzhou for a large part of that period.

2.2.3.5 Piracy continued to be endemic in the waters around Lantau well into the 19th century. One of the most notorious pirates was Cheung Po who in 1808 defeated the Government navy on several occasions. At

one time Cheung Po had over 270 boats and 15,000 men under his command with hideouts in Tung Chung and Stanley on Hong Kong Island. In 1810, he was finally surrounded by the combined naval Chinese and Macao naval forces, near Chek Lap Kok, where, he gave himself up on the promise of a pardon.

- 2.2.3.6 Extensive documentary evidence records a nine day battle in the Bay of Tung Chung which took place between 20 to 29 November 1809. Exactly what happened is a matter of some dispute as the accounts from sources such as Official Qing historians and Portuguese records have very different biases. For example, the official account talks of 1,400 pirates being killed and many pirate ships sunk or damaged. The Portuguese account is similarly inflated with claims of having destroyed a third of the pirate fleet by fire ships. There is one remarkable eye witness account by Richard Glasspoole, an officer from the British East Indiaman the Marquis of Ely which was stationed about twelve miles off Macau at the time. Glasspoole says that the combined Chinese and Portuguese fleet inflicted no significant damage at all on the pirates.
- 2.2.3.7 Glasspoole had been captured on 7 September 1809 while returning to his ship from a trip to Macau to fetch a pilot. Beset by heavy weather, he escaped one set of pirates only to fall into the hands of Cheung Po Tsai (張保仔). Eventually, some two days after the battle, he and his shipmate's ransom were paid. It consisted of goods to the value of about \$4,000 including two bales of superfine cloth, two chests of opium, two casks of gunpowder, a telescope and the rest in dollars.
- 2.2.3.8 Glasspoole's account was written shortly after the battle for his local masters, the Select Committee of Supercargoes of the East India Company in Macau, and published in London in 1815. He describes the Qing government fleet as comprising ninety three war junks, six Portuguese ships, a brig and a schooner.
- 2.2.3.9 There is another contemporary description of the battle which was translated in 1831 and published in London (Neumann, 1831)⁽⁸⁾. It includes the following description of the fighting:
- 2.2.3.10 *"... In consequence of this determination all commanders and officers of the different vessels were ordered to meet on the seventeenth at Chek Lap Kok, to blockade the pirates in Ta Yu Shan, and to cut off all supplies of provisions that might be sent to them. To annoy them yet more, the officers were ordered to prepare the materials for the fire-vessels. These fire-vessels were filled with gunpowder, nitrate and other combustibles; after being filled, they were set on fire by a match from the stern, and were instantly all in a blaze. The Major of Heang Shan, Pang Noo, asked permission to bring soldiers with him, in order that they might go ashore and make an attack under the sound of martial music, during the time the mariners made their preparation.*

- 2.2.3.11 *On the twentieth it began to blow very fresh from the north, and the commander ordered twenty fire-vessels to be sent off, when they took driven by the wind, an easterly direction; but the pirates' entrenchments being protected by a mountain, the wind ceased, and they could not move father on in that direction; they turned about and set on fire two men of war. The pirates knew our design and were well prepared for it; they had bars with very long pincers, by which they took hold of the fire-vessels and kept them off, they that they could not come near. Our commander, however, would not leave the place; and being very eager to fight, he ordered that an attack should be made, and it is presumed that about three hundred pirates were killed. Pao (i.e. Cheung Po Tsai) now began to be afraid, and asked the Spirit of the Three Po, or old Mothers to give a prognostic. The Puh, or lot for fighting was disastrous; the Puh, or lot to remain in the easterly entrenchment, was to be happy. The Puh, or lot for knowing if he might force the blockade or not on leaving his station tomorrow, was also happy.*
- 2.2.3.12 *There arose with the daylight on the twenty-second a light southerly breeze; all the squadrons began to move, and the pirates prepared themselves to joyfully leave their station. About noon, there was a strong southerly wind, and a very rough sea on. As soon as it became dark the pirates made sail, with a good deal of noise, and broke through the blockade, favoured by the southerly wind. About a hundred vessels were upset, when the pirates left Ta Yu Shan. But our commander being unaware that the pirates would leave their entrenchments was not prepared to withstand them. The foreign vessels fired their guns and surrounded about ten leaky vessels, but could not hurt the pirates themselves; the pirates left the leaky vessels behind and ran away."*
- 2.2.3.13 Whatever the truth of the details of the battle, there is no question that at the end of the nine day battle the pirates were not defeated. However Cheung Po Tsai eventually surrendered in 1810 to the Viceroy Bailing of the Qing navy. At the time of surrender he had over 270 junks, 16,000 men, 5,000 women, 7,000 swords and 1,200 guns. These figures clearly indicate the scale of the pirate activities in the region.
- 2.2.3.14 A remarkable 18m long Qing scroll painted on silk depicts the actions of the Viceroy Bailing (c.1748-1816) from his assumption to office in 1809 to the successful solution to the piracy problem in the summer of 1810. It is divided into twenty 'episodes' and includes the pirate battle at Tung Chung. The scroll is currently displayed in the Hong Kong Maritime Museum at Stanley.
- 2.2.3.15 During the dredging of the seabed between Chek Lap Kok and Tung Chung for the new airport in 1993, part of a cannon and a cannon ball were discovered and reported to the Provisional Airport Authority.

An inscription on the cannon reveals that it was manufactured around 1808 in China (Meacham, 1994)⁽⁴⁾. There is no way of knowing its exact origin but it is the only evidence that has been found for the above battle.

2.2.3.16 With the surrender of the pirates in 1810, the inhabitants of Lantau and Chek Lap Kok were able to live in peace and continue their intensive farming and quarrying. The large amount of granite produced on the island favoured the development of granite quarrying. The products were used to build roads and houses in the developing city of Hong Kong.

2.2.3.17 In the 19th century the Qing Government maintained the Right Battalion of 482 soldiers and 5 patrol boats with Headquarters at Tung Chung walled city. In 1847, there were 155 soldiers at Tung Chung fort and a small outpost of 5 men at Tai Ho (Siu, 1982)⁽⁶⁾. Additional garrisons were located at Sha Lo Wan and Tai O to the west (Guangzhou Fu Gazetteer 73)⁽⁷⁾.

2.2.3.18 Naval encounters with pirates were recorded in the area in 1809, 1854, 1857 and 1864. Two of these encounters took place in Tung Chung Wan. Ultimately the piracy was doomed and by the end of the 19th century the practice in Hong Kong waters had been suppressed.

2.2.4 The Tung Chung Walled City

2.2.4.1 The disruption and danger posed by the pirates led to the building of the Tung Chung walled city, also called the Tung Chung Fort. It was built on a piece of land between Sheung Ling Pei(上嶺皮) and Ha Ling Pei (下嶺皮) villages in the Tung Chung Valley. It was built in 1832 by Ho Chun Lung a captain from the Chin Shan Battalion of the Heung Shan Brigade (Bard, 1988)⁽⁹⁾.

2.2.4.2 The walled city backs up against the Tai Tung mountain. Its four rubble filled walls enclose an area of 225 feet by 265 feet and the more formidable front wall runs to about 15 feet thick. Along the main wall can be seen six old muzzle loading cannons each fixed to a cement base. There are two on the western side and four on the eastern side. They bear inscriptions but only four out of the six are still legible. They detail the casting of each cannon: for example the inscription on the second one from the east states that it was cast in the 8th moon of the 14th year of the Jiaqing (嘉慶) reign (1809), serial number Qing 80, weighing 1,000 catties and was cast by the master of the Man Shing Furnace.

2.2.4.3 At this time the pirate Cheung Po Tsai had a very strong influence on Lantau Island. The governor-general of Kwangtung and Kwangsi, Pa-Ling (兩廣總督百齡), was responsible for suppressing Cheung and his colleagues. He organised the casting of cannons and had them mounted throughout the coastal regions so that the area become more strongly fortified against Cheung's attacks. All the cannons that he cast bore serial numbers.

2.2.4.4 Two further cannons are dated to 1841 and were probably used for defence against the British and the opium trade. On the eastern side of the main gate one of the cannons was cast in the 1st moon of the 10th year of the Jiaqing reign (1805) and weighs 1,200 catties. It is highly likely that this cannon was also used for the defence of the region against piracy. The cannon lying next to the one above has been severely weathered and its inscription is illegible. It is clear from the differing casting dates that the cannons were cast elsewhere and transported. Although they have been cast over a period of 4 decades they all shared the same purpose of defending the region against pirates and foreign invaders. The walled city (also known as Tung Chung Fort) has been declared a monument and has been extensively repaired and it now opens as a visitor attraction.

2.2.5 Tung Chung Battery (東涌小炮台)

2.2.5.1 Further evidence for the severity of the pirate threat is demonstrated by the presence of Tung Chung Battery. Tung Chung is in a valley surrounded by hills on three sides and faces the sea to the north. The valley is well drained by streams and provides fertile land for farming. At the entrance to Tung Chung a low lying hill known as the Shek She Shan (the rocky lion mountain) is situated. The Tung Chung Battery is found on the mountain's north slope.

2.2.5.2 The Tung Chung Battery was built in 1817 in order to strengthen defences on the northern coast of Lantau Island and to guard the Tuen Mun waterway. It had two cannon places, seven guard houses and an ammunition store. To its south at the entrance to Tung Chung was the Tung Chung Hau Shuen (with eight guard houses) built in the same year. The fort and the guard houses together had a garrison of thirty soldiers under the command of a patsung sent from the Tai Pang Battalion (Lui Yuen-chung, 1990)⁽¹⁰⁾. There is little documented evidence about the Tung Chung Battery after 1877 and its existence seemingly was forgotten. Recently, rubble walls were found on a knoll near the Tung Chung ferry pier. They are completely ruined but likely to form one of the two cannon places of the Tung Chung Battery. The remains of the Tung Chung Battery are protected under the Antiquities and Monuments Ordinance as a declared monument.

2.2.6 Archive Search

2.2.6.1 The UK Hydrographic Office (UKHO) holds a database of surveyed shipwrecks in Hong Kong, including those not shown on Admiralty Charts. These charts are particularly useful as they may show wrecks which have been subsequently buried or broken up. They also show the original shore lines prior to any reclamation. The database contained no records of shipwrecks within the study area.

2.2.7

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3 JUSTIFICATION FOR ADDITIONAL DIVER SURVEY

- 3.1.1.1 The previous MAI studies within the same Study Area have been reviewed as the Project has accumulated a large amount of relevant data. **Figure 2.1** sets out the coverage of the existing geophysical surveys. It is confirmed no anomalies from the previous surveys fall within the proposed extension areas.
- 3.1.1.2 There is full data coverage for the present Study Area except that there are data gaps for Tung Chung Bay and the near shore areas of North Lantau. In these areas, a combination of the rocky, shallow shore line preventing survey boat access and data masking resulted in either no or degraded data.
- 3.1.1.3 The only way to obtain accurate information about the seabed at these locations is to undertake diver survey. It is therefore proposed that visual surveys to be conducted at regular intervals along the non reclaimed shorelines of the study area in Tung Chung Bay. This area has not been inspected by divers previously as it was outside the 100m buffer zone (as shown in **Figure 2.1**) for the HKLR.

4 DETAILS OF DIVER SURVEY

4.1 Coverage of Diver Survey

4.1.1.1 A survey plan conducting 50m circular searches at 100m intervals and 50m from the shore provided comprehensive coverage of the seabed. **Figure 4.1** shows a blue dot as the centre mark for the location of each 50m circular search. 20 diver surveys were required along the Tung Chung Bay coast.

Table 4.1 Locations of Diver Survey

ID	Coordinates	
	x	y
Centre point for each of the 50m diameter circular search along the shallow near shore coastline of Tung Chung Bay		
TCB-1	810373	816325
TCB-2	810440	816251
TCB-3	810511	816181
TCB-4	810578	816107
TCB-5	810613	816013
TCB-6	810634	815919
TCB-7	810633	815815
TCB-8	810703	815754
TCB-9	810796	815792
TCB-10	810883	815841
TCB-11	810975	815878
TCB-12	811068	815916
TCB-13	811090	816013
TCB-14	811135	816103
TCB-15	811208	816171
TCB-16	811279	816242
TCB-17	811232	816330
TCB-18	811258	816427
TCB-19	811297	816519
TCB-20	811352	816602

4.2 Survey License

4.2.1.1 The diver survey could not start until SDA Marine Ltd was granted a *Licence to Search for and Excavate for Antiquities* issued by the Antiquities and Monuments Office, HKSAR. The application was submitted on 31 August 2012 and the Licence was issued on 31 October 2012.

4.3 Diver Survey Methodology

- 4.3.1.1 The diver survey commenced on 14 November 2012 with a survey period of five days. A team of four divers with Sarah Heaver as Project Manager completed the survey. A sampan was used as a workboat due to the very shallow water and the divers used surface supplied air. A Differential Global Positioning System (DGPS) was used to control the location of the sampan. The boat was positioned above each target and a shot weight was placed on the seabed marked by a buoy on the surface (Photo 1 of **Appendix 4.1**). The drop position was checked against the target position using the DGPS.
- 4.3.1.2 The diver was equipped with a hand held video camera to record the unknown objects and associated seabed features. The video had a remote TV monitor in the boat's wheelhouse, which displayed the video footage in real time (Photo 2 of **Appendix 4.1**). This facilitated the management on the diver from the surface via the through water communications. Surface supplied air was used at all times. (Photo 3 of **Appendix 4.1**). The diver survey work was forced to be conducted around the High Tide on every day of survey due to the shallow water in Tung Chung Bay.
- 4.3.1.3 All diving operations followed the *Code of Practice – Safety and Health at Work for Industrial Diving (1998)*, as published by the Occupational Safety and Health Branch of the Hong Kong Labour Department. All diving operations also followed the requirements of the *UK Health and Safety Executive Diving at Work Regulations (1997)* and the *Commercial diving projects inland/inshore: Diving at Work Regulations (1997), Approved Code of Practice*.
- 4.3.1.4 Photo records of diver survey team are shown in **Appendix 4.2**.

5 MARINE SURVEY RESULTS

- 5.1.1.1** Across the whole Study Area the seabed was composed of soft silty mud. This created a very difficult working environment for the divers as the through water visibility was very restricted and at some times it was almost impossible to see through the intensely muddy water. The boat's propeller and the movement of the diver combined to further degrade the water quality (Photo 1 of **Appendix 5.1**). The poor water quality and prevailing high sedimentation also resulted in very low quality photographs.
- 5.1.1.2** At each location it was significant that there was a very little debris and hardly any identified any seabed features. It was concluded that this was due to the active fishing and shellfish harvesting across the bay. On each day of the survey there were at least nine small fishing boats intensively working in the bay and fishermen were observed collecting shellfish (Photo 2, 3 of **Appendix 5.1**). Fishing barges (Photo 4 of **Appendix 5.1**) were also present on the dates of survey and it is anticipated there would be significant seabed disturbance in these areas.
- 5.1.1.3** The results of diver seabed circular surveys are listed in **Table 5.1** below and the photo records of diver survey results are shown in **Appendix 5.2**.

Table 5.1 Results of diver seabed circular surveys

Diver Survey ID	Description
TCB-1	<ul style="list-style-type: none"> Flat muddy seabed Door handle
TCB-2	<ul style="list-style-type: none"> Flat muddy seabed Stone with marine growth
TCB-3	<ul style="list-style-type: none"> Flat muddy seabed Metal scaffolding bar
TCB-4	<ul style="list-style-type: none"> Flat muddy seabed Modern building debris
TCB-5	<ul style="list-style-type: none"> Flat muddy seabed Modern metal bar
TCB-6	<ul style="list-style-type: none"> Flat muddy seabed Modern wood fragment with marine growth
TCB-7	<ul style="list-style-type: none"> Flat muddy seabed Modern metal cylinder
TCB-8	<ul style="list-style-type: none"> Flat muddy seabed Modern metal pole
TCB-9	<ul style="list-style-type: none"> Flat muddy seabed Modern wooden fragment
TCB-10	<ul style="list-style-type: none"> Flat muddy seabed Plastic cable

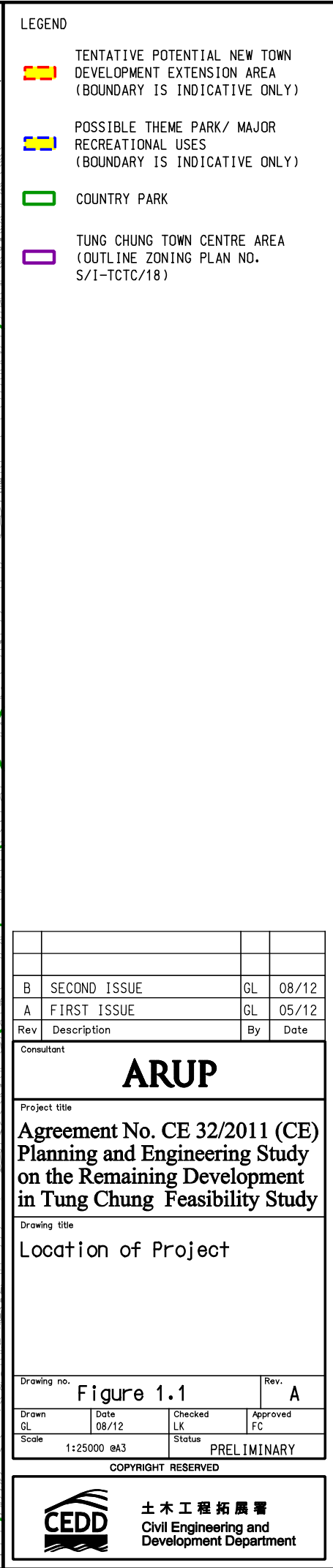
Diver Survey ID	Description
TCB-11	<ul style="list-style-type: none"> Flat muddy seabed Modern wood fragment
TCB-12	<ul style="list-style-type: none"> Flat muddy seabed Modern debris and rope
TCB-13	<ul style="list-style-type: none"> Flat muddy seabed Coke can
TCB-14	<ul style="list-style-type: none"> Flat muddy seabed BBQ equipment
TCB-15	<ul style="list-style-type: none"> Flat muddy seabed Corroded modern metal
TCB-16	<ul style="list-style-type: none"> Flat muddy seabed Modern concrete debris
TCB-17	<ul style="list-style-type: none"> Flat muddy seabed Plastic water bottle
TCB-18	<ul style="list-style-type: none"> Flat muddy seabed Plastic bowl
TCB-19	<ul style="list-style-type: none"> Flat muddy seabed Oyster shell
TCB-20	<ul style="list-style-type: none"> Flat muddy seabed Modern building debris

5.1.1.4 No marine archaeological remains were positively identified during the seabed survey.

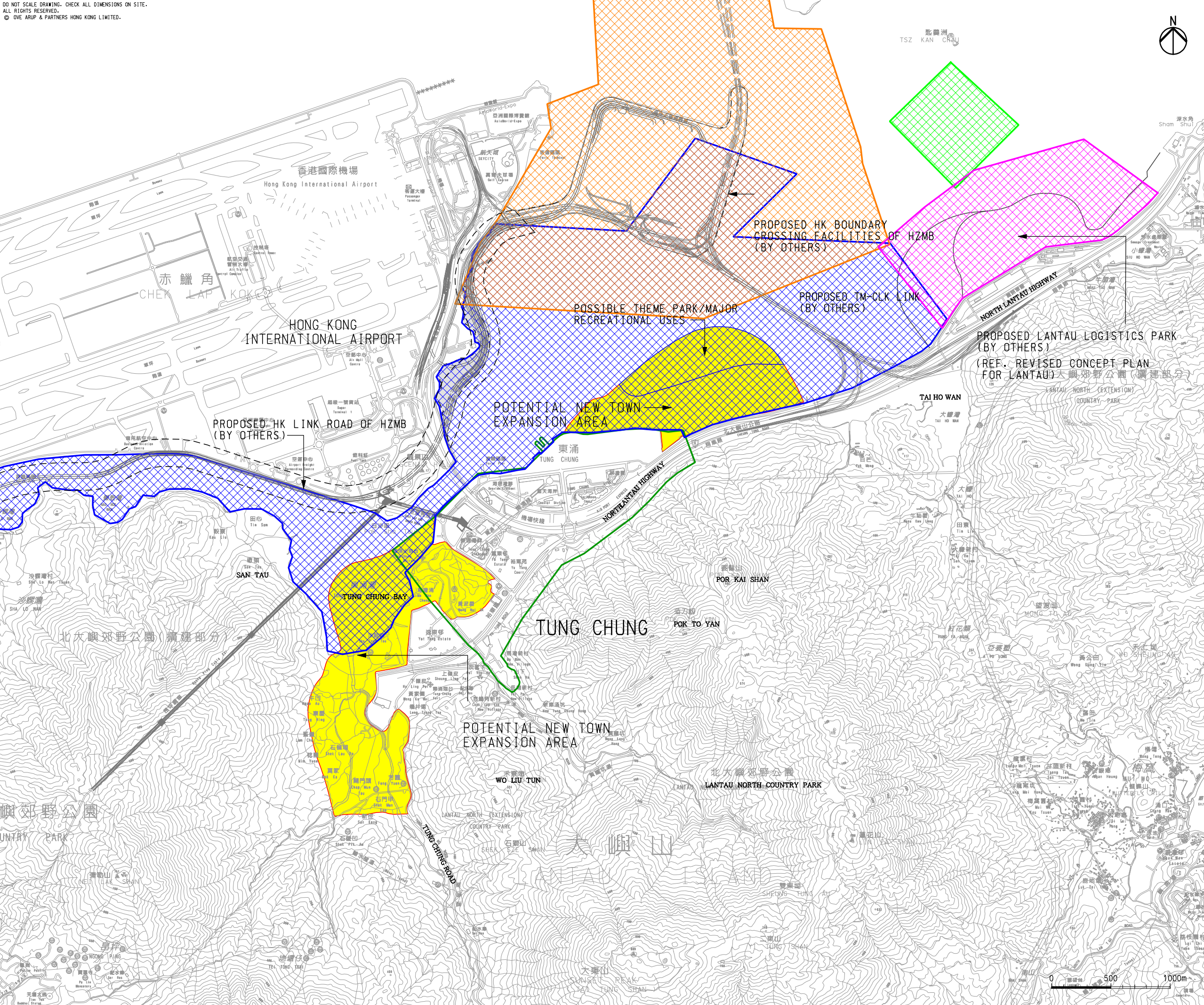
6 CONCLUSION

- 6.1.1.1 The lack of debris and seabed features across the whole of Tung Chung Bay is the result of intense fishing and shellfish collection over many years. These activities are assumed to have removed any archaeological artefacts which may have been on the seabed surface. Marine archaeological resource was not identified during the diver survey and thus no further action or mitigation is required.


Figures



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- LEGEND
- POTENTIAL NEW TOWN EXPANSION AREA
 - POSSIBLE THEME PARK/MAJOR RECREATIONAL USES
 - TUNG CHUNG TOWN CENTRE AREA (AS ON OUTLINE ZONING PLAN NO. S/I-TCTC/18)
 - LLP GEOPHYSICAL SURVEY AREA
 - HKBCF GEOPHYSICAL SURVEY AREA
 - HKLR GEOPHYSICAL SURVEY AREA
 - NEW CONTAMINATED MUD MARINE DISPOSAL FACILITY AT SOUTH BROTHERS GEOPHYSICAL SURVEY AREA
 - HKLR 100M BUFFER ZONE

A		FIRST ISSUE		GL	11/12
Rev	Description			By	Date
Consultant					
ARUP					
Project title					
Agreement No. CE 32/2011 (CE) Planning and Engineering Study on the Remaining Development in Tung Chung Feasibility Study					
Drawing title					
Previous Geophysical Survey Areas in Tung Chung					
Drawing no.				Rev.	
Figure 2.1				A	
Drawn	Date	Checked	Approved		
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Scale	1:30000 @A3		Status	PRELIMINARY	
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Filename : G:\env\project\219844-70\13 Drawing Deliverables\11.Marine Diver Survey Report\01 Draft\Figure 2.1 - Previous Geophysical Survey Areas in Tung Chung_20121129.dgn

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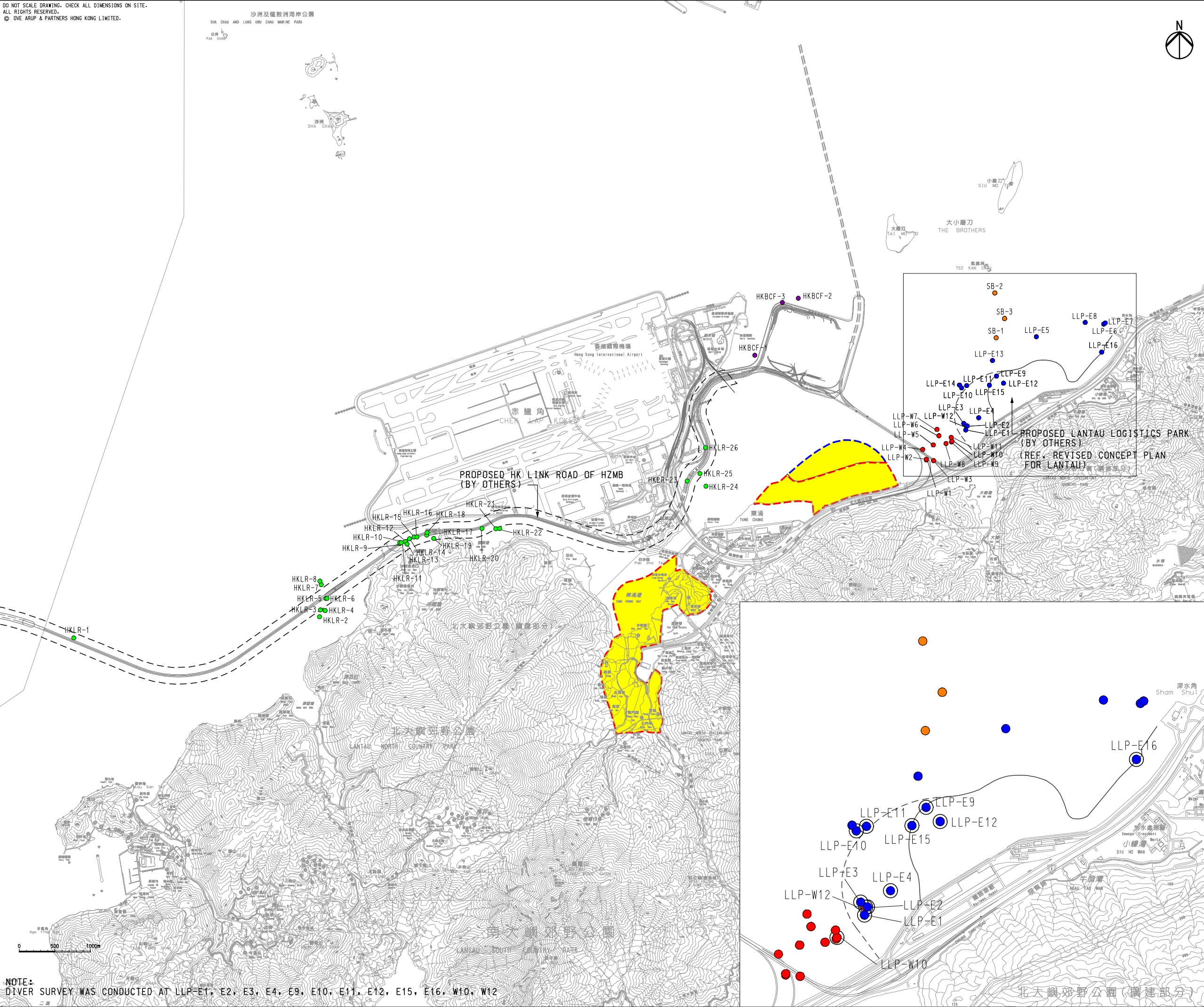
沙洲及離散洲海岸公園
SHA CHAU AND LUNG KIU CHAU MARINE PARK

白礁
PAU CHAU



LEGEND

- STUDY AREA
- POTENTIAL NEW TOWN EXPANSION AREA
- POSSIBLE THEME PARK/ MAJOR RECREATIONAL USES
- LLP WESTERN SURVEY AREA SURFACE ANOMALIES (SONAR CONTACTS)
- LLP EASTERN SURVEY AREA SURFACE ANOMALIES (SONAR CONTACTS)
- HKLR SURVEY AREA SURFACE ANOMALIES (SONAR CONTACTS)
- HKBCF SURVEY AREA SURFACE ANOMALIES (SONAR CONTACTS)
- NEW CONTAMINATED MUD MARINE DISPOSAL FACILITY AT SOUTH BROTHERS SURVEY AREA SURFACE ANOMALIES (SONAR CONTACTS)
- HKLR 100M BUFFER ZONE
- ANOMALIES DIRECTLY IMPACTED BY PROPOSED LLP RECLAMATION



NOTE:
DIVER SURVEY WAS CONDUCTED AT LLP-E1, E2, E3, E4, E9, E10, E11, E12, E15, E16, W10, W12

A	FIRST ISSUE			GL	11/12
Rev	Description			By	Date
Consultant					
ARUP					
Project title					
Agreement No. CE 32/2011 (CE) Planning and Engineering Study on the Remaining Development in Tung Chung Feasibility Study					
Drawing title					
Location of Targets from * Previous Geophysical Survey					
Drawing no.					Rev.
Figure 2.2					A
Drawn	Date	Checked	Approved		
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Scale	1:50000 @A3		Status	PRELIMINARY	



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A	FIRST ISSUE	GL	11/12
Rev	Description	By	Date

Project title

**Tung Chung New Town
Development Extension**




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Scale 1:10000 @A3		Status		PRELIMINARY			



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Appendix 4.1

Photo Records of Diver Survey

Photo No.	Description	Photo
1	Buoy used as the centre of a circular search	
2	Boat display unit	
3	Surface supplied air	



Appendix 4.2

Photo Records of Diver Survey Team

Photo No.	Description	Photo
1	Diver Survey Team	
2		
3		
4		

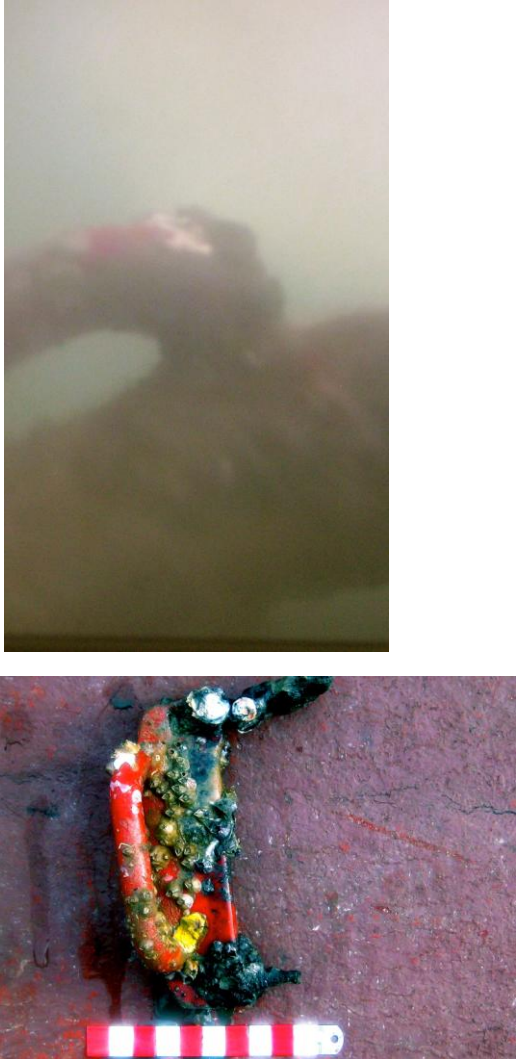

Appendix 5.1




Photo Records of Site Conditions during Diver Survey





Photo No.	Description	Photo
1	Sediment disturbance caused by propeller and diver movements	
2	Small local fishing boat	
3	Local Fishing Boat	
4	Fishing Barges	





Appendix 5.2



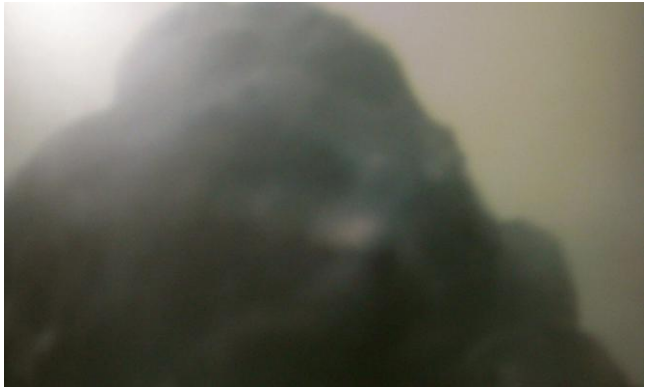
Photo Records of Diver Survey Results




Diver Survey ID	Description	Photo
TCB-1	<ul style="list-style-type: none">Flat muddy seabedDoor handle	 <p>The first photograph shows a wide, flat, muddy seabed with a reddish-brown hue. The second photograph is a close-up of a red door handle, heavily encrusted with green and yellow marine growth. A red and white striped scale bar is visible at the bottom of the close-up.</p>
TCB-2	<ul style="list-style-type: none">Flat muddy seabedStone with marine growth	 <p>The photograph shows a flat, muddy seabed with a reddish-brown hue. A stone, partially covered in green and yellow marine growth, is visible in the center of the frame.</p>

Diver Survey ID	Description	Photo
TCB-3	<ul style="list-style-type: none">Flat muddy seabedMetal scaffolding bar	
TCB-4	<ul style="list-style-type: none">Flat muddy seabedModern building debris	
TCB-5	<ul style="list-style-type: none">Flat muddy seabedModern metal bar	

Diver Survey ID	Description	Photo
TCB-6	<ul style="list-style-type: none"> Flat muddy seabed Modern wood fragment with marine growth 	
TCB-7	<ul style="list-style-type: none"> Flat muddy seabed Modern metal cylinder 	
TCB-8	<ul style="list-style-type: none"> Flat muddy seabed Modern metal pole 	
TCB-9	<ul style="list-style-type: none"> Flat muddy seabed Modern wooden fragment 	

Diver Survey ID	Description	Photo
TCB-10	<ul style="list-style-type: none"> Flat muddy seabed Plastic cable 	
TCB-11	<ul style="list-style-type: none"> Flat muddy seabed Modern wood fragment 	
TCB-12	<ul style="list-style-type: none"> Flat muddy seabed Modern debris and rope 	
TCB-13	<ul style="list-style-type: none"> Flat muddy seabed Coke can 	

Diver Survey ID	Description	Photo
TCB-14	<ul style="list-style-type: none">Flat muddy seabedBBQ equipment	
TCB-15	<ul style="list-style-type: none">Flat muddy seabedCorroded modern metal	
TCB-16	<ul style="list-style-type: none">Flat muddy seabedModern concrete debris	

Diver Survey ID	Description	Photo
TCB-17	<ul style="list-style-type: none"> Flat muddy seabed Plastic water bottle 	
TCB-18	<ul style="list-style-type: none"> Flat muddy seabed Plastic bowl 	
TCB-19	<ul style="list-style-type: none"> Flat muddy seabed Oyster shell 	

Diver Survey ID	Description	Photo
TCB-20	<ul style="list-style-type: none">Flat muddy seabedModern building debris	