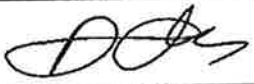



Chung Shun Boring Eng. Co., Ltd.

Contract No. HK/2009/04

Wan Chai Development Phase II and
Central – Wan Chai Bypass –
Baseline Sampling, Field Measurement and
Testing Works

Coral Translocation Plan and Monitoring Proposal

	Name	Signature
Prepared by:	Chung Shun Boring Eng. Co. Ltd.	-
Certified by:	Environmental Team Leader – Mr. Andy Chung	
Verified by:	Independent Environmental Checker – Mr. David Yeung	

16 November 2009

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16 November 2009

1. Introduction

This Coral Translocation Plan and Monitoring Proposal details the procedures for **Pre-translocation Baseline Survey, Coral Translocation, and Post-translocation Monitoring**.

The plan has been certified by the Environmental Team Leader (ETL) and verified by the Independent Environmental Checker (IEC) as conforming to the information and recommendations contained in the approved EIA Report (EPD's Register No: AEIAR-125/2008).

All the works are to be carried out in accordance with the detailed mitigation measures documented in the approval EIA Report and Environmental Monitoring and Audit (EM&A) Manual (*EIA 141/2007*) and Environmental Permit (*EP-356-2009*).

2. Pre-translocation Surveys

a) Baseline Survey for Coral Donor Site

The pre-translocation surveys will be in the ex-PWCDA basin (Site 13) and North Point (Site 27) (**Figures 7.1, 7.2 and 7.4** refer). The survey will map and confirm the number of all coral colonies in these waters. Previously, a total of 19 coral colonies (18 colonies of *Oulastrea crispata* at Site 13; a single colony of *Echinomuricea* sp. at Site 27) were identified during the Rapid Ecological Assessment (REA) surveys in the EIA stage of the Project. Details of the coral colonies recorded are presented in **Table 1A** and **1B**.

Table 1A Size, Distance Along the Transect, Health Condition and Translocation Feasibility of Coral Colonies found at Site 13

Coral Number	Coral Species	Size (cm)	Distance along the transect (m)	Health Condition	Translocation Feasibility
1	<i>Oulastrea crispata</i>	5	5	Fair	Yes
2	<i>Oulastrea crispata</i>	3	15	Fair	Yes
3	<i>Oulastrea crispata</i>	5	27	Fair	Yes
4	<i>Oulastrea crispata</i>	6	34	Fair	Yes
5	<i>Oulastrea crispata</i>	3	50	Fair	Yes
6	<i>Oulastrea crispata</i>	3	56	Fair	Yes

Coral Number	Coral Species	Size (cm)	Distance along the transect (m)	Health Condition	Translocation Feasibility
7	<i>Oulastrea crispata</i>	5	64	Fair	Yes
8	<i>Oulastrea crispata</i>	5	64	Fair	Yes
9	<i>Oulastrea crispata</i>	7	72	Fair	Yes
10	<i>Oulastrea crispata</i>	6	74	Fair	Yes
11	<i>Oulastrea crispata</i>	8	74	Fair	Yes
12	<i>Oulastrea crispata</i>	3	80	Fair	Yes
13	<i>Oulastrea crispata</i>	5	86	Fair	Yes
14	<i>Oulastrea crispata</i>	5	87	Fair	Yes
15	<i>Oulastrea crispata</i>	6	89	Fair	Yes
16	<i>Oulastrea crispata</i>	8	92	Fair	Yes
17	<i>Oulastrea crispata</i>	5	97	Fair	Yes
18	<i>Oulastrea crispata</i>	5	97	Fair	Yes

Table 1B Size, Distance Along the Transect, Health Condition and Translocation Feasibility of Coral Colonies found at Site 27

Coral Number	Coral Species	Size	Distance along the transect (cm)	Health Condition	Translocation Feasibility
1	<i>Echinomuricea</i> sp.	25	75	Fair	Yes

All the coral colonies attached on movable boulders (< 50cm in diameter) identified will be mapped and tagged during this survey. The following baseline information of each of the coral colonies will be collected in this phase:

- Locations

- Verification of the coral species: Tagged coral colonies should be identified to the highest taxonomic resolution as far as practicable.
- Size
- Depth
- Orientation
- Health Status :

Percentage of mortality / bleaching: For gorgonian coral, the percentage of branches affected by partial mortality (e.g. with dead tissue) and secretion of mucus will be recorded. For hard coral, surface area with partial mortality (e.g. with dead tissue) and blanched (i.e. paled) / bleached (i.e. bleached white) area will be recorded. Blanched coral tissue would appear pale due to loss of zooxanthellae or photosynthetic pigment. In contrast, bleached areas would appear white due to the white colouration of the skeleton visible through the transparent coral tissue. This bleaching would occur due to total loss of zooxanthellae. The coral tissue would still be present. It is possible that the lower portions of the coral tissue remain unbleached and would therefore help in differentiating bleached areas as opposed to partial mortality areas where the coral tissue would be absent. To aid for the estimation of area with mortality / bleaching, underwater digital photographs of the tagged corals will be taken followed by image analysis on the computer.

- Percentage of sediment cover:

For each tagged hard coral colony, sediment cover will be recorded including percentage cover, colouration, texture and approximate thickness of sediment on the colony itself and on adjacent hard substrate. Any contiguous patches of sediment cover > 10% should be counted. To aid percentage cover estimates, a 50 cm x 50 cm quadrat equipped with 10 cm spaced string grid will be used.

- Attached boulders size
- General condition of immediate surrounding of the coral colonies

Photographic records of each coral colony tagged in the survey will be collected from an angle that best represents the entire colony.

b) Baseline Survey for Coral Recipient Site

A 10 m x 10 m coastal area at Junk Bay was proposed as a practical and feasible recipient site in the EIA of this Project (**Figure 7.3** of the WDII & CWB Coral Translocation Plan refers). Prior to coral translocation, the proposed recipient site and its vicinity will be surveyed to ensure a healthy coral community of the same

species and similar hydrographical conditions (e.g. substratum type and water depth) as the existing donor site. Spot-check reconnaissance dive will be conducted at the proposed recipient site and its vicinity to check for the presence of health colonies (e.g. fair health condition) of the two targeted species, *Ouslastrea crispata* and *Echinomuricea* sp., which will be translocated to the recipient site. The area of recipient site was selected based on the space requirement of approximately 20 boulders with attached coral colonies (occupying the largest area of less than 0.25 m² each). The recipient site should have sufficient space to receive the newly translocated coral colonies. If necessary, adjustment to the location of actual translocation sites for successful translocation should be considered. Once the exact location of the recipient site is marked, the area will be demarcated by buoys or visible markers. In order to distinguish the natural variation in health status of corals and the health variation due to coral translocation, natural colonies of *Oulastrea crispata* (10 colonies) and *Echinomuricea* sp. (5 colonies*) within and adjacent to the recipient site will be randomly selected and tagged. The baseline information of these tagged coral colonies same as those collected during baseline survey at the donor site will be recorded.

Note: * At least five colonies of gorgonian should be tagged if adequate number of *Echinomuricea* sp. colonies is not available within and adjacent to the coral recipient site.

3. Coral Translocation

During the coral translocation, the following measures aimed at minimizing stress and preventing damage to corals should be followed as far as possible:

- 1) All tagged movable boulders (with diameter < 50 cm) with translocated coral colonies within the donor site during the pre-translocation survey will be moved entirely as a whole object and lifted from the sea bottom and loaded to ship/boat with lifting bag. In case any tagged boulder with corals recorded during the pre-translocation survey no longer accommodates live coral growth, the boulder will not be moved. If additional boulders with coral that can be moved are discovered while removing the tagged boulders with coral, these boulders will also be incorporated into the translocation works. An effort will be made to minimize the amount of contact by the diver and the length of time the boulders/rocks are handled. All the coral colonies attached on the boulders will be kept submerged at all time with a brief exposure unavoidable when transferred onto the vessel.
- 2) The translocated coral colonies transferred onto the vessel will be submerged in seawater tanks (80 cm x 100 cm x 40 cm in dimension and 32 liters in volume

each) with continuous aeration onboard. Each seawater tank will hold no more than 4 boulders to avoid overcrowding. The placement of boulders in tanks will ensure that the coral colonies are fully emerged in seawater. Coral exposure to air should be avoided as far as possible during transport from the donor site to the recipient site. Shading will also be provided by placing the seawater under shell roof of the vessel to avoid exposure to direct sunlight. Ambient water quality parameters of sea surface temperature and dissolved oxygen will be measured once (with at least triplicate sampling) at the coral donor site on the day of coral translocation. The seawater quality in the tank will be checked every ten minutes to ensure no fluctuation above 10% ambient occurs to the seawater in which the coral are submerged.

- 3) Corals will be transported to the recipient site as soon as possible following the removal. The vessel will progress in a slow and steady speed (<5 knots) to the recipient site. During the course of transportation, all the coral colonies on the boulders will be submerged at all times. Constant supervision of the boulders and the correct orientation of boulder in the seawater holding tanks will be carried out to ensure coral colonies are not damaged on the way to the recipient site. The estimated travel time for each journey from the donor site to the recipient site would be approximately 50 minutes.
- 4) When arriving at the coral recipient site, SCUBA divers, with the supervision of the marine ecologist, will carefully place the boulders with coral colonies one by one to the seabed in order to minimize disturbance to the seabed and/or sediment. The coral colonies will be positioned to similar depths with orientations as their previous location at the donor site as far as possible.
- 5) Divers will tag translocated colonies at the recipient site with small plastic labels (e.g. with colony number) anchored or attached on nearby hard substratum using epoxy without touching the corals. All tags will be anchored in vicinity of the coral colonies but no so near as to interfere with potential growth. This would allow the revisit of the coral colonies during the post-translocation monitoring.
- 6) Divers will keep records of size, health status, location, health conditions (percentage of mortality/bleaching), percentage of sediment cover of each translocated coral colony after the completion of translocation works using the same methodologies adopted in the baseline pre-translocation survey. Photographs of each translocated coral upon completion of translocation will be taken and used as a baseline for future monitoring.
- 7) To further minimize the impact on the coral colonies due to translocation work, coral translocation should be scheduled to avoid the spawning season of the corals (July to October) (Lam, 2000; Storlazzi, 2004) as far as possible.

- 8) Audit dive survey at donor site will be conducted as part of the coral translocation exercise after all marked boulders / rocks have been removed and lifted onto the vessel on the same day of coral translocation exercise to ensure that all removable substrate with coral attached are translocated.

The pre-translocation surveys and coral translocation shall be conducted by qualified marine ecologist(s) approved by AFCD, who has knowledge and sound experience in coral identification and translocation works.

4. Post-translocation Monitoring

Following coral translocation, the translocated coral colonies as well as the tagged natural coral colonies at the recipient site will be monitored quarterly for a year. Monitoring will record the following parameters (using the same methodology adopted during the pre-translocation survey); the size, presence, survival, health conditions (percentage of mortality/bleaching) and percentage of sediment of each translocated coral colonies. The general environmental conditions including weather, sea, and tidal conditions of the coral recipient site will also be monitored. Photographic records of the translocated and natural coral colonies will be taken as far as possible maintaining the same aspect and orientation as photographs taken for the pre-translocation surveys. All the tags for marking the translocated and natural coral colonies will be removed / retrieved once the monitoring programme is completed. If, during the post-translocation monitoring observations of any die-off / abnormal conditions of the translocated corals are made, the ET will inform AFCD and in liaison with AFCD investigate any measures needed.

The tentative coral monitoring programme covering **Pre-translocation Baseline Survey, Coral Translocation, and Post-translocation Monitoring** with the survey schedule is provided in **Table 2** as follow:

Table 2 Tentative Programme for Coral Translocation and Monitoring Exercise

Survey Activity	Schedule Implement Time
Pre-translocation Baseline Survey for Coral Donor Site	31 October 2009
Pre-translocation Baseline Survey for Coral Recipient Site	31 October 2009
Preparation of Baseline Survey Report	14 November 2009
Approval of Baseline Survey Report	28 November 2009
Coral Translocation	1 December 2009
Post-translocation Monitoring Survey (time zero)	2 December 2009

Commencement of North Point Reclamation	15 December 2009
1 st Post-translocation Monitoring Survey	2 March 2010
2 nd Post-translocation Monitoring Survey	2 June 2010
3 rd Post-translocation Monitoring Survey	2 September 2010
4 th Post-translocation Monitoring Survey	2 December 2010

5. Reporting

A baseline survey report for the pre-translocation surveys shall be submitted to AFCD prior to the commencement of coral translocation exercise.

Post-translocation monitoring report shall be submitted to AFCD within 2 weeks after the completion of coral translocation and each quarterly coral monitoring survey. The results of the post-translocation monitoring surveys shall be reviewed with reference to the baseline survey results and findings.

6. Marine Ecologist

Mr. Keith Kei will be appointed as the Marine Ecologist for the project. Mr. Kei has over 10 years of experience in coral reef survey and monitoring in Hong Kong water, he is extremely familiar with Hong Kong's coral communities, fish and marine invertebrate diversity. During his services, he has participated in the baseline surveys for numerous major infrastructure developments and commercial projects including underwater cable circuit, Hong Kong theme park, Kau Sai Chau Golf Court development and Kai Tak Airport development etc. Particularly, Keith has involved in the coral translocation works for Kau Sai Chau Golf Court Development and Extension of the Hong Kong Royal Yacht Club at Middle Island.

He is also leading the Reef Check Foundation and organised the activities of "Reef Check" in Hong Kong since 1998 and become the Director since 2008. Since 2000, the Reef Check Foundation is collaborating with Agriculture, Fisheries and Conservation Department to organise the activity in order to monitor the Hong Kong coral communities.

He is also one of the AFCD approved marine ecologists, with well experiences in underwater videography and photography.

Keith Kei will be the marine specialist who carry out and supervise the baseline survey. Personnel responsible for coral translocation and monitoring are pending and subject to future job tendering.

Reference:

Lam, K.K.Y. 2000. Sexual reproduction of a low-temperature tolerant coral *Oulastrea crispata* (Scleractinia, Faviidae) in Hong Kong, China. *Marine Ecology Progress Series* vol.205: 101-111.

Storlazzi, Curt D. Michael E. Field, Andrea S. Ogston, Joshua B. Logan, M. Kathy Presto and Dave G. Gonzales 2004. *Coastal Circulation and Sediment Dynamics Along West Maui, Hawaii Part III: Flow and Particulate Dynamics During the 2003 Summer Coral Spawning Season.*

LEGEND:

- PROPOSED PERMANENT RECLAMATION AREA
- PROPOSED TEMPORARY RECLAMATION AREA
- CORAL SPOT-CHECK SURVEY AREA
- SPOT-CHECK DIVE ROUTE



WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

SPOT-CHECK DIVE SITES AND REA TRANSECTS

(SHEET 1 OF 2)

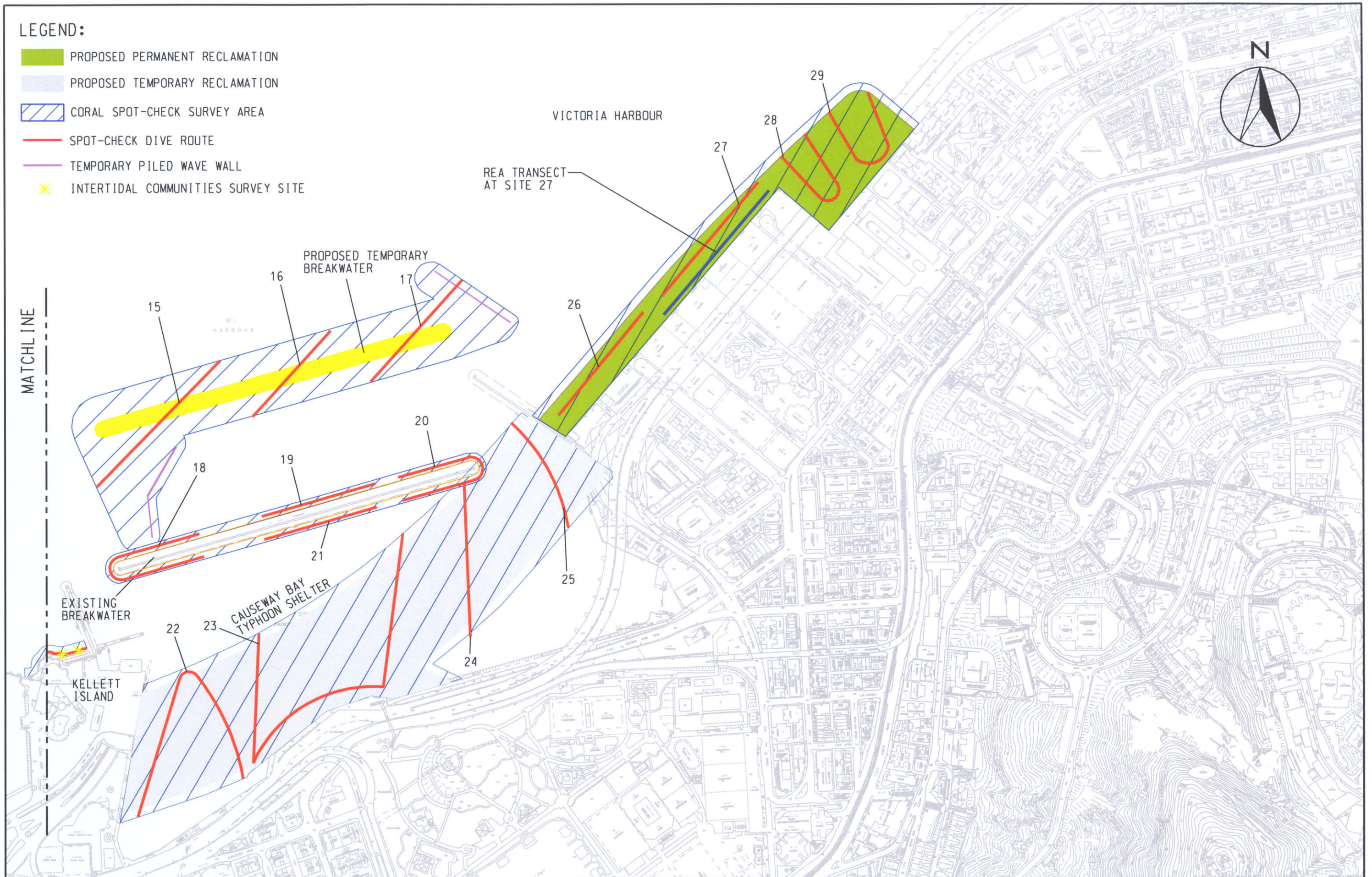
FIGURE 7.1

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LEGEND:

- PROPOSED PERMANENT RECLAMATION
- PROPOSED TEMPORARY RECLAMATION
- CORAL SPOT-CHECK SURVEY AREA
- SPOT-CHECK DIVE ROUTE
- TEMPORARY PILED WAVE WALL
- INTERTIDAL COMMUNITIES SURVEY SITE



WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

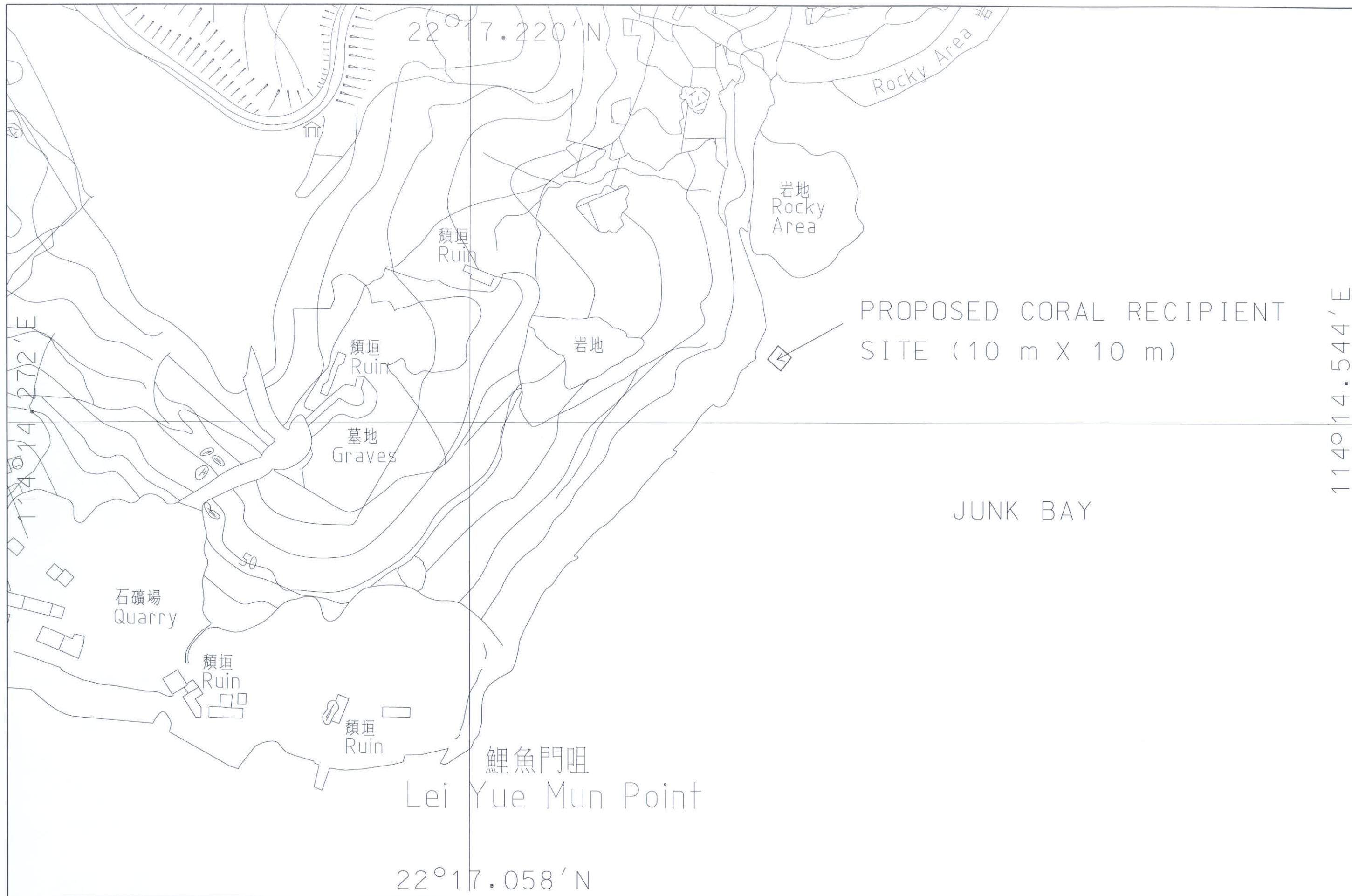
SPOT-CHECK DIVE SITES AND REA TRANSECTS

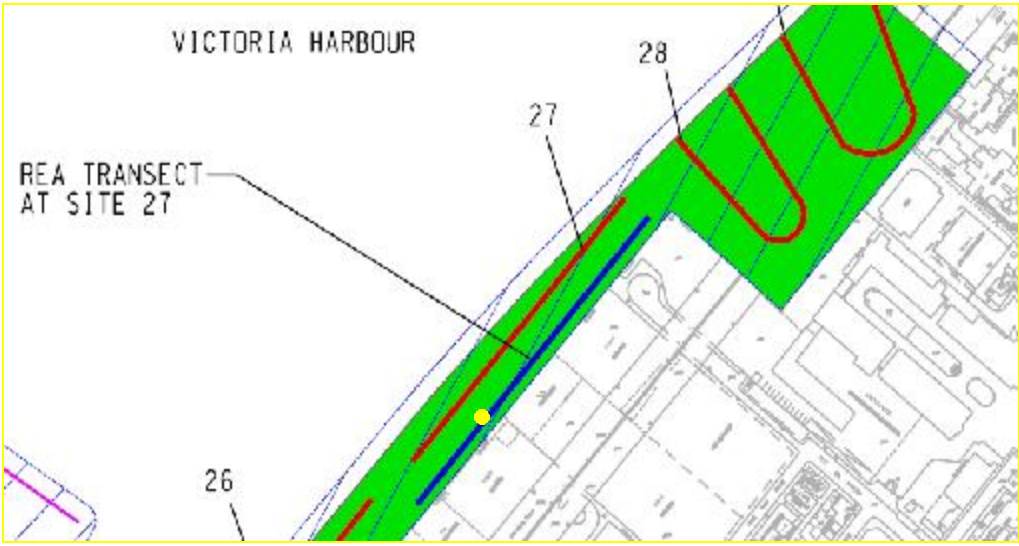
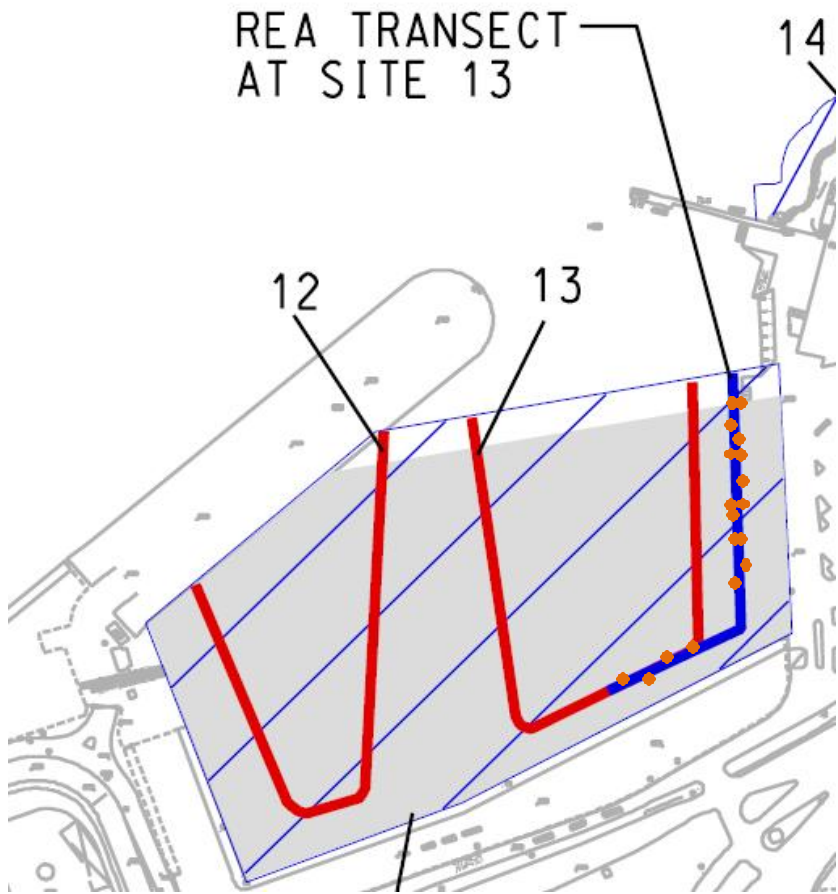
(SHEET 2 OF 2)

FIGURE 7.2

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- Legend:
- *Oulastrea crispata*
 - *Echinomuricea* spp.

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATIONS OF IDENTIFIED CORAL COLONIES

SCALE		DATE	
CHECK		DRAWN	
JOB NO.		FIGURE NO.	7.4
		REV	-