

**Agreement No. CE 18/2002 (EP)**  
**Construction of Helipads at Peng Chau and Yung Shue Wan,**  
**Lamma Island**



**Report for**  
**Coral Monitoring Survey**  
**(21 June 2008)**

**June 2008**



**miniprojects co. Ltd.**

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**Lamma Island**

**Report for**  
**Coral Monitoring Survey**  
**at Yung Shue Wan in June 2008**

**Prepared by:**  
**miniprojects co. Ltd.**  
**Cinotech Consultants Limited**

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## 1 INTRODUCTION

### 1.1 Project Background

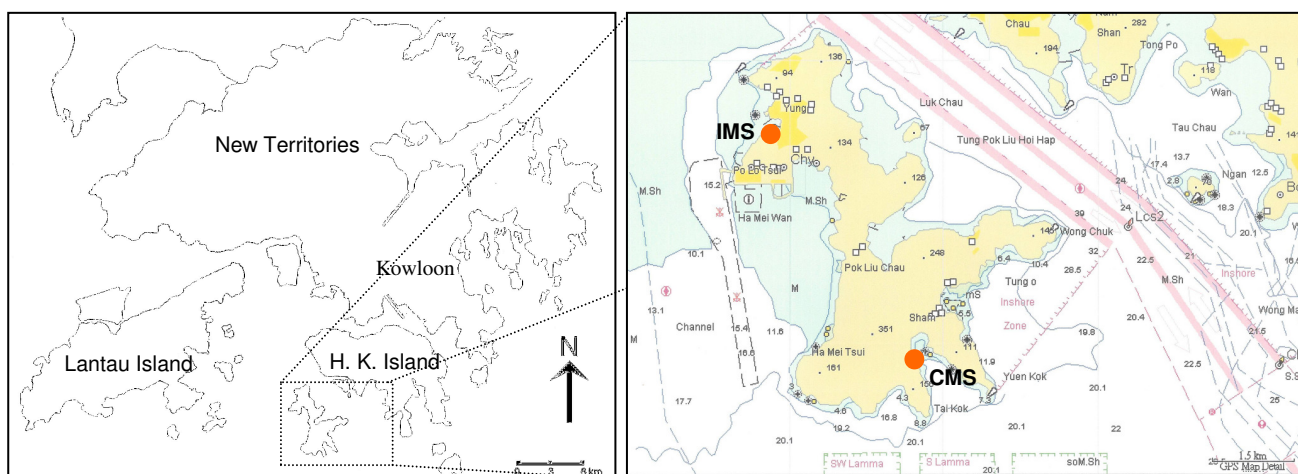
- 1.1.1 Cinotech Consultants Limited has been appointed to formulate a Coral Survey Team to conduct the Marine Ecology Survey for Construction of Helipads at Yung Shue Wan, Lamma Island, Agreement No. CE 18/2002 (EP).
- 1.1.2 miniprojects Company Limited (miniprojects co. Ltd.) have been commissioned by Cinotech Consultants Limited to undertake Coral Monitoring Survey on the tagged hard coral colonies at one Impact Monitoring Station (IMS) and one Control Monitoring Station (CMS).
- 1.1.3 As required by the EM&A manual, frequency of Coral Monitoring Survey is,
- Twice a week for the first two weeks of works affecting seabed
  - Once a week for the following two weeks if no exceedance is detected
  - Once every two weeks for the 2<sup>nd</sup> and 3<sup>rd</sup> months if no exceedance is detected
  - Once a month after the 3<sup>rd</sup> month until completion of the construction works if not exceedance is detected
- 1.1.4 This is the monthly report presenting the results of the monthly Coral Monitoring Survey (i.e. 17<sup>th</sup>) conducted in the 10<sup>th</sup> month (i.e. June 2008) after the commencement of the construction work.

## 2 METHODOLOGY

### 2.1 Impact Monitoring Surveys - Locations

2.1.1 The Impact Monitoring Station (IMS) was located at Yung Shue Wan, close to the seabed construction area (Fig. 2.1). In order to identify background environmental perturbations that are not associated with the construction, Sham Wan, which is away from the impact area, was designated as the Control Monitoring Station (CMS; Fig. 2.1). Locations (GPS coordinates) of IMS and CMS, as well as the conditions during monitoring surveys are summarized in Table 3.1.

**Fig. 2.1 Map Showing the Locations of the Impact Monitoring Station (IMS) and Control Monitoring Station (CMS)**



### 2.2 Survey Methods

- 2.2.1 At both IMS and CMS, 10 hard coral colonies were tagged for continuous monitoring over the course of construction phase. Dive surveys were conducted to record the health status of the tagged corals, including percentage area of sedimentation, bleaching and partial mortality.
- 2.2.2 The condition of each tagged coral colony was recorded by taking photographs that best represents the entire colony. General physical parameters were recorded for each survey site, including visibility, weather, tidal conditions and water current.
- 2.2.3 The results of the impact monitoring surveys were reviewed with reference to finding of the Initial Coral Survey and the data from CMS collected during the monitoring.

## **2.3 Coral Monitoring Frequency**

2.3.1 Monitoring on the tagged corals for degree of sedimentation and area of bleaching shall be conducted at the frequencies indicated below during works affecting the seabed.

- During the first two weeks of works affecting seabed: twice a week.
- If no exceedance detected for the first 2 weeks of monitoring: once a week for the following 2 weeks.
- If no exceedance detected for the first 4 weeks of monitoring: once every two weeks for the 2<sup>nd</sup> and 3<sup>rd</sup> months (i.e. October and November 2007, respectively).
- If no exceedance in the 3<sup>rd</sup> month of monitoring, coral monitoring shall be conducted once per month (i.e. since December 2007) until completion of the construction works.

## **2.4 Actions on Exceedance of Action & Limit Levels**

2.4.1 Where the coral survey indicates the health conditions of the corals exceed the action and limit levels, the Engineer may direct more frequent monitoring to be carried out until exceedance stops. The action and limit level of coral monitoring is shown in Table 2.1.

2.4.2 The Contractor shall take all necessary steps to ensure that the actions of the Contractor are not contributing to the deterioration. These steps shall include, but not be limited to the following:

- Checking of water quality monitoring data;
- Checking of all marine plant and equipment; maintenance or replacement of any marine plant or equipment contributing to the deterioration;
- Checking and maintenance of silt curtains;
- Review of all working methods; and
- Reduced construction rate.

2.4.3 Upon action level being exceeded and after agreement from the Environmental Specialist and AFCD has been obtained regarding the most appropriate method for reducing the adverse impacts during works affecting the seabed, this mitigated method should then be enacted on the next working day.

2.4.4 Upon limit level being exceeded, the Contractor shall suspend all works affecting the seabed until an effective solution is identified. Once the solution has been identified and agreed with the Environmental Specialist and AFCD, construction works affecting seabed may recommence.

2.4.5 The Engineer and AFCD shall be kept informed of all steps taken; and written reports and proposals for action shall be passed to the Engineer and AFCD by the Contractor whenever the coral survey shows any adverse impact upon the corals.

- 2.4.6 After the Contractor have implemented the agreed mitigating measures, if the coral surveys indicate the coral condition is unacceptable, additional mitigation measures should be recommended by the Contractor after consulting the Environmental Specialist for the approval of the Engineer and AFCD to rectify the situation. The Engineer can temporarily suspend the site activities until the problem is under control and an acceptable coral condition is restored.
- 2.4.7 In case the Contractor fails to implement the agreed mitigation measures, the Engineer can direct the Contractor to slow down or suspend his work until the Engineer and AFCD is convinced that the mitigation measures have restored the corals to an acceptable condition.
- 2.4.8 The Environmental Specialist shall assess the effectiveness and efficiency of the proposed mitigation measures and/or remedial actions for construction activities affecting the seabed. The performance of the Environmental Monitoring and Audit Programme shall be reviewed and audited by the Environmental Specialist on a quarterly basis. The findings of this review shall be included in the quarterly EM&A summary reports, together with any recommendations to improve the performance of the Environmental Monitoring and Audit Programme.

**Table 2.1. Action and Limit Level for Coral Monitoring**

<b>Parameter</b>	<b>Action Level Definition</b>	<b>Limit Level Definition</b>
Sedimentation	If during Impact Monitoring a 15% increase in the percentage of sediment cover on hard corals occurs at more than 20% of the tagged coral at any one Impact Monitoring Site that is not recorded at the Control Site, then the Action Level is exceeded.	If during the Impact Monitoring a 25% increase in the percentage of sediment cover occurs at more than 20% of the tagged coral at any one Impact Monitoring Site that is not recorded at the Control Site, then the Limit Level is exceeded.
Bleaching	If during Impact Monitoring a 15% increase in the percentage of bleaching (bleached white) on hard corals occurs at more than 20% of the tagged coral at any one Impact Monitoring Site that is not recorded at the Control Site, then the Action Level is exceeded.	If during the Impact Monitoring a 25% increase in the percentage of bleaching (bleached white) occurs at more than 20% of the tagged coral at any one Impact Monitoring Site that is not recorded at the Control Site, then the Limit Level is exceeded.
Mortality	If during Impact Monitoring a 15% increase in the percentage of mortality on hard corals occurs at more than 20% of the tagged coral at any one Impact Monitoring Site that is not recorded at the Control Site, then the Action Level is exceeded.	If during the Impact Monitoring a 25% increase in the percentage of mortality occurs at more than 20% of the tagged coral at any one Impact Monitoring Site that is not recorded at the Control Site, then the Limit Level is exceeded.



### 3 RESULTS

#### 3.1 Monitoring Surveys in June 2008

3.1.1 In June 2008 (i.e. the 10<sup>th</sup> month after the start of the construction work), both IMS and CMS were surveyed. The date of the survey and physical conditions of each sites are summarized in Table 3.1.

**Table 3.1 IMS and CMS – Physical Conditions.**

	<b>IMS (Yung Shue Wan)</b>	<b>CMS (Sham Wan)</b>
<b>GPS Coordinates</b>	N 22°13'28.4 E 114°06'30.6	N 22°11'15.0 E 114°08'04.0
<b>Date</b>	21 June 2008	June 21 2008
<b>Sedimentation on Rock surfaces (mm)</b>	1-2	1-2
<b>Visibility (m)</b>	1.0-1.5	1.0 to 1.5
<b>Weather</b>	Northeast wind; Beaufort force 3; Sunny	Northeast wind; Beaufort force3; Sunny
<b>Tide</b>	Ebb	Ebb
<b>Current (Knot)</b>	0-0.5	0-0.5
<b>Remark</b>		

3.1.2 Percentages of sedimentation, bleaching and mortality of each tagged colony are presented in Table 3.2. Photographs of each tagged coral in the surveys are illustrated in Appendices Ia and Ib.

#### IMS

3.1.3 In the current survey, sedimentation on the tagged coral colonies was low, varied from +5% to -3% when compared with the baseline level in July 2007. Increment in sedimentation level was observed in 3 colonies (A02, A03 and A08). Lower sedimentation was found in 1 colony (A05). No bleaching was recorded. Partial mortality increased in 5 colonies (A02, A05, A06, A09 and A10), varied from 5% to 80% (Table 3.2; Appendix Ia).

#### CMS

3.1.4 When compared with the baseline data in July 2007, level of sediment on the colonies increased in 8 colonies, varied from +1% to +5% (B01, B02, B03, B05, B06, B08, B09 and B10). Bleaching was recorded in 1 colonies (B03) by 10%. Partial mortality increased in 4 colonies by 2-56% (B02, B03, B06 and B09). Partial mortality previously found in B05 had no further increase (Table 3.2; Appendix Ib).

**Table 3.2 IMS and CMS – Code, Species Name, Area, Percentage of Sedimentation, Bleaching and Mortality of the Tagged Coral Colonies in Initial Coral Survey (21 July 2007), 2 previous (26 April and 10 May 2008) and 1 present monitoring surveys (21 June 2008). “▲” and “▼” indicate increased and decreased in percentage, respectively, when compared with the Initial Coral Survey.**

**IMS (Yung Shue Wan)**

Code	Coral Species	Area (cm <sup>2</sup> )	Sedimentation (%)				Bleaching (%)				Mortality (%)			
			21 Jul 07 (Baseline)	26 Apr 08	10 May 08	21 June 08	21 Jul 07 (Baseline)	26 Apr 08	10 May 08	21 June 08	21 Jul 07 (Baseline)	26 Apr 08	10 May 08	21 June 08
A01	<i>Favites pentagona</i>	110	1	1	1	1	0	0	0	0	0	0	0	0
A02	<i>Favia rotumana</i>	220	0	0	0	2 ▲	0	0	0	0	0	0	0	5 ▲
A03	<i>Platygyra carnosus</i>	400	0	0	0	2 ▲	0	0	0	0	0	0	0	0
A04	<i>Favia rotumana</i>	570	0	1 ▲	1 ▲	0	0	0	0	0	0	0	0	0
A05	<i>Cyphastrea serailia</i>	330	3	0 ▼	1 ▼	0 ▼	0	0	0	0	0	0	0	10 ▲
A06	<i>Cyphastrea serailia</i>	190	0	2 ▲	3 ▲	0	0	0	0	0	0	0	0	0
A07	<i>Favites pentagona</i>	200	0	2 ▲	1 ▲	0	0	0	0	0	0	0	0	80 ▲
A08	<i>Favites pentagona</i>	400	0*	0	2 ▲	5 ▲	0	0	0	0	0	0	0	0
A09	<i>Favites pentagona</i>	300	0	1 ▲	2 ▲	0	0	0	0	0	0	0	0	5 ▲
A10*	<i>Favites pentagona</i>	1800	0*	1 ▲	2 ▲	0	0	0	0	0	0	0	0	20 ▲

**CMS (Sham Wan)**

Code	Coral Species	Area (cm <sup>2</sup> )	Sedimentation (%)				Bleaching (%)				Mortality (%)			
			21 Jul 07 (Baseline)	26 Apr 08	10 May 08	21 June 08	21 Jul 07 (Baseline)	26 Apr 08	10 May 08	21 June 08	21 Jul 07 (Baseline)	26 Apr 08	10 May 08	21 June 08
B01	<i>Favia lizardensis</i>	360	1	1	0 ▼	2 ▲	0	0	0	0	0	0	0	0
B02*	<i>Favites pentagona</i>	750	0*	0	3 ▲	2 ▲	0	0	0	0	0	0	0	2 ▲
B03	<i>Psammocora profundacella</i>	440	2	2	6 ▲	5 ▲	0	0	0	10 ▲	0	0	4 ▲	60 ▲
B04	<i>Cyphastrea serailia</i>	220	0	2 ▲	2 ▲	0	0	0	0	0	0	0	0	0
B05	<i>Favites abdita</i>	650	2	2	5 ▲	5 ▲	0	0	0	0	0	2 ▲	2 ▲	2 ▲
B06	<i>Leptastrea pruinosa</i>	450	1	0 ▼	5 ▲	3 ▲	0	0	0	0	0	2 ▲	2 ▲	8 ▲
B07	<i>Platygyra acuta</i>	350	1	0	0	1	0	0	0	0	0	0	0	0
B08	<i>Leptastrea pruinosa</i>	690	2	2	9 ▲	4 ▲	0	0	0	0	0	0	0	0
B09	<i>Leptastrea pruinosa</i>	400	2	1 ▼	3 ▲	5 ▲	0	0	0	0	0	0	0	2 ▲
B10	<i>Favites pentagona</i>	130	0	2 ▲	2 ▲	5 ▲	0	0	0	0	0	0	0	0

\*Newly tagged colony in 15 March 2008 survey as baseline.

## **4 SUMMARY AND CONCLUSION**

### **4.1 Summary – Monitoring Surveys**

- 4.1.1 In the monitoring surveys conducted in June 2008, the level of sedimentation varied at a low range ( $\pm 5\%$ ) in both IMS and CMS. There was, however, significant elevation in partial mortality in selected colonies from both sites (5 colonies in IMS and 4 colonies in CMS). Similar mortality was observed in other untagged colonies in both sites, particularly for those located at the shallower water.
- 4.1.2 The increased mortality is suggested to be associated with low salinity caused by heavy rainfall from late May to mid June. Decreased salinity (13-20 ppt) was recorded to last for around two weeks in western Hong Kong waters. Low level of salinity has been shown to caused discoloration (18 – 26 ppt for 12 hrs) or mortality (15 ppt for 12 hrs) in colonies under laboratory condition (Kerswell & Jones 2003). Although salinity was not measured in the IMS and CMS, the mortality and bleaching in both sites is likely to be results of hypo-saline stress during the continuous precipitation.
- 4.1.3 The present survey showed no significant enhancement in sedimentation in IMS when compared with the CMS. Therefore, the increase in bleaching and partial mortality observed is believed not to be caused by construction work.
- 4.1.4 Further observation is necessary in order to evaluate the mortality status in colonies of A07 and A10 (IMS) and B03 (CMS). If the mortality continues, the colonies will be considered not suitable for monitoring purpose and new colonies will be tagged to accomplish the objective in the next survey.

### **4.2 Compliance / Event Action Plan**

- 4.2.1 The monitoring results were evaluated against the Action and Limit Levels as defined in the EM&A manual (Table 2.1), and is summarized in Table 4.1
- 4.2.2 Overall, the healthy status of the tagged coral colonies was normal, with low levels of sedimentation. High levels of mortality were observed in both Monitoring and Control Sites, which is believed not to be caused by construction work. Neither action/limit level of sedimentation and bleaching was exceeded in both monitoring survey conducted in June 2008.

**Table 4.1 Evaluation of Monitoring Results against Action and Limit Level for Coral Monitoring Surveys.** Note Definition of Action/Limit levels are listed in Table 2.1. “No” indicates NO exceedance.

**21 June 2008**

Site \ Exceedance	Sedimentation		Bleaching		Mortality	
	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level
IMS	No	No	No	No	No	No
CMS	No	No	No	No	No	No

**Reference:**

Kerswell AP, Jones RJ (2003) Effects of hypo-osmosis on the coral *Stylophora pistillata*: nature and cause of ‘low-salinity bleaching’. Marine Ecology Progress Series 253:145-154

## **APPENDIX**

Appendices Ia Photographs of the tagged corals at IMS (21 June 2008)

Appendices Ib Photographs of the tagged corals at CMS (21 June 2008)