

*Figures*

圖

Reclamation at Tsing Lung Tau constructed  
under Contract No. HY/99/18 (EP-093/2001)  
根據合約編號 HY/99/18  
興建的青龍頭填海區 (EP-093/2001)

Grand Bay Villa  
龍濤花園



Bay Side Villas  
彩濤花園

Cut slope constructed  
under Contract No. HY/99/18  
根據合約編號 HY/99/18 興建的削土坡

Photograph of Existing Roadworks  
at West End of Remaining Project  
剩餘路段西面末端的現有道路工程

Mouchel Halcrow JV

Photo No. 照片 1

Reclamation at Tsing Lung Tau constructed  
under Contract No. HY/99/18 (EP-093/2001)  
根據合約編號 HY/99/18  
興建的青龍頭填海區 (EP-093/2001)

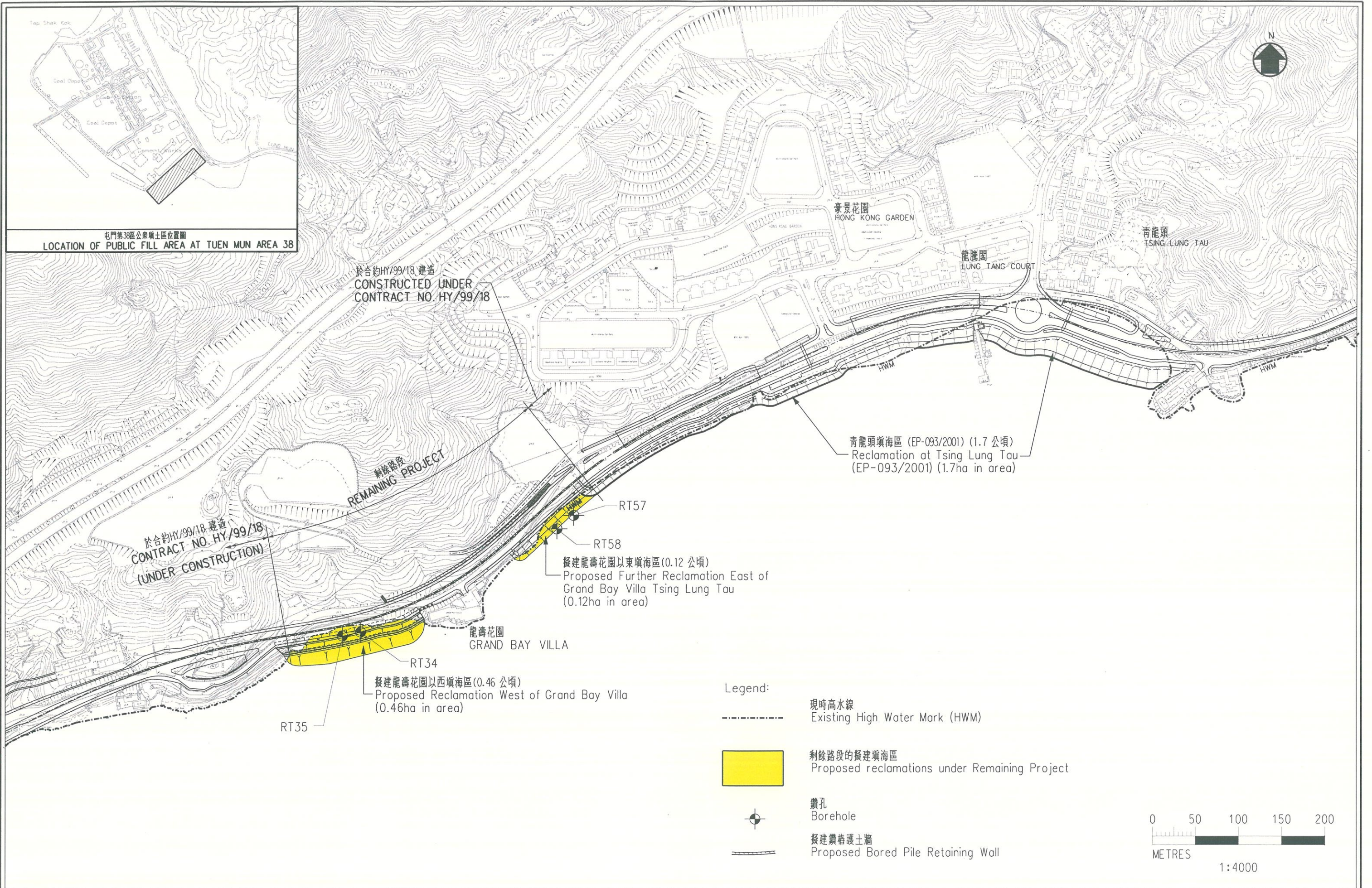


Grand Bay Villa  
龍濤花園

Photograph of Existing Roadworks  
at East End of Remaining Project  
剩餘路段東面末端的現有道路工程

Mouchel Halcrow JV

Photo No. 照片 2



屯門第38區公眾填土區位置圖  
LOCATION OF PUBLIC FILL AREA AT TUEN MUN AREA 38

於合約HY/99/18 建造  
CONSTRUCTED UNDER  
CONTRACT NO. HY/99/18

於合約HY/99/18 建造  
CONTRACT NO. HY/99/18  
(UNDER CONSTRUCTION)

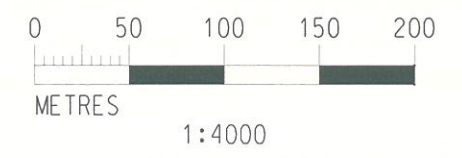
剩餘路段  
REMAINING PROJECT

青龍頭填海區 (EP-093/2001) (1.7 公頃)  
Reclamation at Tsing Lung Tau  
(EP-093/2001) (1.7ha in area)

擬建龍灣花園以東填海區(0.12 公頃)  
Proposed Further Reclamation East of  
Grand Bay Villa Tsing Lung Tau  
(0.12ha in area)

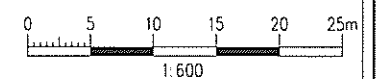
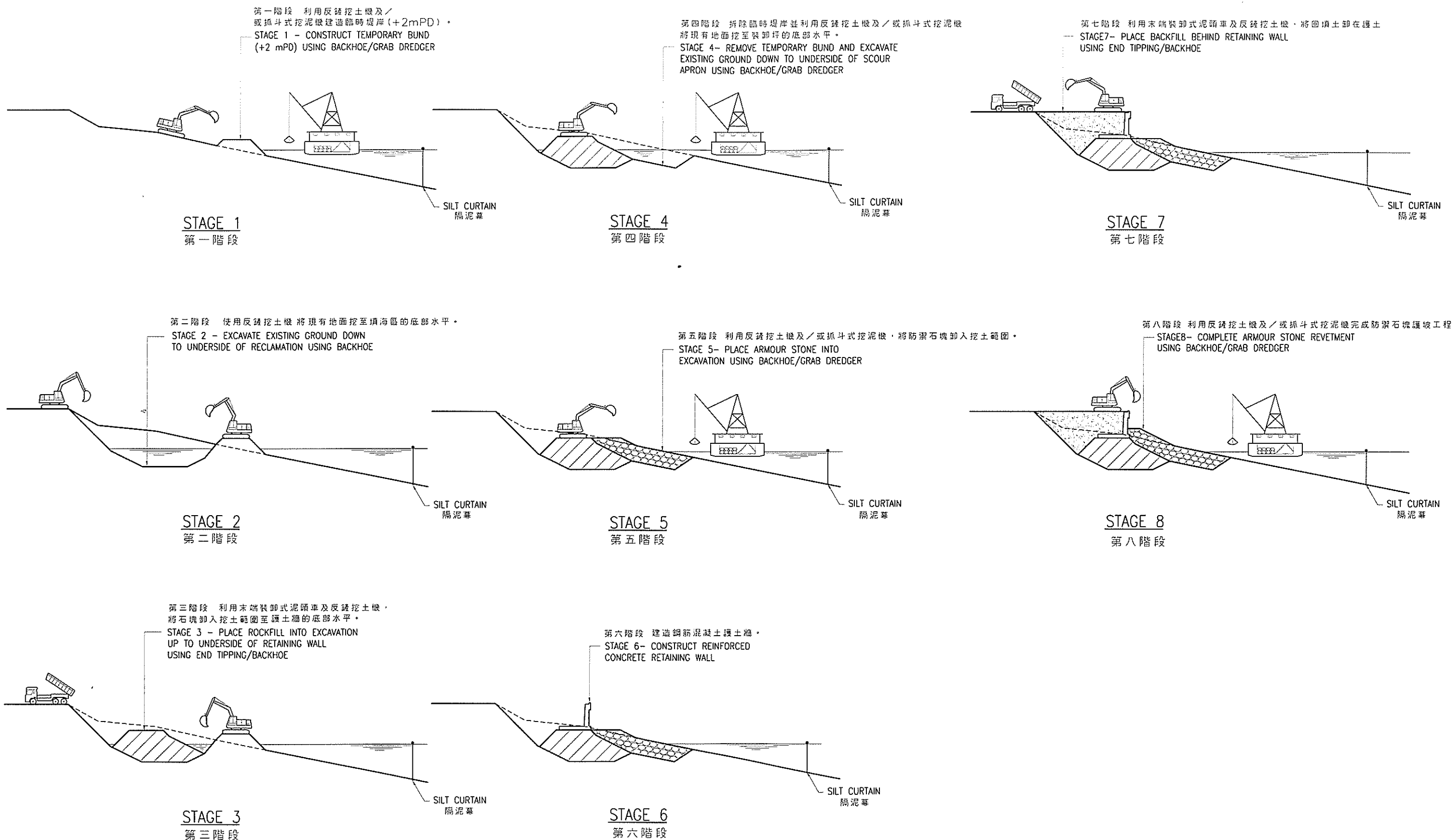
龍灣花園  
GRAND BAY VILLA  
擬建龍灣花園以西填海區(0.46 公頃)  
Proposed Reclamation West of Grand Bay Villa  
(0.46ha in area)

- Legend:
- 現時高水線  
Existing High Water Mark (HWM)
  - 剩餘路段的擬建填海區  
Proposed reclamations under Remaining Project
  - ⊕ 鑽孔  
Borehole
  - 擬建鑽植護土牆  
Proposed Bored Pile Retaining Wall

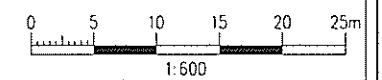
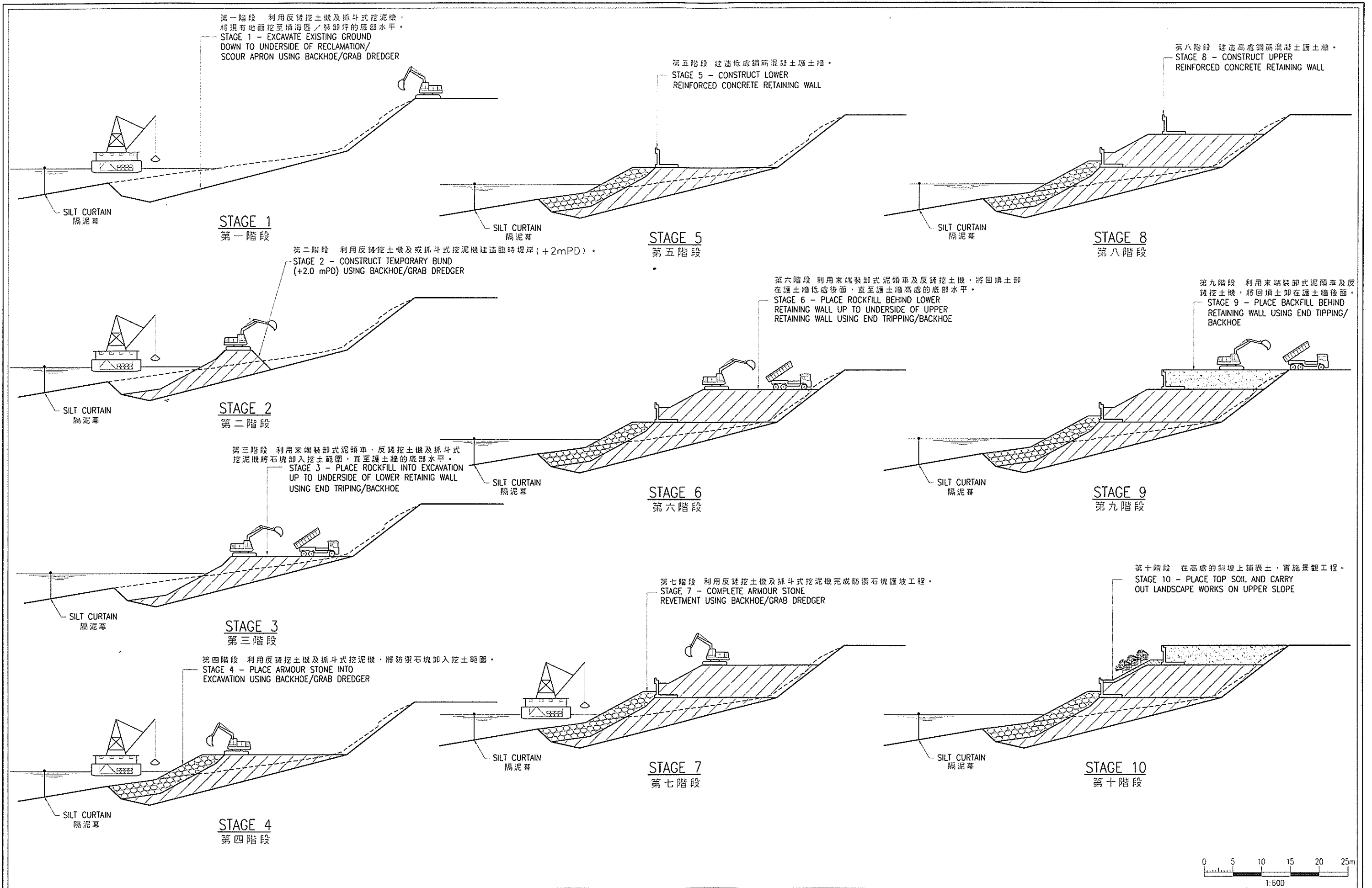


擬於剩餘路段建設填海區  
Castle Peak Road Improvement between Area and Ka Loon Tsuen, Tsuen Wan - Proposed Reclamation Works for Remaining Project

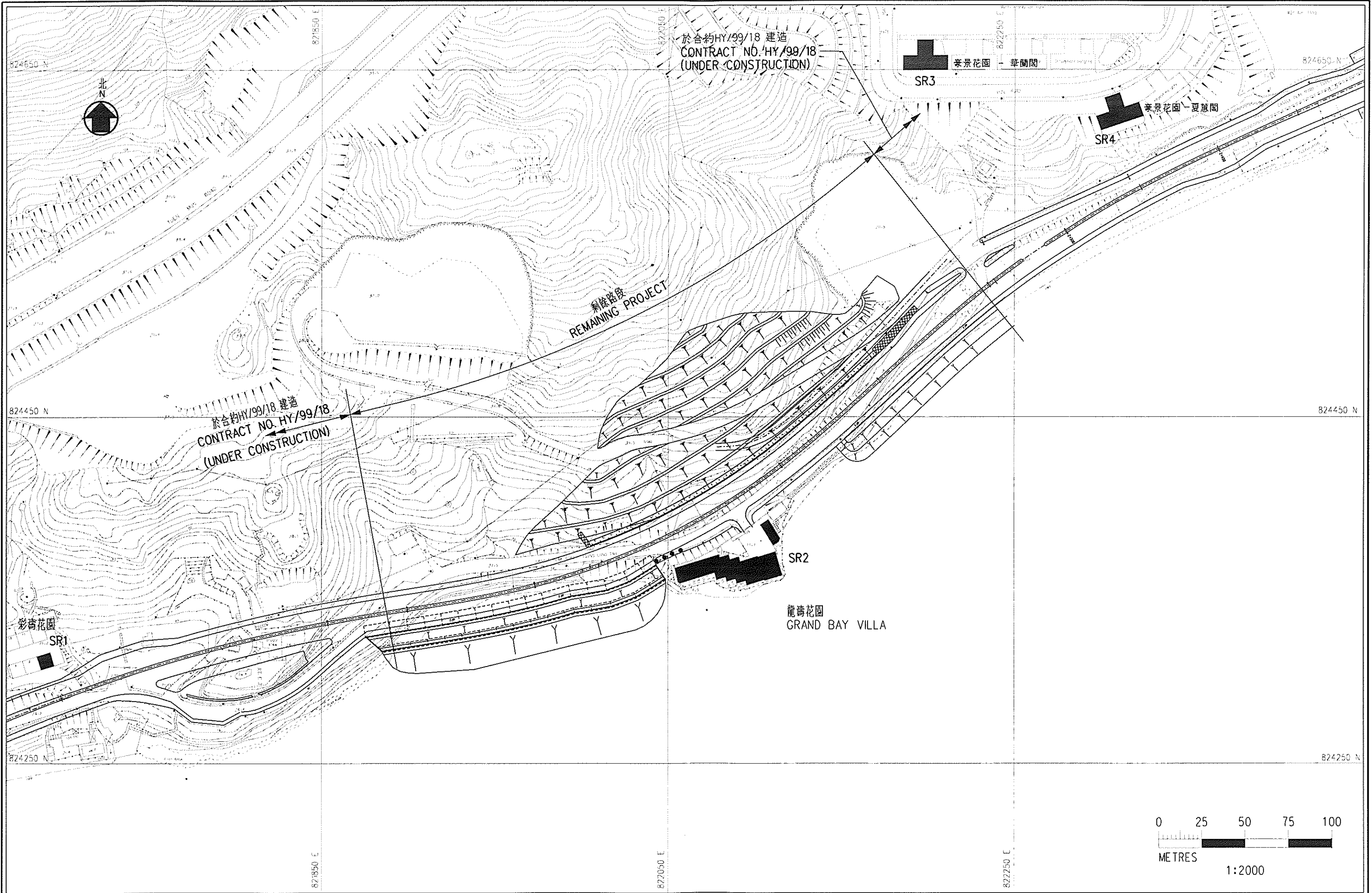
K:\F90956\DEVELOP\FIG\_16.DGN



龍濤花園以東填海區的預計建設方法  
ANTICIPATED CONSTRUCTION METHOD FOR THE AREA OF RECLAMATION EAST OF GRAND BAY VILLA



龍濤花園以西填海區的預計建設方法  
 ANTICIPATED CONSTRUCTION METHOD FOR THE AREA OF RECLAMATION WEST OF GRAND BAY VILLA



感應強的地方位置圖  
Locations of Representative Noise Sensitive Receivers

Mouchel Halcrow JV

Figure No. 3



# DRILLHOLE RECORD

DRILLHOLE No. RT34

CONTRACT NO. GE/2003/14

SHEET 1 of 1

JOB TITLE PWP Item No. 553TH Castle Peak Road Improvement from Sham Tseng to Ka Loon Tsuen, Tsuen Wan - Marine Ground Investigation

METHOD W+RC

CO-ORDINATES

WORKS ORDER No. GE/2003/14.2

MACHINE & No. Toho, D81

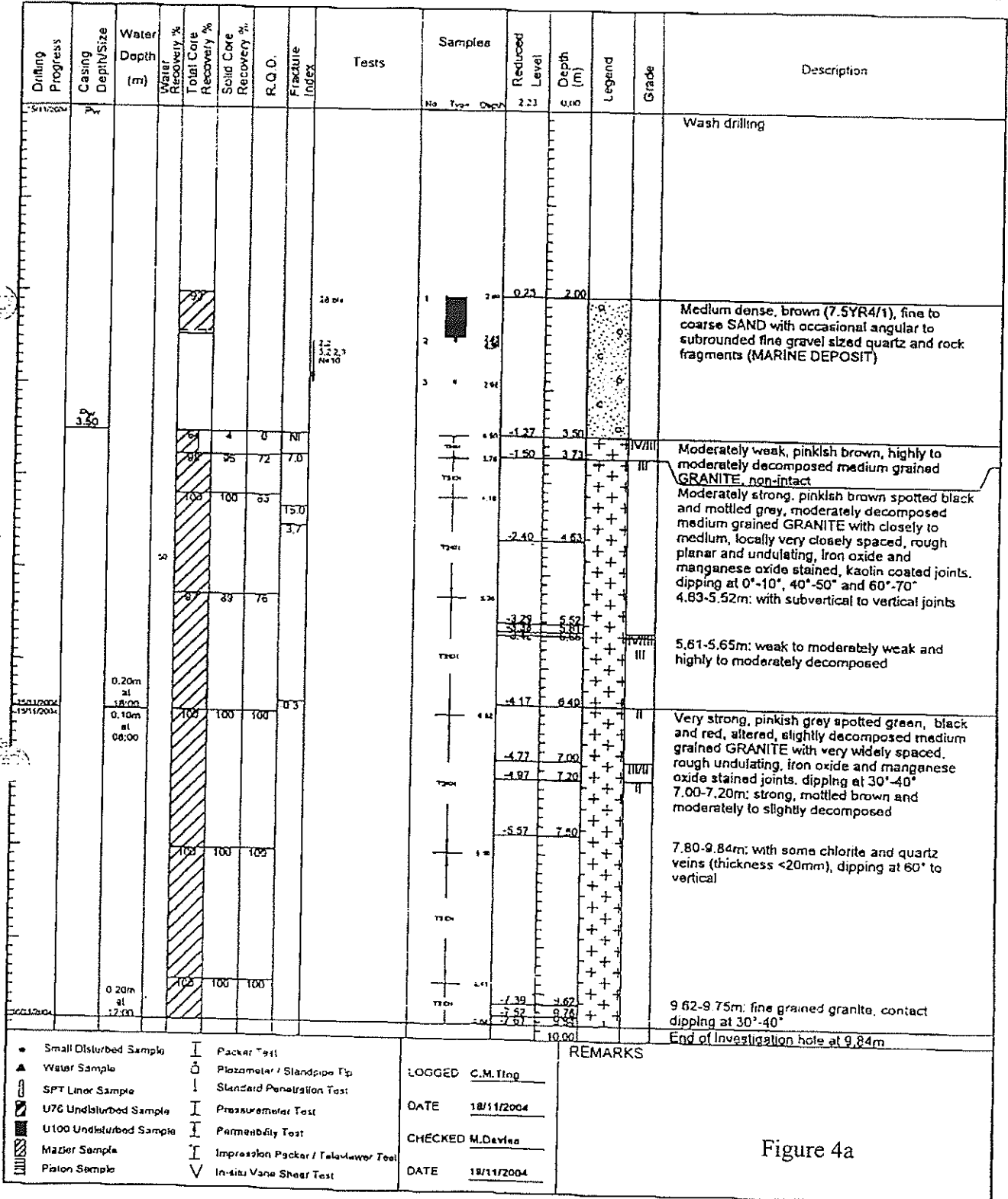
E 821974.63  
N 824341.17

DATE from 15/11/2004 to 16/11/2004

FLUSHING MEDIUM Sea Water

ORIENTATION Vertical

GROUND LEVEL + 2.23 mPD







# DRILLHOLE RECORD

DRILLHOLE No. RT35

CONTRACT NO. GE/2003/14

SHEET 1 of 2

JOB TITLE PWP Item No. 553TH Castle Peak Road Improvement from Sham Tseng to Ka Loon Tsuen, Tsuen Wan - Marine Ground Investigation

METHOD W+RC CO-ORDINATES WORKS ORDER No GE/2003/14.2

MACHINE & No Toho, D81 E 821953.53 N 824336.49 DATE from 11/11/2004 to 13/11/2004

FLUSHING MEDIUM Sea Water ORIENTATION Vertical GROUND LEVEL + 2.43 mPD

Drilling Progress	Casing Depth/Size	Water Depth (m)	Water Recovery %	Total Core Recovery %	Solid Core Recovery %	R.O.D.	Fracture Index	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
									No	Type					
11/11/2004 12/11/2004	Pw 2.50 Hw	Dry at 14:00 Dry at 08:00						25 ba	1	2.43	2.43	0.00			Wash drilling
								7.3 23.6,4 N=17	2		-0.07	2.50			Medium dense, brown (7.5YR4/6), fine to coarse SAND (MARINE DEPOSIT)  2.50-3.10m: with some angular to subrounded fine to medium gravel sized quartz and rock fragments
									3						
									4		-1.07	3.50		VIV	No recovery inferred to be completely to highly decomposed GRANITE
		1.00m at 14:00 1.10m at 08:00		100	81	39	4.6		5		-1.57	4.00			Moderately strong, pinkish brown mottled grey, streaked and dappled brown, moderately decomposed medium to coarse grained GRANITE with some microfractures, dipping at 70° to vertical, and with closely to medium, locally extremely closely to very closely and medium spaced, rough planar and undulating, iron oxide and manganese oxide stained joints, dipping at 0°-10°, 30°-40° and 60°-70° 4.00-4.05m: moderately weak and highly to moderately decomposed 4.32-4.39m: moderately weak and highly to moderately decomposed 4.78-4.83m: moderately weak and highly to moderately decomposed 6.40-6.46m: moderately weak and highly to moderately decomposed 6.72-6.90m: moderately weak and highly to moderately decomposed 7.10-7.40m: strong and slightly decomposed
				100	100	100	3.2		6		-1.89	4.32		III	
				100	85	78	5.3		7		-2.35	4.78		III	
				100	80	61	6.7		8		-4.29	6.72		III	
				100	100	100			9		-4.47	6.80		III	
				100	100	100			10		-4.67	7.10		III	
				100	100	100			11		-4.97	7.40		III	
				100	100	93	1.3		12		-5.57	8.00		II	8.00-11.00m: strong and slightly decomposed 8.10-8.50: with subvertical to vertical joints
				100	100	100	2.4		13		-5.67	8.10		II	
				100	100	100			14		-6.07	8.60		II	
				100	100	100			15		-7.57	10.00		II	

- Small Disturbed Sample
- Water Sample
- SPT Liner Sample
- U7A Undisturbed Sample
- U100 Undisturbed Sample
- Mudler Sample
- Platon Sample
- Packer Test
- Piezometer / Standpipe Tip
- Standard Penetration Test
- Pressuremeter Test
- Permeability Test
- Impression Packer / Televiewer Test
- In-situ Vane Shear Test

LOGGED C.M.Ting  
 DATE 18/11/2004  
 CHECKED M.Davies  
 DATE 18/11/2004

REMARKS  
 Figure 4b



# DRILLHOLE RECORD

DRILLHOLE No RT35

CONTRACT NO. GE/2003/14

SHEET 2 of 2

JOB TITLE PWP Item No. 653TH Castle Peak Road Improvement from Sham Tseng to Ka Loon Tsuen, Tsuen Wan - Marine Ground Investigation

METHOD W+RC

CO-ORDINATES

WORKS ORDER No GE/2003/14.2

MACHINE & No. Toho, D81

E 821953.53  
N 824336.49

DATE from 11/11/2004 to 13/11/2004

FLUSHING MEDIUM Sea Water

ORIENTATION Vertical

GROUND LEVEL + 2.43 mPD

Drilling Progress	Casing Depth/Size	Water Depth (m)	Water Recovery %	Total Core Recovery %	Solid Core Recovery %	R.O.D	Fracture Index	Tests	Samples			Legend	Grade	Description
									No	Type	Depth			
				100	100	100	1.4							As sheet 1 of 2
				100	93	84	5.2							11.80-13.03m. with subvertical to vertical joints
				100	84	41	12.0							
		1.11m at 13.00					5.0							

● Small Disturbed Sample	I	Packer Test	LOGGED <u>C.M. Ting</u>
▲ Water Sample	○	Piezometer / Standpipe Tip	
▬ SPT Lower Sample	I	Standard Penetration Test	DATE <u>18/11/2004</u>
▨ U76 Undisturbed Sample	I	Pressuremeter Test	CHECKED <u>M. Davine</u>
▩ U100 Undisturbed Sample	I	Permeability Test	DATE <u>18/11/2004</u>
▧ Mazzer Sample	I	Impression Packer / Televiewer Test	
▦ Platon Sample	V	In-situ Vane Shear Test	

REMARKS

Figure 4b



# DRILLHOLE RECORD

DRILLHOLE No. RT57

CONTRACT NO. GE/2003/14

SHEET 1 of 2

JOB TITLE PWP Item No. 553TH Castle Peak Road Improvement from Sham Tseng to Ka Loon Tsuen, Tsuen Wan - Marine Ground Investigation

METHOD W+RC

CO-ORDINATES

WORKS ORDER No. GE/2003/14.2

MACHINE &amp; No. Albane

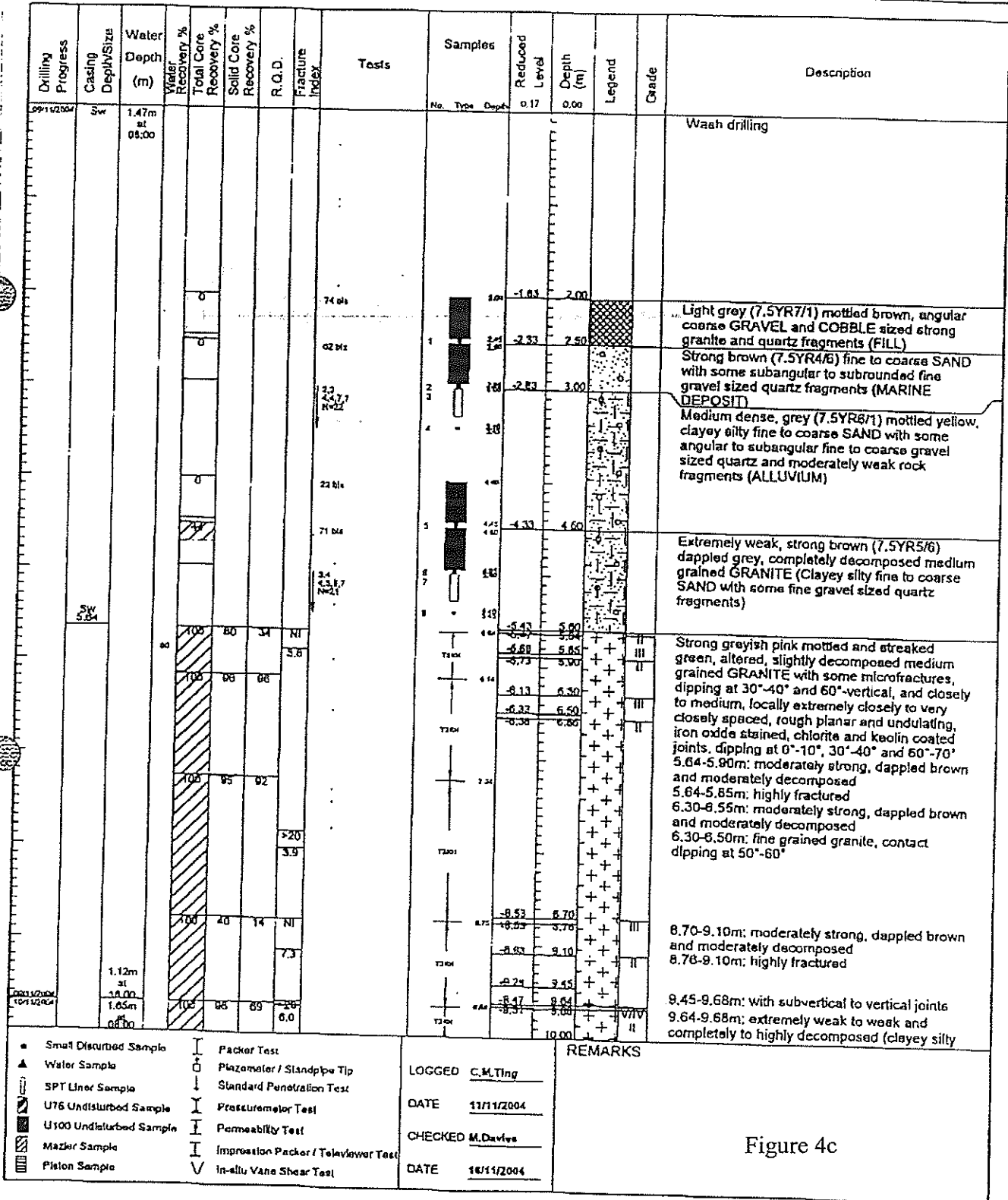
E 822222.82  
N 824476.24

DATE from 09/11/2004 to 10/11/2004

FLUSHING MEDIUM Sea Water

ORIENTATION Vertical

SEABED LEVEL + 0.17 mPD





# DRILLHOLE RECORD

DRILLHOLE No RT57

CONTRACT NO. GE/2003/14

SHEET 2 of 2

JOB TITLE PWP Item No. 553TH Castle Peak Road Improvement from Sham Tseng to Ka Loon Tsuen, Tsuen Wan - Marine Ground Investigation

METHOD W+RC

CO-ORDINATES

WORKS ORDER No. GE/2003/14.2

MACHINE & No. Albane

E 822222.82  
N 824476.24

DATE from 09/11/2004 to 10/11/2004

FLUSHING MEDIUM Sea Water

ORIENTATION Vertical

SEABED LEVEL + 0.17 mPD

Drilling Progress	Casing Depth/Size	Water Depth (m)	Water Recovery %	Total Core Recovery %	Solid Core Recovery %	R.O.D.	Fracture Index	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
		1.85m at 08:45		100	100	69	8.7									fine to coarse SAND with some fine to coarse gravel sized weak to moderately weak rock fragments)
																11.10-11.79m: with some chlorite and quartz veins (thickness <10mm), dipping at 60°-subvertical
																End of investigation hole at 11.79

- Small Disturbed Sample
- ▲ Water Sample
- SPT Liner Sample
- U75 Undisturbed Sample
- U100 Undisturbed Sample
- Mazier Sample
- Platen Sample
- I Pecker Test
- Plazometer / Standpipe Tip
- Standard Penetration Test
- Pressuremeter Test
- Permeability Test
- Impression Packer / Televue Test
- ∇ In-situ Vane Shear Test

LOGGED C.M. Ting  
DATE 11/11/2004  
CHECKED M. Davies  
DATE 16/11/2004

REMARKS  
  
Figure 4c



# DRILLHOLE RECORD

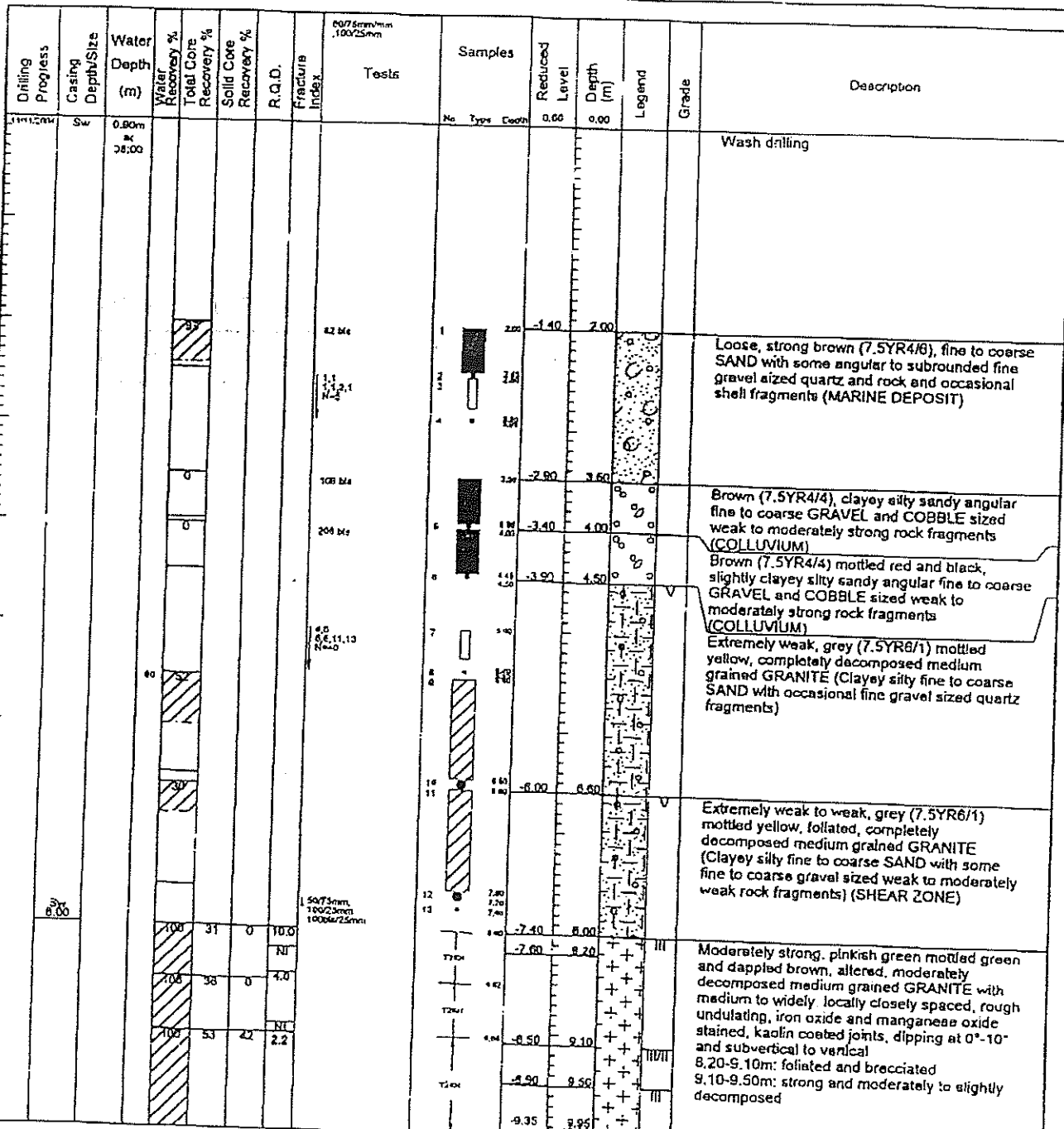
DRILLHOLE No. RT58

CONTRACT NO. GE/2003/14

SHEET 1 of 3

JOB TITLE PWP Item No. 553TH Castle Peak Road improvement from Sham Tsang to Ka Loon Tsuen, Tsuen Wan - Marine Ground Investigation

METHOD	W+RC	CO-ORDINATES	WORKS ORDER No	GE/2003/14.2
MACHINE & No.	Albane	E	822204.12	
		N	824460.76	DATE from 11/11/2004 to 12/11/2004
FLUSHING MEDIUM	Sea Water	ORIENTATION	Vertical	SEABED LEVEL + 0.60 mPD



- Small Disturbed Sample
- ▲ Water Sample
- ▨ SPT Undisturbed Sample
- ▨ U76 Undisturbed Sample
- ▨ U100 Undisturbed Sample
- ▨ Mezier Sample
- ▨ Piston Sample
- ⊥ Packer Test
- ⊥ Piezometer / Standpipe Tip
- ⊥ Slender Penetration Test
- ⊥ Pressuremeter Test
- ⊥ Permeability Test
- ⊥ Impression Packer / Television Test
- ⊥ In-situ Vane Shear Test

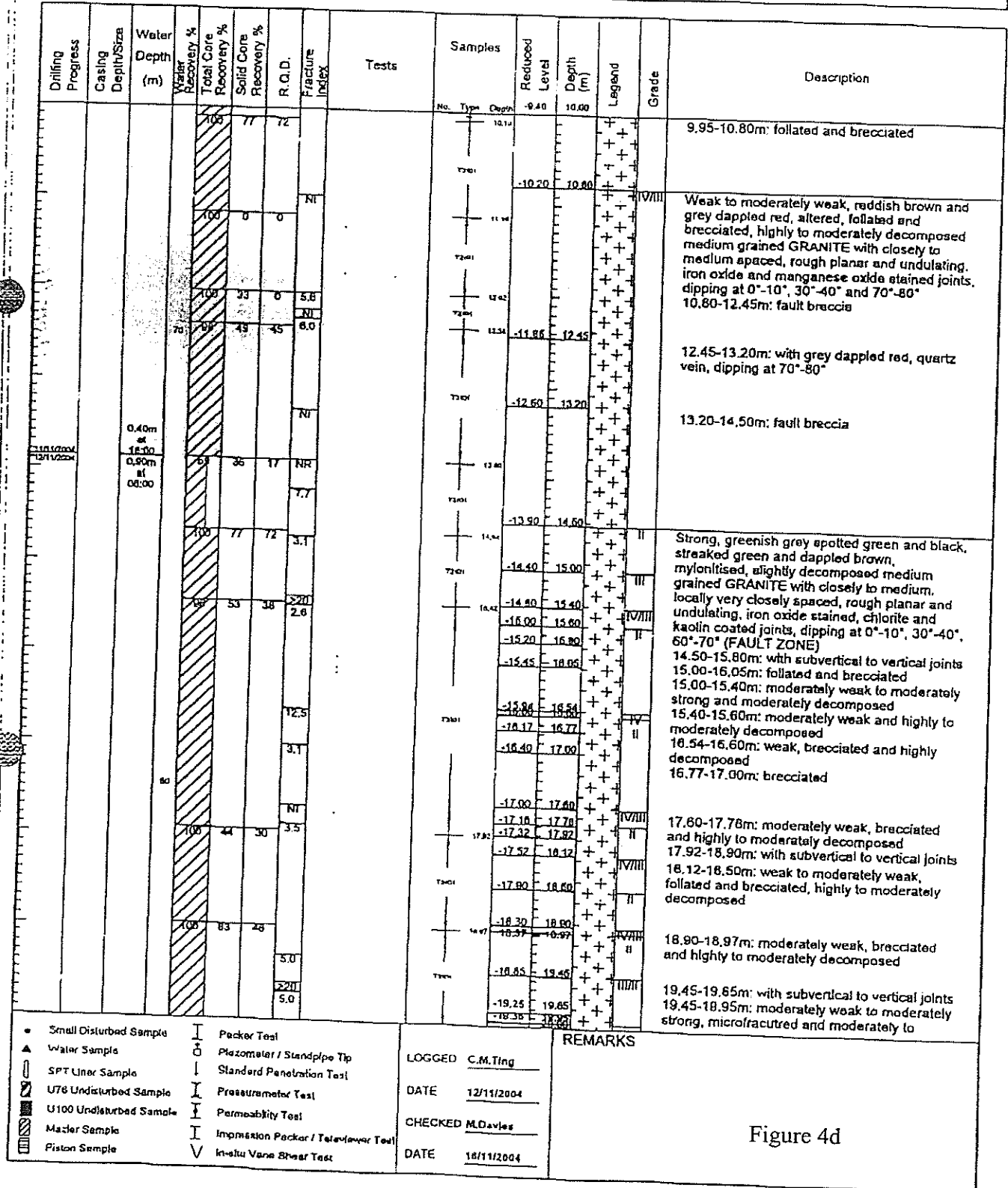
LOGGED C.M.Ting  
 DATE 12/11/2004  
 CHECKED M.Oa-lee  
 DATE 16/11/2004

REMARKS

Figure 4d

JOB TITLE **PWP Item No. 553TH Castle Peak Road Improvement from Sham Tseng to Ka Loon Tsuen, Tsuen Wan - Marine Ground Investigation**

METHOD <b>W+RC</b>	CO-ORDINATES	WORKS ORDER No <b>GE/2003/14.2</b>
MACHINE & No. <b>Albane</b>	E <b>822204.12</b> N <b>824460.76</b>	DATE from <b>11/11/2004</b> to <b>12/11/2004</b>
FLUSHING MEDIUM <b>Sea Water</b>	ORIENTATION <b>Vertical</b>	SEABED LEVEL <b>+ 0.60 mPD</b>





# DRILLHOLE RECORD

DRILLHOLE No. RT58

CONTRACT NO. GE/2003/14

SHEET 3 of 3

JOB TITLE PWP Item No. 553TH Castle Peak Road Improvement from Sham Tseng to Ka Loon Tsuen, Tsuen Wan - Marine Ground Investigation

METHOD W+RC

CO-ORDINATES

WORKS ORDER No. GE/2003/14.2

MACHINE & No. Albane

E 822204.12  
N 824460.76

DATE from 11/11/2004 to 12/11/2004

FLUSHING MEDIUM Sea Water

ORIENTATION Vertical

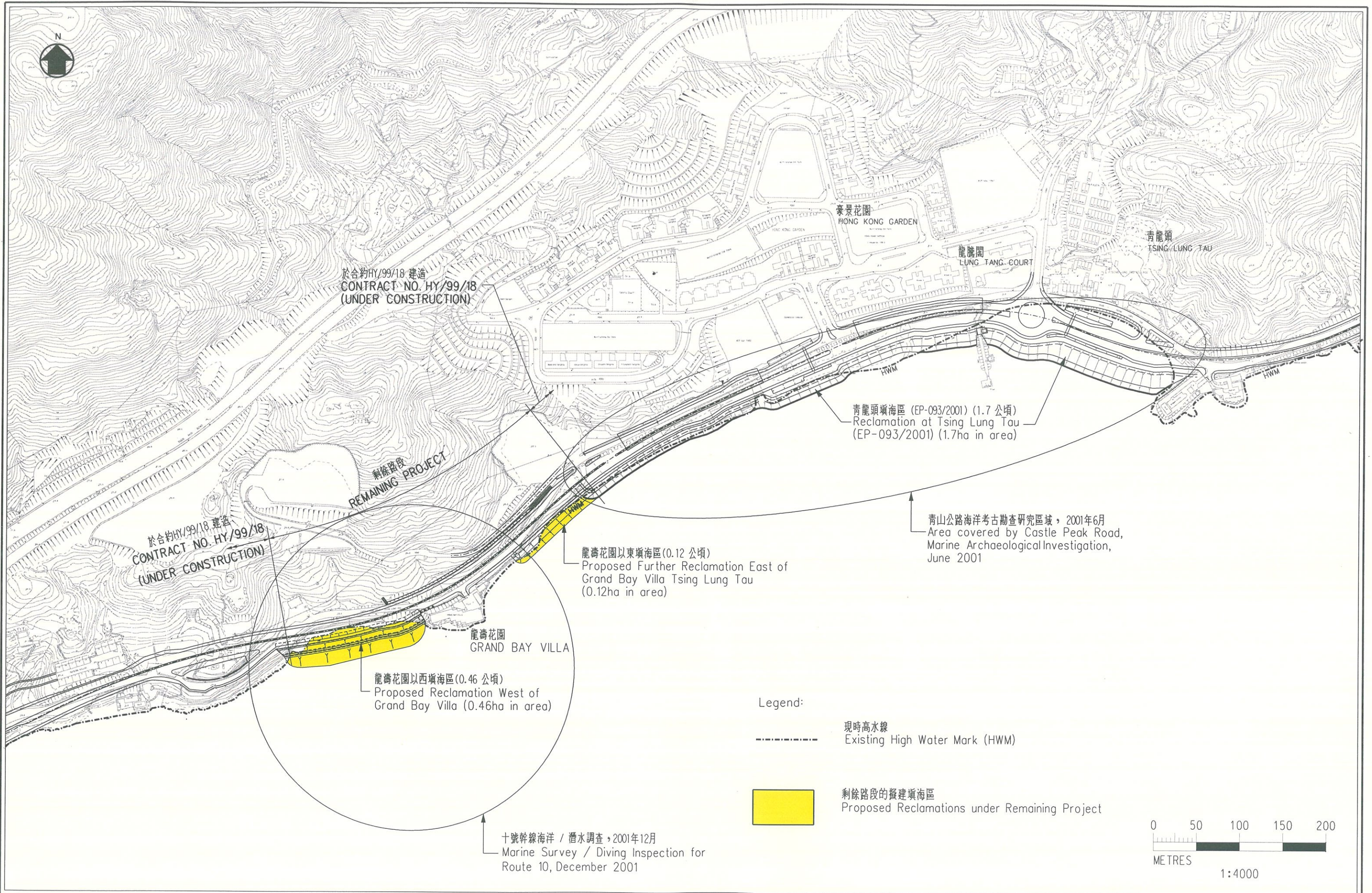
SEABED LEVEL + 0.60 mPD

Drilling Progress	Casing Depth/Size	Water Depth (m)	Water Recovery %	Total Core Recovery %	Soft Core Recovery %	R.O.D	Fracture Index	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
		0.40m		100	73	81			Ts01		-18.40	20.80		II	slightly decomposed	
		18.00							Ts02		-20.15	20.75		II	20.75-21.00m; moderately weak to moderately strong, microfractured and moderately to slightly decomposed with subvertical to vertical joints End of investigation hole at 21.10m	
									Ts03		-20.40	21.00		II		
									Ts04		-20.50	21.10		II		

- Small Disturbed Sample
- ▲ Water Sample
- ▬ SPT Liner Sample
- ▨ U78 Undisturbed Sample
- ▩ U100 Undisturbed Sample
- Mudler Sample
- ▧ Piston Sample
- ⊥ Packer Test
- ⊕ Piezometer / Standpipe Tie
- ⊖ Standard Penetration Test
- ⊗ Pressuremeter Test
- ⊘ Permeability Test
- ⊙ Impression Packer / Televiewer Test
- ∇ In-situ Vane Shear Test

LOGGED C.M.Ting  
DATE 12/11/2004  
CHECKED M.Devies  
DATE 16/11/2004

REMARKS  
  
Figure 4d

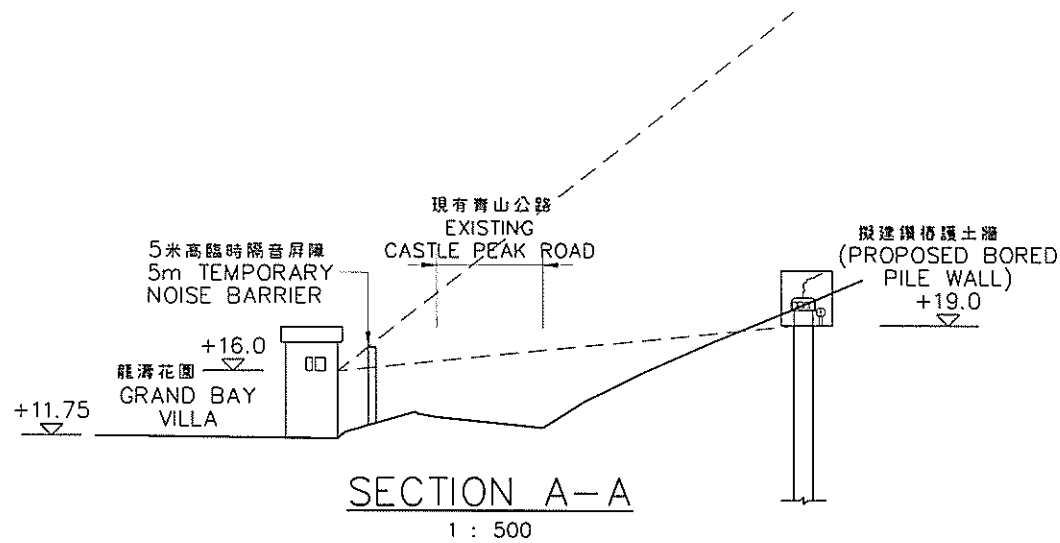
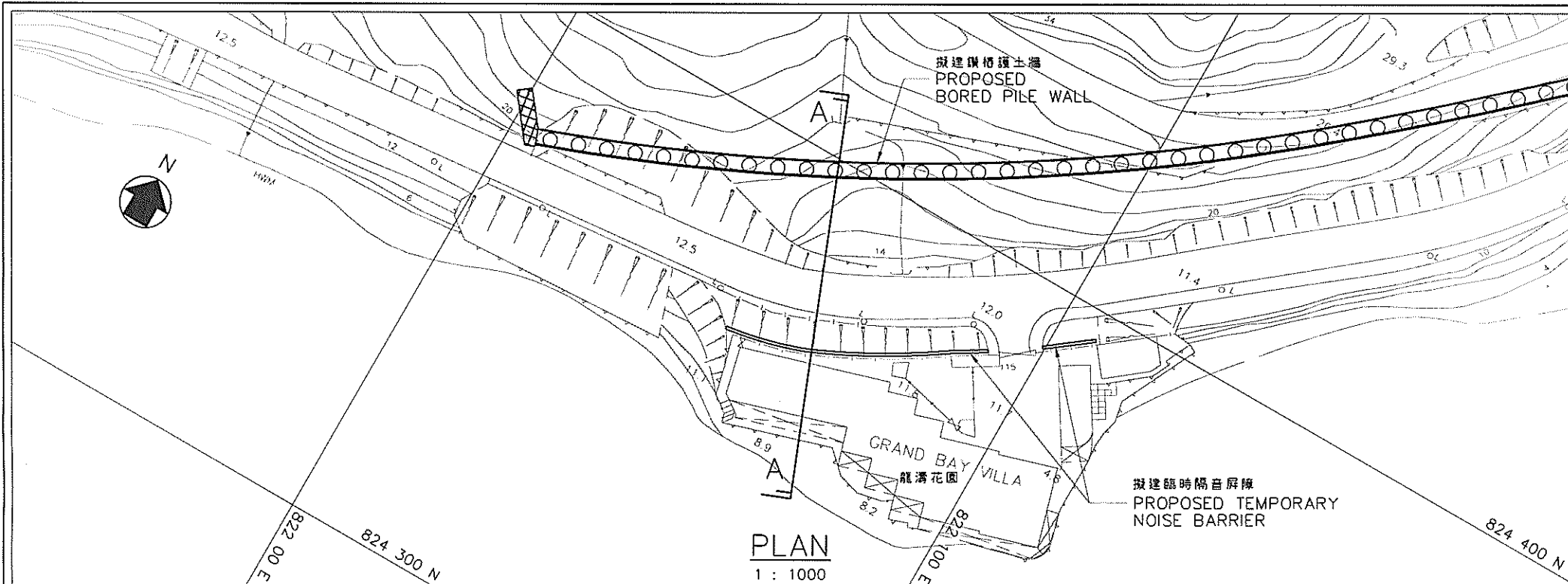


海洋考古調查研究區域  
 Area Covered by Marine Archaeological Investigations

Mouchel Halcrow JV

Figure No. 5





Title : 於龍灣花園擬建臨時隔音屏障  
**Proposed Temporary Noise Barrier at Grand Bay Villa (SR2)**

Figure. **6**

*Appendix A*  
*附件 A*

## Marine Ecology

The establishment of the baseline marine ecological profile of the study area was based on recent field surveys (3 November 2004) and review of the existing marine ecological information. The following two reports covering areas within/adjacent to the present project area were, in particular, reviewed:

- Route 10 – North Lantau to Yuen Long Highway Investigation and Preliminary Design (Agreement No. CE 82/97)
- EIA Report – Improvement to Castle Peak Road Between Ka Loon Tsuen and Siu Lam (Agreement No. CE 88/98)

## Methodology

Field survey was undertaken to supplement and update the data collected through the literature review. Areas of ecological interest that would be directly or indirectly affected by the proposed project were surveyed by a marine ecology team.

Quantitative field survey was conducted on 3 November 2004 covering the natural coastline to identify the species composition. The survey design involved sampling throughout the intertidal zones so that the vertical range (0.6 mCD – 1.5 mCD) of all species was represented. A 10 m horizontal transect was laid at the selected height and 10 quadrats (0.5 × 0.5 m<sup>2</sup>) were placed randomly along the transect to assess the abundance and distribution of intertidal fauna. All fauna found in each quadrat were counted and identified to species level (or to genus level as appropriate). The project area covered and the locations of quantitative transect surveys were shown in *Figure 1*.

## Results

The coastline in the project area included coarse sandy beach (less than 50m long) and boulder shore. Visual inspection of the sandy beaches indicated that significant proportion of epi-fauna were not present. This is also in accordance with the previous agreement (No. CE 88/98) in similar habitat near the project area.

The boulder coastline is a typical sheltered rocky shore with little exposure to strong-waves. The field survey was conducted to identify the species composition at the natural boulder coastline. In total, five 10m horizontal transects were laid in the low (0.6 mCD), mid (~1.0 mCD) and high (1.5 mCD) shores of the project area. The locations of the quantitative transect surveys were shown in *Figure 1*. Typical habitats of subareas A and B within the project area are shown in *Figures 2* and *3*, respectively. The field survey indicated that the assemblages were of sheltered shore communities with high quantities of periwinkle *Nodilittorina radiata* dominating the upper shore. The dominant fauna on the lower shore was Common Topshell *Monodonta labia* while the mid shore was dominated by Limpets *Cellana* sp. Other intertidal species recorded including Goose-neck Barnacle *Pollicipes mitella*, Shore crabs *Hemigrapsus sanguineus* and *Sphaerozium nitidus*, Hermit crab, Common Whelk *Thais* sp., Periwinkles *Littoraria articulata* and *Nodilittorina trochoides*, Turban Shell *Lunella* sp., Rock Oyster *Saccostrea cucullata*, Smooth Limpet *Notoacmoea* sp., False Limpet *Siphonaria* sp. and Sea Anemone *Haliplanella lineata*. The intertidal fauna recorded are summarised in *Table 1* below.

No rare species were recorded in the present field survey or other previous surveys of similar habitats near the project area (Agreement No. CE 82/97; Agreement No. CE 88/98). Based on the Annexes 8 and 16 of the EIAO-TM, the potential ecological value of the coastline habitats within the project area is considered as low.

**Table 1. Summary of Intertidal Field Survey Results**

	Sub-area	A	A	B	B	B
	Shore Height (mCD)	0.8	1.5	0.6	1.0	1.5
	Substrate Type	Boulder	Rock Bed	Pebble	Boulder	Boulder
	Transect	A1	A2	B1	B2	B3
Name	Species	Abundance (individuals per m <sup>2</sup> )				
Shore Crab	<i>Sphaerozius nitidus</i>			0.4		
Shore Crab	<i>Hemigrapsus sanguineus</i>			1.6	1.2	
Hermit Crab				0.8		
Goose-neck Barnacle	<i>Pollicipes mitella</i>	0.4	18			
Limpet	<i>Cellana</i> sp.	9.2		0.8	9.6	
Smooth Limpet	<i>Notoacmaea</i> sp.	0.4			1.2	
False Limpet	<i>Siphonaria sirisis</i>	2.4			10	
Rock Oyster	<i>Saccostrea cucullata</i>				0.8	
Turban Shell	<i>Lunella</i> sp.			0.4		
Common Topshell	<i>Monodonta labio</i>	5.2		60.4	6.8	
Common Whelk	<i>Thais</i> sp.	3.2				
Periwinkle	<i>Littoraria articulata</i>		12.4		2.8	3.2
Periwinkle	<i>Nodilittorina radiata</i>		106			28.4
Periwinkle	<i>Nodilittorina trochoides</i>		1.6			
Sea Anemone	<i>Haliplanella lineata</i>	1.2		0.8	1.6	
	<b>Taxa</b>	7	4	7	8	2
	<b>Total Abundance (individuals per m<sup>2</sup>)</b>	22	138	65.2	34	31.6

Note: 10x 0.25 m<sup>2</sup> quadrat samples were enumerated at each transect; Sub-area A = Grand Bay Villa; Sub-area B = Tsing Lung Tau.



Figure 2. Boulder coastline at Subarea A.



Figure 3. Boulder coastline at Subarea B.

*Appendix B*  
*附件 B*

THE OCEANWAY CORPORATION LTD.

CASTLE PEAK ROAD  
IMPROVEMENT BETWEEN  
AREA 2 AND KA LON TSUEN,  
TSUEN WAN.

---

Agreement No. 1/96

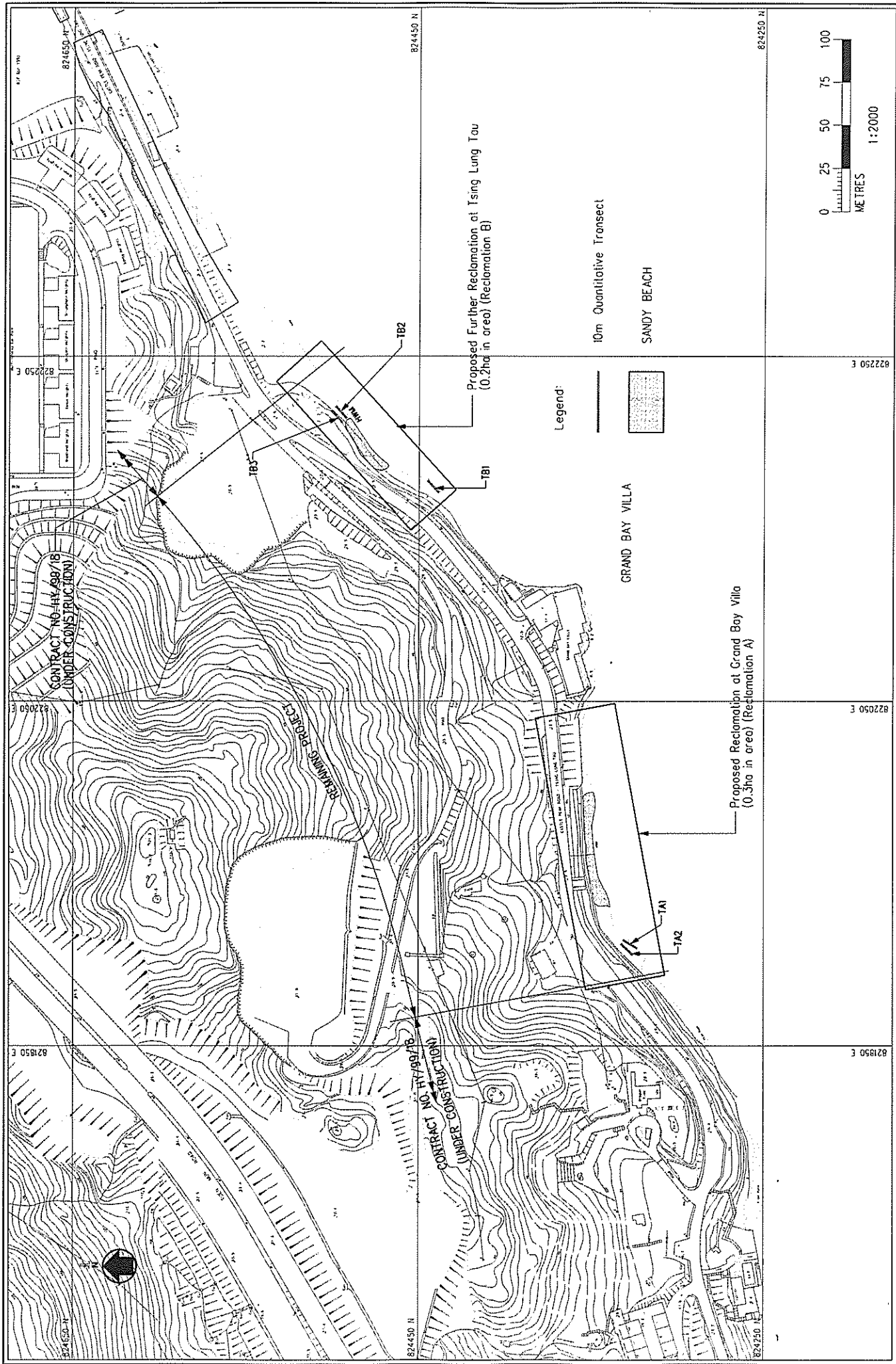
MARINE ECOLOGY BASELINE SURVEY

**Report I**



[www.hkocl.com](http://www.hkocl.com)

December 2004



Proposed Areas for Further Reclamation and Locations of Quantitative Ecological Surveys

K:\V\2007\ME\RECL\38007\_1.DWG



This report has been authorized by:

Paul Hodgson  
The Oceanway Corporation.

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## BACKGROUND

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The marine assemblages in Hong Kong are typically patchy. In order to survey large areas cost effectively, a method known as Rapid Ecological Assessment (REA) Seabed Survey is used. This method was adapted from a seabed survey methodology described in DeVantier *et al.* (1998). This survey methodology has been used to survey coral and other benthic communities throughout Hong Kong, including other reclamations along Castle Peak Road; Mouchel, 2001, and has proved more reliable than other previously used survey techniques. The REA is also a recommended method prescribed in the EIAO Guidance Note No. 11/2004 on the *Methodologies for Marine Ecological Baseline Surveys*.

The coral communities of Hong Kong are known as incipient reefs and are not typical of other high-latitude, non-reefal locations such as eastern and western Australia (Oceanway 2002b). Incipient reef coral areas have no calcium carbonate framework as a foundation for the corals, instead corals attach directly onto boulders and bedrock, forming simple pseudo fringing coral communities. Local coral communities are dominated by faviid species with massive, encrusting and foliaceous growth forms and over 84 species from 28 genera having been recorded. These corals tolerate wide annual fluctuations in water temperature (12-30°C) and salinity (20-35‰) (Cope 1982) and periodic typhoons.

The two areas surveyed were between Area 2 and Ka Lon Tsuen. The first, called Area A in this report, is Tsing Lung Tau and referred to as such. The second, Area B, was around Grand Bay Villas and the area immediately south of the villa. We have elected to call this area Grand Bay Villa.

## OBJECTIVES

In order to determine the present ecological status and presence of any species of conservation interest present, a baseline dive survey was required to cover the marine ecology of the proposed reclamation sites. The location of these proposed sites is shown in Figure 1. below.

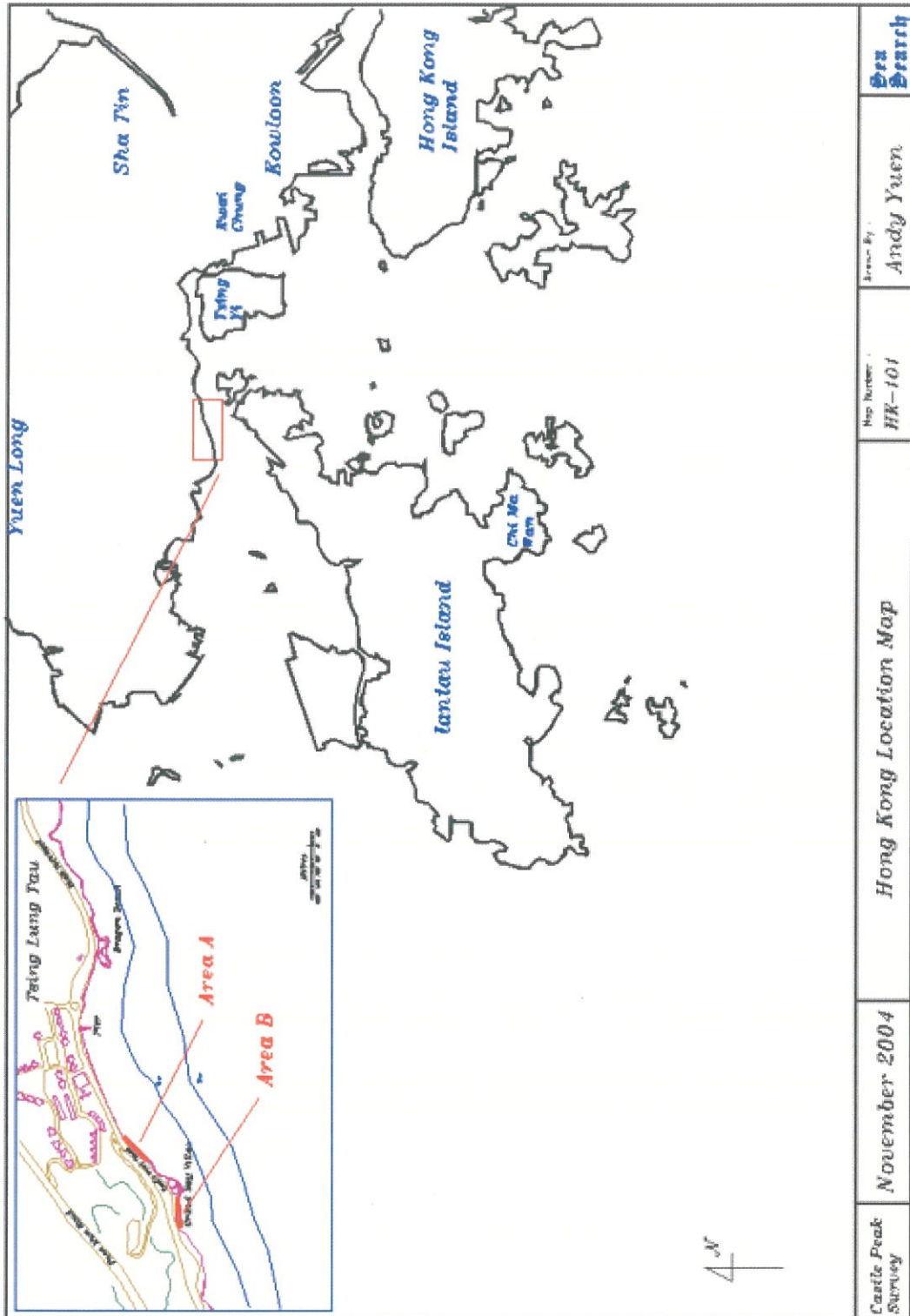


Figure 1. The location of the reclamation areas.

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## METHODOLOGY

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A Rapid Ecological Assessment (REA) Seabed Survey Methodology, as adapted from DeVantier *et al.* (1998) was used to survey the two sites.

A survey was conducted at the proposed reclamation sites and surrounding areas within 300 metres from the reclamation sites. It was noted that the proposed site was adjacent to the Urmston Road (channel) where rapid water currents are present. It was realized that surveys 300 metres from the shore may not be feasible (or safe for dive personnel conducting the surveys) unless there was a break in the strong currents during the survey periods. Notwithstanding, the methodology detailed below was used to survey both the proposed reclamation sites and the areas closer to the existing shoreline. Coral communities and other species of conservation interest that are typically distributed in the eulittoral zone (i.e., in the shallow areas nearer the shore) were the focus of this survey. All of the shore area to be reclaimed is inter-tidal with a depth of less than 1m during most of the survey period. For this reason no transects were carried out in either of the proposed reclamation areas. These areas were viewed during low tide to ascertain whether or not any of the noted sessile benthos was present. None was observed or recorded. Two of the spot dives also investigated inside these areas, and again there was nothing of interest observed or recorded (see Appendix A, S2 and S4).

Data was recorded by observers experienced in the field identification of sessile benthic taxa, swimming down-current along selected areas using scuba gear. The area was first explored by spot dives to determine the type and makeup of the benthos in the area. The number of spot dives was determined at the site, however there was a satisfactory number carried out to ensure the whole survey area was adequately covered. The location of the spot dives was shown on a map submitted with the survey results.

Following the spot dives, a total of 47 separate 30m transects (parallel to the shore) were surveyed, with the starting points of the transects determined using a portable global positioning system (GPS). The attached maps, Appendix A & B, show the locations of the spot dives and the transects. The 30m transects were laid out and digital photographs of the key benthos taken along each transect. Whilst Video footage could be arranged at extra cost and it should be made clear that these waters are often turbid and the clarity of the picture may be poor, it was therefore considered that the photographs would be sufficient. The approach was the same as our previous ecological REA surveys carried out in this area.

The initial survey was followed by a two tiered assessment. Tier I comprised an assessment of the benthic cover and Tier II determined taxon abundance. Both stages of the assessment were undertaken in a swathe approximately 2m wide, 1m either side of each transect. Further details of the assessment are provided below. Note, in order to survey a wider spatial area, an attempt was made to survey areas 300m from the shore during the low tide (when currents are weaker). The window when weak currents were present during the low tide was only half an hour, the cut-off used was the dive depth. A maximum depth of 10 metre was considered the safest depth for diving in this area.

### **Tier I Assessment: Categorisation of Benthic Cover**

On completion of each transect, six ecological and five substratum attributes (Table 1a) were assigned to one of six standard ranked (ordinal) categories (Table 1b).

**Table 1a: Benthic Attributes**

<i>Ecological</i>	<b>Substratum</b>
1. Hard coral	1. Bedrock
2. Dead standing coral	2. Boulders
3. Soft coral (including gorgonians)	3. Sediment – sand and/or mud.
4. Anemone beds	4. Rubble (dead coral)
5. Other benthos (sponges, zoanthids, ascidians and bryozoans)	5. Cobbles
6. Macro-algae	

**Table 1b: Ordinal Ranks of Percentage Cover**

<b>Rank</b>	<b>Percentage</b>
0	None recorded
0.5	1-5
1	6-10
2	11-30
3	31-50
4	51-75
5	76-100

**\*\* Due to the extremely low coverage of benthos recorded an additional ordinal rank was introduced to the percentage cover data (Table 1b). One to five percent cover has been represented by the rank value 0.5.**

### **Tier II Assessment: Taxonomic Inventories**

An inventory of benthic taxa was compiled along each transect. Taxa were defined *in situ* to the following levels:

Scleractinian corals to species where possible;

Soft corals, anemones and conspicuous macro-algae to genus;

Other benthos (including sponges, zoanthids, ascidians and bryozoans) identified to genus level wherever possible but more typically to phylum. Additionally, the growth form (where applicable) will also be recorded.

On completion of each transect, each taxon in the inventory was ranked in terms of abundance in the community (Table 1c). These broad categories rank taxa in terms of relative abundance of individuals, rather than the contribution to benthic cover along each transect. The ranks were subjective assessments of abundance, rather than quantitative counts of each taxon.

**Table 1c: Ordinal Ranks of Taxon Abundance**

<b>Rank</b>	<b>Abundance</b>
0	Absent
1	Rare
2	Uncommon
3	Common
4	Abundant
5	Dominant

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## RESULTS

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The baseline survey to assess the sub tidal marine ecology of the proposed sites was carried during the period 23<sup>rd</sup> to 24<sup>th</sup> November 2004. This survey focused on the hard and soft coral communities located within the shallow (2-10 m depth range) sub tidal coastline of the two sites. Conditions during the field work were difficult with limited visibility (< 2 m) and unpredictable and often strong currents. Since the areas within 300m of the reclamation overlapped, the same transects could be used to calculate values for both areas. Notwithstanding this a total of 47 separate 30m transects were carried out in this survey. The weather on both days was overcast; the sea was mild to rough.

### BIOLOGICAL DESCRIPTIONS

#### Tsing Lung Tau – Tables 3 and 4 (Area A).

The substrate at this site was composed mainly of boulders in front of the rocky areas (of varying sizes) and a mixture of sand and mud in front of the beaches with the occasional boulder or other hard substrate such as old vehicle tires. In shallow water the soft substrate was largely composed of sand but the particles quickly became much finer and, therefore, turned into a mixture of sand and mud before becoming just mud. The topography of the seabed, except for the actual site of the reclamation, was such that it quickly sloped to a depth of >10 m within approximately 100m of the shore.

Benthic marine life was sparse as compared to areas of a similar depth and exposure in southern and eastern waters, especially on the sand and mud areas. Apart from the occasional animal on the soft substratum, most of the visible marine life was confined to hard substrate. A number of benthic species were, however, abundant on the rocks, boulders and rubbish in the area. Notable were one species of encrusting Bryazoa (brown and orange in colour), a foliaceous brown Bryazoa *Bugula* spp., a pale blue gorgonian *Guaiagorgio* sp. and several species of barnacle (*Megabalanus volcano*, *Balanus reticulatus*, *B. amphitrite*, *B. trigonus* and *Chirona amaryllis*). In addition to these species, *Balanophyllia* sp. (a cup coral) was recorded on all shallow water transects with hard substratum. Small areas with clumps of *Perna viridis* were also observed. Although several decorator and short spined urchins were observed other echinoderms (long- spined urchins and holthurians) were notably absent.

There were several notable features concerning the colonies of gorgonians that were recorded at this site. All had significant levels of partial mortality, some above 90%. The average recorded for all Area A transects was  $25.43 \pm 5.08$ , and every colony had some partial mortality. There were also a large number of totally dead colonies recorded with an average of  $1.46 \pm 0.29$  for all transects. Finally no new recruits (size less than 5cm) were recorded in this area.

Refer to Tables 3 and 4 for summary information and Appendix D for the raw data for this site. We have also included the density of the recorded species per 1m<sup>2</sup> of area in Appendix F.

#### Grand Bay Villa – Tables 3 and 4 (Area B).

The hard substrate at this site was largely limited to a thin strip of boulders and bedrock running along the coastline in front of the villas. This area dropped to just a few meters depth before changing to mud and isolated boulders out to approximately 8 metres. Further out past that was mud. As at Tsing Lung Tau marine life was largely recorded on the hard substrate and was, therefore sparse. The dominant organisms noted at Tsing Lung Tau were also noted in this area,



that is, Bryozoa, Cirripedia, Gorgonacea and *Balanophyllia* sp. As with the Ting Lung Tau site all of the Gorgonians had partial mortality, but a slightly higher average figure for each transect was recorded at  $33.33 \pm 5.45$ . The number of totally dead colonies recorded was also higher at  $1.81 \pm 0.31$ . This may be due to the stronger water currents in this area. Transects T36 and T39 were the only transect with new recruits recorded (size <5cm). All other transects, including those carried out in the Tsing Lung Tau Area (Area 1) did not have any newly recruited Gorgonians recorded on them. The average number of encrusting sponges on each transect was also greater for this area with an average of  $0.59 \pm 0.16$  as compared to  $0.49 \pm 0.12$  for Tsing Lung Tau.

Refer to Tables 3 and 4 for summary information and Appendix E for the raw data for this site. We have also included the density of the recorded species per 1m<sup>2</sup> of area in Appendix F.

**Fish Life (Areas A&B).**

The poor visibility made an assessment of the fish life in the two areas very difficult, the diversity and abundance of fish were much lower than that observed at similar depths and exposure in other areas of Hong Kong. Common fish such as rabbit fish, damsel fish, flat heads, puffer fish, rock fish and one large flounder (*Bothus* sp.) were noted. Apart from the single flounder, no large commercially valuable species were observed although the poor visibility would have had a marked influence on the observation of large fast moving species.

**Table 3: A summary of Tier 1 results**  
(Average of recorded Ordinal Ranks of Percentage Cover in Table 1a and 1b)

	<u>Site</u>	
	<i>Tsing Lung Tau</i> (Area A)	<i>Grand Bay Villa</i> (Area B)
Depth, m	$5.68 \pm 0.50$	$5.94 \pm 0.50$
Exposure (1-4)	$1.29 \pm 0.08$	$1.30 \pm 0.08$
Sediment (0-3)	$1.51 \pm 0.10$	$1.37 \pm 0.10$
% cover soft coral (live)	<3	<3
% cover hard coral (live)	<3	<3
<b>Hard substrate (% of total)</b>	$20.43 \pm 5.69$	$25.74 \pm 6.21$
Bed rock (% of HS)	$1.71 \pm 0.58$	$7.41 \pm 3.83$
Large boulder (% of HS)	$46.86 \pm 8.28$	$51.85 \pm 8.79$
<b>Soft substrate (% of total)</b>	$79.57 \pm 5.69$	$74.26 \pm 6.21$
Sand (% of SS)	$47.43 \pm 6.10$	$35.00 \pm 7.20$
Silt/Mud (% of SS)	$23.71 \pm 4.08$	$30.19 \pm 6.26$
Mud (% of SS)	$28.86 \pm 7.10$	$34.81 \pm 7.96$
<b>Slope</b>	$1.14 \pm 0.14$	$1.04 \pm 0.16$
0 Flat, 1 Gentle, 2 medium, 3 steep, 4 vertical		
Visibility, m	<2	<2
Salinity, psu	35	35
Temp, °C	$22.80 \pm 0.13$	$22.96 \pm 0.19$

**Table 4. A summary of Tier 2 results**  
(Average of recorded Ordinal Ranks of Percentage Cover in Table 1a and 1c)

<u>Taxa</u>	<u>Site</u>	
	Tsing Lung Tau (Area A)	Grand Bay Villa (Area B)
<b>Bryazoa</b>		
Bugula	0.89 ± 0.21	0.67 ± 0.18
Brown/orange encrust	0.31 ± 0.13	0.07 ± 0.05
Red encrust	0.29 ± 0.15	0.19 ± 0.07
<b>Actiniaria (Sea anemones)</b>		
Anemone	0.0 ± 0.0	0.04 ± 0.04
Sand anemone	0.03 ± 0.03	0.0 ± 0.0
<b>Pennatulacea (Sea Pen)</b>		
Thin	0.0 ± 0.0	0.04 ± 0.04
Fat	0.0 ± 0.0	0.04 ± 0.04
<b>Gorgonacea</b>		
<i>Guaiaigorgia</i>	1.43 ± 0.31	1.41 ± 0.31
<i>Euplexaura</i>	0.54 ± 0.14	0.56 ± 0.12
<i>Echinomuricea</i>	0.60 ± 0.17	0.56 ± 0.11
Dead colonies	1.46 ± 0.29	1.81 ± 0.31
Partial Mortality (%)	25.43 ± 5.08	33.33 ± 5.45
<b>Octocorallia</b>		
<i>Dendronephthya</i>	0.09 ± 0.06	0.07 ± 0.05
<b>Scleractinia</b>		
<i>Balanophyllia</i>	1.57 ± 0.35	1.56 ± 0.34
<b>Mollusca</b>		
<i>Perna viridis</i>	0.57 ± 0.20	0.78 ± 0.24
<b>Porifera (sponge)</b>		
Encrusting	0.49 ± 0.12	0.59 ± 0.16
Golf ball	0.00 ± 0.00	0.04 ± 0.04
<b>Crustacea: Cirripedia</b>	0.46 ± 0.15	1.07 ± 0.35
( <i>Megabalanus volcano</i> , <i>Balanus reticulatus</i> , <i>B. amphitrite</i> , <i>B. trigonus</i> , <i>C. amaryllis</i> )		
<b>Echinodermata</b>		
Short spined urchin	0.03 ± 0.03	0.04 ± 0.04
Green decorator	0.23 ± 0.07	0.11 ± 0.06
<b>Misc.</b>		
Cyanobacterial mats	0.0 ± 0.0	0.0 ± 0.0
Tunicate	0.03 ± 0.03	0.07 ± 0.05

Maps of the approximate locations of the transects used for this survey are in Appendix B. The GPS coordinates are in Appendix C. The raw REA Data is in Appendix D and E. We have included a unit area population table in Appendix F. Representative photographs are in Appendix G. It should be realized that the visibility condition of this area does not permit magazine quality photographs to be taken in this area. However, the photographs included show the majority of the organisms encountered during the survey.

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## DISCUSSION

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Both Tsing Lung Tau and the Grand Bay Villa site have already suffered from anthropogenic impacts, both in terms of pollution and nearby shore reclamation (Oceanway 2002a). Rubbish (plastic bags, bottles, tins and car/truck tires) was a common feature of the seabed, some even encrusted with the animals counted in this survey. A large number of golf balls were recorded along transect T7. The only significant benthic marine life recorded were members of Cirripedia, Cnidaria and Gorgonacea. Species of bryozoans and barnacles are common fouling components of intertidal and subtidal substrates and are common throughout the coastal waters of Hong Kong. The brown foliaceous bryozoan *Bugula*, for example, can be found fouling mooring ropes throughout Hong Kong. The two species of encrusting bryozoan recorded in the western waters of Hong Kong are different from those species recorded in the eastern and southern waters of Hong Kong. The western water species are apparently adapted to the turbid and low salinity conditions that typify these waters. Of the Gorgonacea one species was dominant and this was *Guaiaogorgio* sp. This species is common in the western waters (previous Oceanway reports) but has been noted in shallow waters (<5m) around Lamma Island (Oceanway 2004b). This species exhibited a high partial mortality (sometimes over 90%) with concomitant sponge and algal over growth. The cause of the partial mortality is unknown but may be related to anthropogenic perturbations, such as, pollution.

As with previous surveys in this area, the species of interest was a species of cup-coral, *Balanophyllia* sp. This species has been noted from all parts of Hong Kong (Scott, 1984), it was abundant in the present survey with colonies being recorded on almost all transects with hard substratum. Previous surveys have recorded *Balanophyllia* sp. in this area, however, in significantly smaller populations. It is interesting to note that no reef-building hermatypic corals were observed and although the pioneering *Oulastrea crispata* has previously been recorded in the Tsing Lung Tau area, during this survey it was conspicuous by its absence. It is also interesting to note that the coral community in this area is not common in the southern and eastern waters of Hong Kong (Oceanway 2002b). It is possible that the conditions that prevail in this area, allow it to thrive due to the absence of any competition, which would be present in the form of zooxanthellate corals in other areas of Hong Kong's coastal waters.

This survey also recorded the soft coral *Dendronephthya* sp. It has been recorded in other areas around Tsing Lung Tau and Grand Bay Villas, but never actually seen during a survey at either of these two sites before. At least three species were observed during this survey either on the transects or during the spot dives carried out prior to the commencement of the survey.

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## CONCLUSION

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The western waters of Hong Kong are normally very turbid and can experience large variations in salinity depending upon the discharge rate of the Pearl River (Morton and Wu 1975). The western side of the New Territories around the Northern section of Lantau Island are also subject to strong tidal current flows. The sessile benthos that survives there has to be environmentally tolerant to such conditions. Oceanway has carried out some surveys in surrounding areas of the sites of this survey, in particular adjacent to Tsing Lung Tau site (Oceanway 2002a), and found a similar grouping of organisms populates the marine area up to Gemini Beach in the east.

Other nearby areas along the coast of Mainland China also have similar assemblages of marine organisms. This suggests that these areas along the Lantau coast are not unique to Hong Kong. One such area already located and surveyed is the southern end of Hai Ling Island in Bei Luo Wan (Oceanway 2004a). This area is approximately 200km south of Hong Kong, and has a similar mix of estuarine (low salinity) and marine (higher salinity) water. It is the Feng Tau Luo River outflow near Hai Ling Island that provides the fresh water component for this area. All species located in the Hai Ling survey were also recorded in the Castle Peak Survey. The one major difference between the two areas is the visibility. Castle Peak has a very high turbidity and a low visibility, Hai Ling averages 5~10m visibility all year round. This suggests that these communities are also not unique to the turbid waters of the Lantau coast.

### Habitat Value and Impact Evaluation

The habitats recorded in these survey areas are typical of the Urmston Road (channel) area. Three main habitats are present; rocky shores, sand and mud. From the survey data between 20%~25% consist of hard substratum, the remainder (75%~80%) being soft substrate. Of the soft substratum, about 50% consists of mud. Unlike areas in the eastern waters, the mud areas of Urmston Road are devoid of soft corals. The reasons for this are not confirmed but may be due to the total lack of any scattered rocks in the mud areas. These areas are, therefore, considered to be of low ecological value. The associated sessile marine benthos is also typical for this area and comprised of species common to similar habitats throughout Hong Kong. All areas of hard substratum have scattered colonies of Gorgonacea, Scleractinia, Porifera, Cirripedia and some Octocorallia. The recorded organisms in sandy areas were on either rocks or rubbish in those areas. Stony corals are of conservation interest and habitats where they are present considered to be of high ecological value. The reclamation will result in loss of habitat and the direct loss of benthos including solitary corals. However, based on the poor condition and negligible abundance of the corals present, the overall impact associated with individuals under the reclamation footprint is considered to be minor.

### Mitigation Measures

There was one open sediment curtain installed at a nearby reclamation works. It is recommended that a closed sediment curtain be installed along the boundary of all reclamation works in Hong Kong. Curtains similar to the ones used at Penny's Bay and at Pak A have been shown to be suitable for Hong Kong's marine areas. If boat access is required to the inside of the curtain, then a closable opening should be included in the design. It is also important that the sediment curtain extend from the surface to the seabed. Given the high water current flow in the area concerned, sufficient weighting should also be used to ensure a proper fixing to the seabed.

All surveys carried out in this area have shown that the majority of the corals settle on large rocks and boulders in the areas investigated. It would also be prudent to ensure that this substratum be replaced by any seawalls or artificial retaining walls that are part of the reclamation works. Large assorted boulders, similar to those used at the Hong Kong Electric Lamma Island seawalls (Oceanway 2004b), should be included in the design. This would allow suitable areas to be created that allow for the possible reestablishment and increase of corals in these areas.

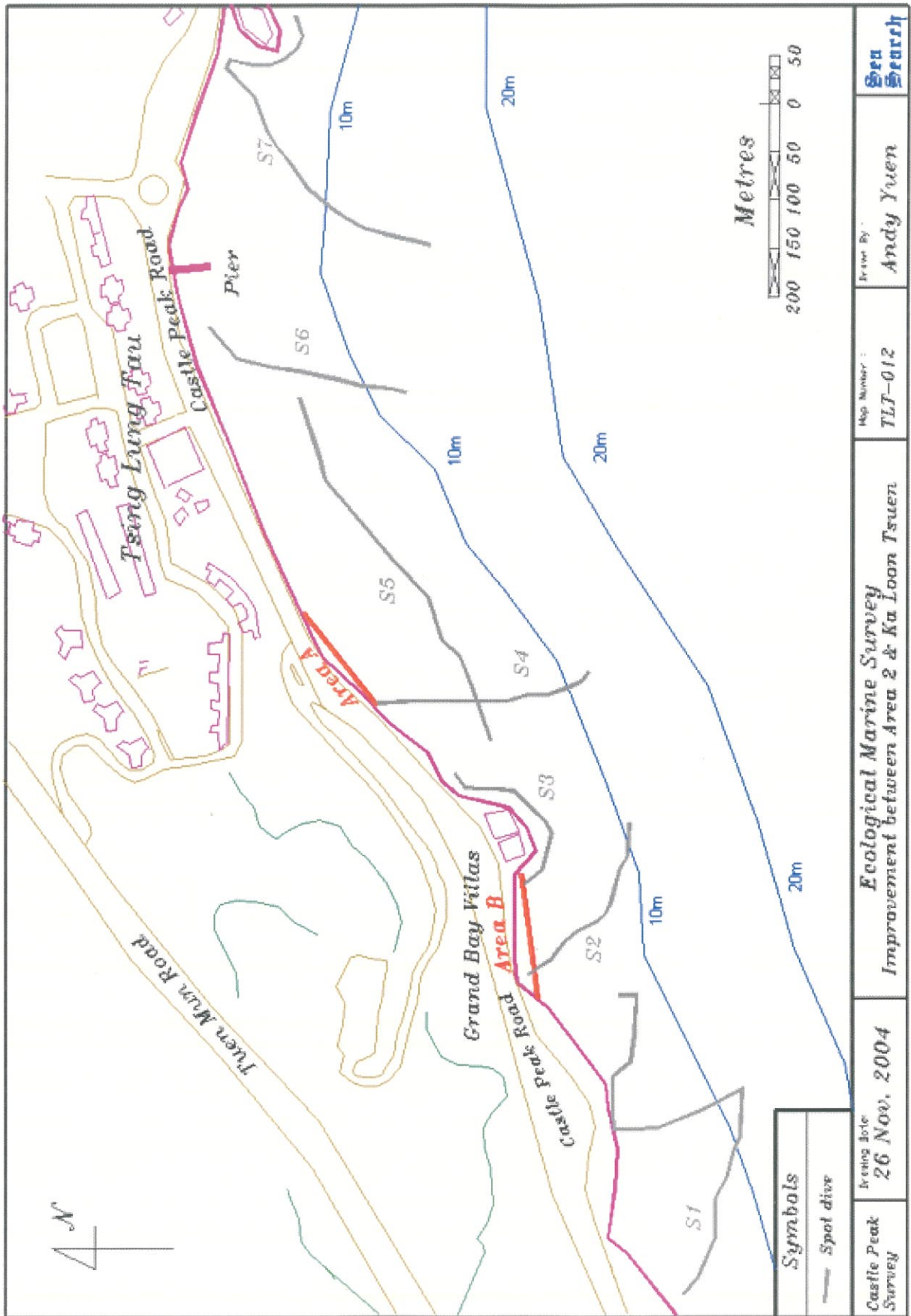
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## REFERENCES

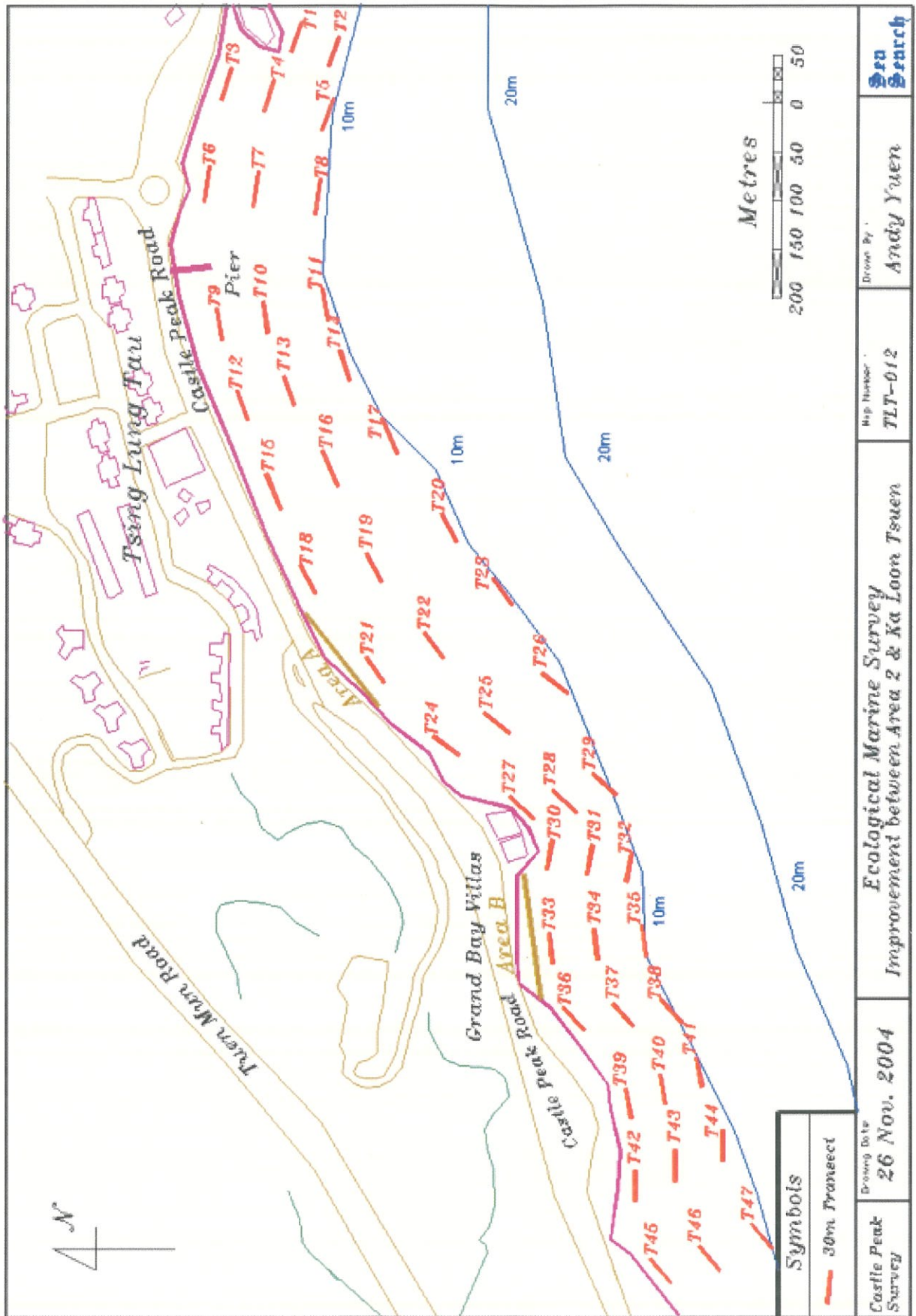
---

- Cope, M. 1982. Interspecific coral interactions in Hong Kong. *Proceedings of the Fourth International Coral Reef Symposium, Manila, 1981*.
- DeVantier, L.M., G. De'ath, T.J. Done and Turak, E. 1998. Ecological assessment of a complex natural system: a case study from the Great Barrier Reef. *Ecological Application* 8:480-96.
- Fabricius, K.E. 2001. Identification and documentation of octocorals from Kong Kong waters. Unpublished report for the Agriculture, Fisheries and Conservation Department Hong Kong SAR Government.
- Fabricius, K. and Alderslade, p. 2000. Soft Corals and Sea Fans, A comprehensive guide to the tropical shallow-water genera of the Central-West Pacific, the Indian Ocean and the Red Sea. Australian Institute of Marine Science, Townville, Australia, 264pp.
- Morton, B and Wu, S. S. 1975. The hydrology of the coastal waters of Hong Kong. *Environmental Research* 10: 319-47
- Oceanway 2002a. *Route 10. North Lantau to Tsing Lung Tau*. Unpublished document to Maunsell Environmental Management Consultants Ltd, Hong Kong.
- Oceanway 2002b. *Corals and coral communities of Hong Kong: Ecological values and status 2001-02*, Underwater Survey in Coastal Waters of Hong Kong. Unpublished document to the Agriculture, Fisheries and Conservation Department of the Hong Kong (SAR) Government. Hong Kong.
- Oceanway 2004a. *Rapid Ecological Survey at Bei Luo Wan, Hai Ling Island, China*. Unpublished Report to the Environmental Protection Department of the Government of the Peoples Republic of China.
- Oceanway 2004b. *Lamma Power Station Extension, Environmental Monitoring and Audit*. Unpublished Report to the Hong Kong Electric Company Limited, Hong Kong.
- Scott, P.J.B. 1984. *The Corals of Hong Kong*. Hong Kong: Hong Kong University Press.

APPENDIX A - SPOT DIVES



APPENDIX B – TRANSECTS SURVEYED





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**APPENDIX C – TRANSECT GPS COORDINATES.**


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<b>Transect</b>	<b>Northing</b>	<b>Easting</b>
T1	114° 02.890	22° 21.602
T2	114° 02.880	22° 21.589
T3	114° 02.861	22° 21.632
T4	114° 02.855	22° 21.615
T5	114° 02.843	22° 21.591
T6	114° 02.803	22° 21.639
T7	114° 02.801	22° 21.622
T8	114° 02.795	22° 21.596
T9	114° 02.760	22° 21.638
T10	114° 02.723	22° 21.620
T11	114° 02.730	22° 21.596
T12	114° 02.668	22° 21.630
T13	114° 02.677	22° 21.612
T14	114° 02.693	22° 21.588
T15	114° 02.619	22° 21.618
T16	114° 02.632	22° 21.596
T17	114° 02.634	22° 21.527
T18	114° 02.564	22° 21.604
T19	114° 02.570	22° 21.579
T20	114° 02.594	22° 21.549
T21	114° 02.510	22° 21.579
T22	114° 02.524	22° 21.556
T23	114° 02.556	22° 21.527
T24	114° 02.463	22° 21.553
T25	114° 02.477	22° 21.532
T26	114° 02.500	22° 21.509
T27	114° 02.428	22° 21.523
T28	114° 02.430	22° 21.505
T29	114° 02.440	22° 21.489
T30	114° 02.399	22° 21.504
T31	114° 02.397	22° 21.488
T32	114° 02.393	22° 21.470
T33	114° 02.344	22° 21.506
T34	114° 02.347	22° 21.487
T35	114° 02.331	22° 21.465
T36	114° 02.299	22° 21.500
T37	114° 02.302	22° 21.479
T38	114° 02.304	22° 21.458
T39	114° 02.251	22° 21.472
T40	114° 02.259	22° 21.457
T41	114° 02.269	22° 21.442
T42	114° 02.202	22° 21.468
T43	114° 02.197	22° 21.452
T44	114° 02.225	22° 21.432
T45	114° 02.150	22° 21.463
T46	114° 02.157	22° 21.442
T47	114° 02.169	22° 21.420





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**APPENDIX F – UNIT AREA DENSITY**


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All figures are for 1m<sup>2</sup> area.

<b>Taxa</b>	<b>Site</b>	
	<b>Tsing Lung Tau (Area A)</b>	<b>Grand Bay Villa (Area B)</b>
<b>Bryazoa</b>		
Bugula	0.0657 ± 0.0188	0.0877 ± 0.0307
Brown/orange encrust	0.0181 ± 0.0095	0.0012 ± 0.0008
Red encrust	0.0076 ± 0.0035	0.0099 ± 0.0044
Cyanobacterial mats	0.00 ± 0.00	0.00 ± 0.00
<b>Cnidaria</b>		
Anemone	0.00 ± 0.00	0.0006 ± 0.0006
Sand anemone	0.0005 ± 0.0005	0.00 ± 0.00
<b>Pennatulacea (Sea Pen)</b>		
Thin	0.00 ± 0.00	0.0012 ± 0.0012
Fat	0.00 ± 0.00	0.0006 ± 0.0006
<b>Gorgonacea</b>		
<i>Guatagorgia</i>	0.5762 ± 0.1887	0.6488 ± 0.1914
<i>Euplexaura</i>	0.0657 ± 0.0319	0.0951 ± 0.0385
<i>Echinomuricea</i>	0.0433 ± 0.0148	0.0617 ± 0.0175
<i>Balanophyllia</i>	1.0419 ± 0.3222	0.8673 ± 0.2769
Tunicate	0.0005 ± 0.0005	0.00 ± 0.00
<b>Mollusca</b>		
<i>Perna viridis</i>	0.0338 ± 0.0120	0.7556 ± 0.5845
<b>Crustacea: Cirripedia</b>		
( <i>Megabalanus volcano</i> , <i>Balanus reticulatus</i> , <i>B. amphitrite</i> , <i>B. trigonus</i> , <i>C. amaryllis</i> )	0.0876 ± 0.0319	2.5772 ± 1.0963
<b>Echinodermata</b>		
urchin (D)	0.0124 ± 0.0045	0.0086 ± 0.0043

Note that it was impossible to count all of the *Perna viridis* and Cirripedia on several transects.

In such cases the population was estimated to be 1,000 pcs.

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## APPENDIX G - PHOTOGRAPHS

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**Plate 1.** An almost totally dead blue *Guaiagorgia* sp. Only small patches remain alive. The purple material encrusting the stalks is a sponge. (Area A)



**Plate 2.** Another photograph of an almost totally dead blue *Guaiagorgia* sp. Only one small patch remains alive. Notice the thickness of the encrusting sponge is much greater suggesting this colony started dying before the one photographed in Plate 1. above. (Area A).



**Plate 3** A totally dead, sponge covered colony. Not all of the dead gorgonians were covered in sponge. Some were covered in algae. (Area A)



**Plate 4.** This colony has a total mortality of over 80% (Area A).



**Plate 5.** A solitary colony of the cup coral *Balanophyllia* sp. (Area A)



**Plate 6.** An assemblage of *Balanophyllia* sp. Each is a separate colony attached to the remains of a barnacle. Note that whilst this animal looks similar, it is slightly different. (Area A)



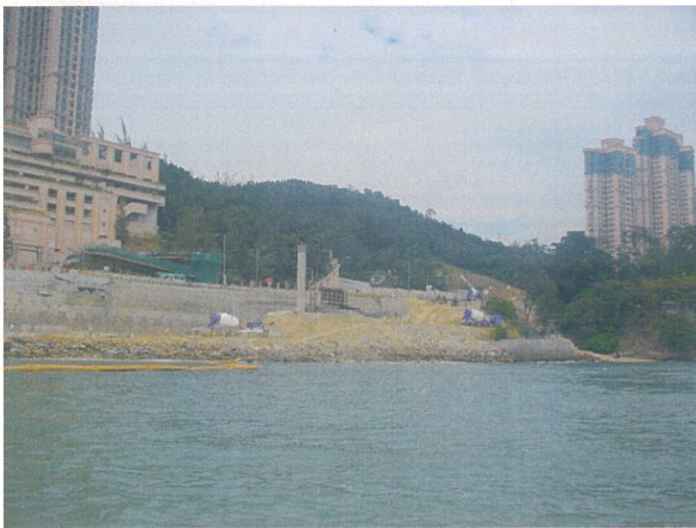
**Plate 7.** A sponge encrusting some of the hard substrate. The colonies were clumped with large local areas covered forming random patches over the area (Area A).



**Plate 8.** A colony of *Dendronephthya* sp. recorded along a transect in Area A.

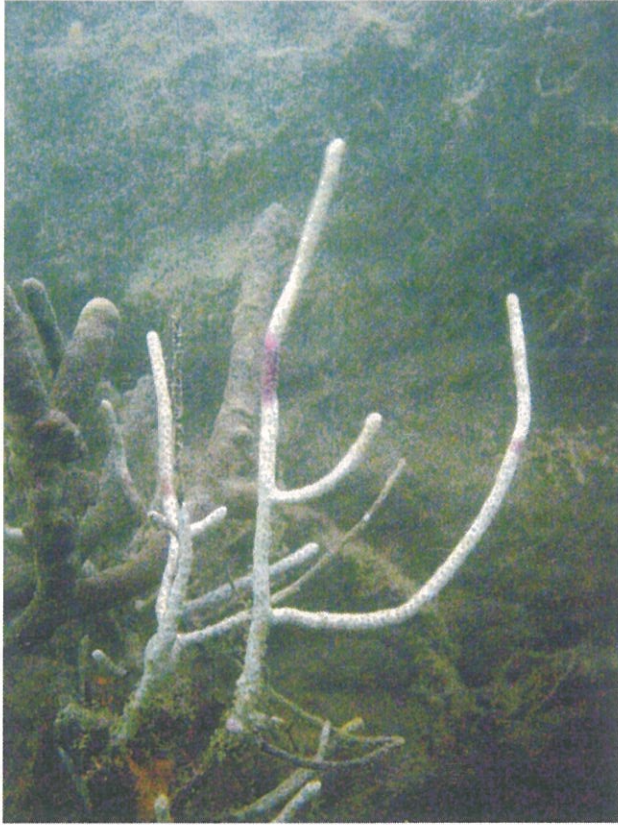


**Plate 9.** A solitary *Perna veridis*. In Area A most of these animals were solitary. This contrasted Area B where most were recorded as groups of many individuals. (Area A)



**Plate 10.** Some of the reclamation works currently going on very close to Area A.





**Plate 11.** Some of the colonies were in a reasonable condition, like this *Echinomuricea* sp. (Area A).



**Plate 12.** The decorator urchin *Ternopleurus* sp. (Area A)



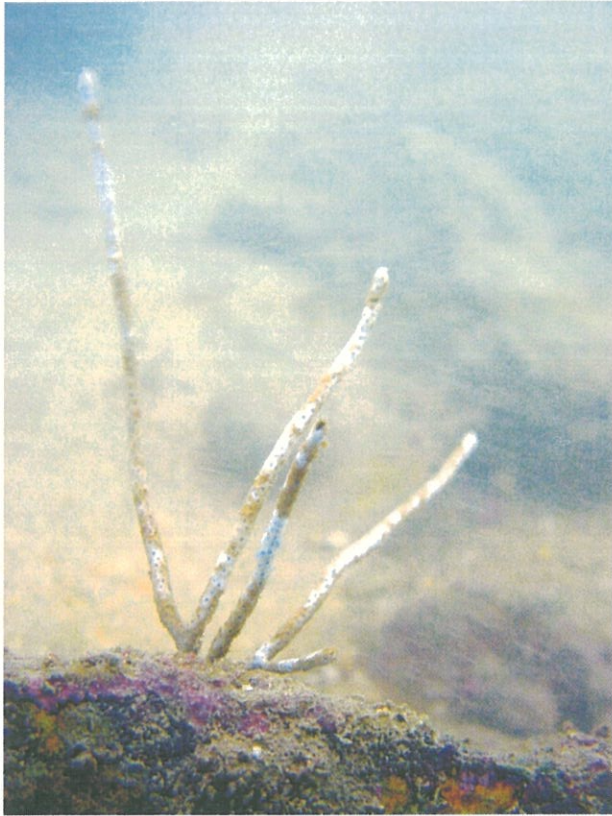
**Plate 13.** A diver in the water in front of Grand Bay Villas. (Area B)



**Plate 14.** The *Perna veridis* in this area, Area B, were recorded in clumps.



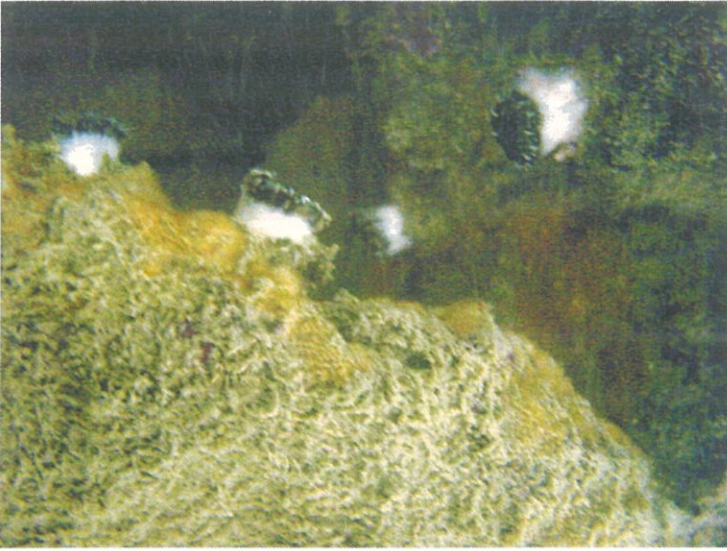
**Plate 15.** The brown orange encrusting bryozoa.



**Plate 16.** A colony of *Guaiagorgia* sp. (Area B)



**Plate 17.** A new recruit. This colony of *Echinomuricea* sp. was less than 5cm tall. Very few new recruits were recorded in this survey. (Area B)



**Plate 18.** Groups of the cup coral *Balanophyllia* sp. (Area B).



**Plate 19.** A solitary colony of *Balanophyllia* sp. (Area B).



**Plate 20.** An encrusting sponge in Area B.

*Appendix C*  
*附件 C*

Appendix C1: Distance between NSR and Construction Equipment (Reclamation East of Grand Bay Villa)

Construction Stage	Equipment	CNP Equipment Code	Number of Equipment	Sound Power Level (SWL) in dB(A)*	Slant Distance between SR 1 and Each Equipment (m)			Slant Distance between SR 2 and Each Equipment (m)			Slant Distance between SR 3 and Each Equipment (m)			Slant Distance between SR 4 and Each Equipment (m)		
					1	2	3	1	2	3	1	2	3	1	2	3
Stage 1	Grab Dredger	CNP 063	1	112	#	#	#	89	-	-	163	-	-	143	-	-
	Excavator (Backhoe)	CNP 081	3	112	#	#	#	89	124	159	163	180	204	143	178	212
	Lorry	CNP 141	3	112	#	#	#	89	124	159	163	180	204	143	178	212
Stage 2	Excavator (Backhoe)	CNP 081	3	112	#	#	#	89	124	159	163	180	204	143	178	212
	Lorry	CNP 141	3	112	#	#	#	89	124	159	163	180	204	143	178	212
	Excavator (Backhoe)	CNP 081	3	112	#	#	#	89	124	159	163	180	204	143	178	212
Stage 3	Excavator (Backhoe)	CNP 081	3	112	#	#	#	89	124	159	163	180	204	143	178	212
	Lorry	CNP 141	3	112	#	#	#	89	124	159	163	180	204	143	178	212
	Grab Dredger	CNP 063	1	112	#	#	#	89	-	-	163	-	-	143	-	-
Stage 4	Excavator (Backhoe)	CNP 081	3	112	#	#	#	89	124	159	163	180	204	143	178	212
	Lorry	CNP 141	3	112	#	#	#	89	124	159	163	180	204	143	178	212
	Grab Dredger	CNP 063	1	112	#	#	#	89	124	159	163	-	-	143	-	-
Stage 5	Excavator (Backhoe)	CNP 081	3	112	#	#	#	89	124	159	163	180	204	143	178	212
	Lorry	CNP 141	3	112	#	#	#	89	124	159	163	180	204	143	178	212
	Concrete Lorry	CNP 044	1	109	#	#	#	89	-	-	163	-	-	143	-	-
Stage 6	Concrete Pump	CNP 047	1	109	#	#	#	89	-	-	163	-	-	143	-	-
	Concrete Pocker	CNP 170	1	113	#	#	#	89	-	-	163	-	-	143	-	-
	Air Compressor	CNP 003	1	104	#	#	#	89	-	-	163	-	-	143	-	-
Stage 7	Excavator (Backhoe)	CNP 081	3	112	#	#	#	89	124	159	163	180	204	143	178	212
	Lorry	CNP 141	3	112	#	#	#	89	124	159	163	180	204	143	178	212
	Roller	CNP186	3	108	#	#	#	89	124	159	163	180	204	143	178	212
Stage 8	Grab Dredger	CNP 063	1	112	#	#	#	89	-	-	163	-	-	143	-	-
	Excavator (Backhoe)	CNP 081	3	112	#	#	#	89	124	159	163	180	204	143	178	212
	Lorry	CNP 141	3	112	#	#	#	89	124	159	163	180	204	143	178	212

\* SWL are obtained from the Technical Memorandum on Noise from Construction Work Other than Percussive Piling.  
# The distance between NSR and construction equipment is more than 300m, no significant noise impact at NSR is expected.

Appendix C2: Distance between NSR and Construction Equipment (Reclamation West of Grand Bay Villis)

Construction Stage	Equipment	Equipment Code	Number of Equipment	Sound Power Level (SWL) in dB(A)	Slant Distance between SR 1 and Each Equipment (m)					Slant Distance between SR 2 and Each Equipment (m)					Slant Distance between SR 3 and Each Equipment (m)					Slant Distance between SR 4 and Each Equipment (m)									
					1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5					
Stage 1	Grab Dredger	CNP 063	1	112	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Excavator (Backhoe)	CNP 081	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Lorry	CNP 141	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
Stage 2	Grab Dredger	CNP 063	1	112	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Excavator (Backhoe)	CNP 081	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Lorry	CNP 141	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
Stage 3	Excavator (Backhoe)	CNP 081	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Lorry	CNP 141	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Grab Dredger	CNP 063	1	112	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
Stage 4	Excavator (Backhoe)	CNP 081	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Lorry	CNP 141	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Concrete Lorry	CNP 044	1	109	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
Stage 5	Concrete Pump	CNP 047	1	109	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Concrete Piler	CNP 170	1	113	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Air Compressor	CNP 003	1	104	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
Stage 6	Excavator (Backhoe)	CNP 081	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Lorry	CNP 141	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Grab Dredger	CNP 063	1	112	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
Stage 7	Excavator (Backhoe)	CNP 081	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Lorry	CNP 141	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Concrete Lorry	CNP 044	1	109	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
Stage 8	Concrete Pump	CNP 047	1	109	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Concrete Piler	CNP 170	1	113	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Air Compressor	CNP 003	1	104	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
Stage 9	Excavator (Backhoe)	CNP 081	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Lorry	CNP 141	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Roller	CNP 186	5	103	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
Stage 10	Dumper	CNP 066	1	105	205	-	-	-	-	30	-	-	-	-	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
	Lorry	CNP 141	5	112	205	234	264	294	324	30	60	90	120	150	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#

# SWL are obtained from the Technical Memorandum on Noise from Construction Work Other than Percussive Piling.  
The distance between NSR and construction equipment is more than 300m, no significant noise impact at NSR is expected.

*Appendix D*  
*附件 D*



**Appendix D**

**Predicted Unmitigated Noise Level (in dB(A)) at NSR  
 During Reclamation Construction at West of Grand Bay Villa**

Construction Stage*	Predicted Noise Level at Noise Sensitive Receiver, dB(A)			
	SR1	SR2	SR3	SR4
1	69.5	83.4	#	#
2	69.5	83.4	#	#
3	68.9	82.1	#	#
4	69.5	83.4	#	#
5	64.6	81.3	#	#
6	68.9	82.1	#	#
7	69.5	83.4	#	#
8	64.6	81.3	#	#
9	69.7	82.9	#	#
10	66.2	79.8	#	#

\* Please refer section 2.1

NSR Exceeding 75dB(A) will require the application of Noise mitigation measure

# The distance between NSR and construction equipment is more than 300m, no significant noise impact at NSR is expected.

**Predicted Unmitigated Noise Level (in dB(A)) at NSR  
 During Reclamation Construction at East of Grand Bay Villa**

Construction Stage*	Predicted Noise Level at Noise Sensitive Receiver, dB(A)			
	SR1	SR2	SR3	SR4
1	#	74.7	70.5	71.1
2	#	73.7	69.7	70.1
3	#	73.7	69.7	70.1
4	#	74.7	70.5	71.1
5	#	75.4	70.5	71.1
6	#	71.9	66.6	67.7
7	#	74.4	70.5	70.9
8	#	74.7	70.5	71.1

\* Please refer section 2.1

NSR Exceeding 75dB(A) will require the application of Noise mitigation measure

# The distance between NSR and construction equipment is more than 300m,

*Appendix E*  
*附件 E*

Appendix E: Distance between NSR and Construction Equipment (Bored Pile Retaining Wall)

Construction Stage	Equipment	CNP Equipment Code	Number of Equipment	Sound Power Level (SWL) in dB(A)*	Slant Distance between SR 1 and Each Equipment (m)				Slant Distance between SR 2 and Each Equipment (m)				Slant Distance between SR 3 and Each Equipment (m)				Slant Distance between SR 4 and Each Equipment (m)			
					1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Stage 1	Mobile Crane	CNP 048	2	112	#	#	#	#	40	106	-	-	201	270	-	-	228	306	-	-
	Lorry	CNP 141	2	112	#	#	#	#	40	106	-	-	201	270	-	-	228	306	-	-
Stage 2	Reverse Circulation Drill	CNP 166	4	100	#	#	#	#	36	56	89	126	169	203	240	289	182	231	278	325
	Excavator (Backhoe)	CNP 081	4	112	#	#	#	#	36	56	89	126	169	203	240	289	182	231	278	325
	Lorry	CNP 141	4	112	#	#	#	#	36	56	89	126	169	203	240	289	182	231	278	325
Stage 3	Oscillator	CNP 165	1	115	#	#	#	#	38	-	-	-	142	-	-	-	154	-	-	-
	Air Compressor	CNP 003	1	104	#	#	#	#	38	-	-	-	142	-	-	-	154	-	-	-
	Mobile Crane	CNP 048	1	112	#	#	#	#	38	-	-	-	142	-	-	-	154	-	-	-
	Concrete Lorry	CNP 044	1	109	#	#	#	#	38	-	-	-	142	-	-	-	154	-	-	-
	Concrete Pump	CNP 047	1	109	#	#	#	#	38	-	-	-	142	-	-	-	154	-	-	-

\* SWL are obtained from the Technical Memorandum on Noise from Construction Work Other than Percussive Piling.  
# The distance between NSR and construction equipment is more than 300m, no significant noise impact at NSR is expected.

Predicted Unmitigated Noise Level (in dB(A)) at NSR During Bored Pile Wall Construction

Construction Stage*	Predicted Noise Level at Noise Sensitive Receiver, dB(A)			
	SR1	SR2	SR3	SR4
1	#	76.5	65.9	64.5
2	#	81.2	69.6	68.7
3	#	81.6	70.1	69.4

\* NSR Encasing 7.5dB(A) will require the application of noise mitigation measure  
# The distance between NSR and construction equipment is more than 300m, no significant noise impact at NSR is expected.

*Appendix F*  
*附件 F*

### Appendix F1

#### Predicted Mitigated Noise Level (in dB(A)) at NSR During Reclamation Construction at West of Grand Bay Villa

Construction Stage*	Predicted Noise Level at Noise Sensitive Receiver, dB(A)			
	SR1	SR2	SR3	SR4
1	59.5	73.4	#	#
2	59.5	73.4	#	#
3	58.9	72.1	#	#
4	59.5	73.4	#	#
5	54.6	71.3	#	#
6	58.9	72.1	#	#
7	59.5	73.4	#	#
8	54.6	71.3	#	#
9	59.7	72.9	#	#
10	56.2	69.8	#	#

\* Please refer section 2.1

NSR Exceeding 75dB(A) will require the application of Noise mitigation measure

# The distance between NSR and construction equipment is more than 300m, no significant noise impact at NSR is expected.

#### Predicted Mitigated Noise Level (in dB(A)) at NSR During Reclamation Construction at East of Grand Bay Villa

Construction Stage*	Predicted Noise Level at Noise Sensitive Receiver, dB(A)			
	SR1	SR2	SR3	SR4
1	#	64.7	60.5	61.1
2	#	63.7	59.7	60.1
3	#	63.7	59.7	60.1
4	#	64.7	60.5	61.1
5	#	65.4	60.5	61.1
6	#	61.9	56.6	57.7
7	#	64.4	60.5	60.9
8	#	64.7	60.5	61.1

\* Please refer section 2.1

NSR Exceeding 75dB(A) will require the application of Noise mitigation measure

# The distance between NSR and construction equipment is more than 300m,

**Appendix F2**

**Predicted Mitigated Noise Level (in dB(A)) at NSR  
 During Bored Pile Wall Construction**

Construction Stage*	Predicted Noise Level at Noise Sensitive Receiver, dB(A)			
	SR1	SR2	SR3	SR4
1	#	63.6	50.9	49.8
2	#	67.3	55.7	54.7
3^	#	69.4	58.0	57.3

\* Please refer section 2.1

NSR Exceeding 75dB(A) will require the application of Noise mitigation measure

# The distance between NSR and construction equipment is more than 300m, no significant noise impact at NSR is expected.

^ Temporary noise barrier is applied at SR2 only.

*Appendix G*  
*附件 G*

**Appendix G**

**Predicted Unmitigated Cumulative Noise Level at Sensitive Receiver (dB(A)) (Worst Case)**

	Predicted Noise Level at Noise Sensitive Receiver (Worst Case), dB(A)			
	SR1	SR2	SR3	SR4
Reclamation at West of Grand Bay Villa	69.7	83.4	#	#
Reclamation at East of Grand Bay Villa	#	75.4	70.5	71.1
Bored Pile Wall Construction	#	81.6	70.1	69.6
<b>Cumulative Unmitigated Noise Level</b>	<b>69.7</b>	<b>86.0</b>	<b>73.3</b>	<b>73.4</b>

# NSR Exceeding 75dB(A) will require the application of Noise mitigation measure  
 The distance between NSR and construction equipment is more than 300m,  
 no significant noise impact is considered due to construction activities.

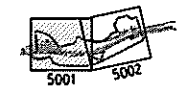
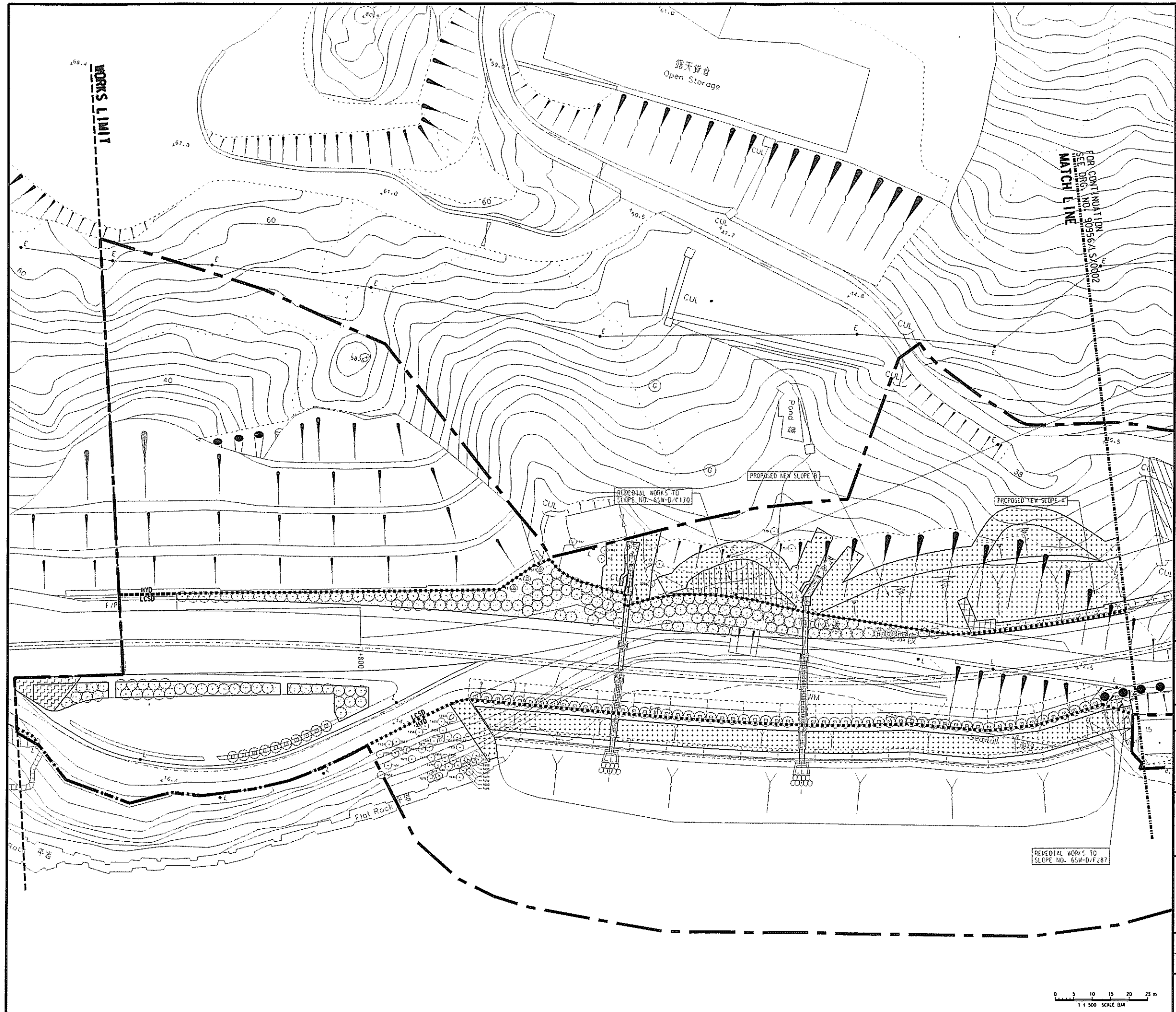
**Predicted Mitigated Cumulative Noise Level at Sensitive Receiver (dB(A)) (Worst Case)**

	Predicted Noise Level at Noise Sensitive Receiver (Worst Case), dB(A)			
	SR1	SR2	SR3	SR4
Reclamation at West of Grand Bay Villa	59.7	73.4	#	#
Reclamation at East of Grand Bay Villa	#	65.4	60.5	61.1
Bored Pile Wall Construction*	#	68.8	58.2	57.5
<b>Cumulative Mitigated Noise Level</b>	<b>59.7</b>	<b>75.3</b>	<b>62.4</b>	<b>62.6</b>

# NSR Exceeding 75dB(A) will require the application of Noise mitigation measure  
 The distance between NSR and construction equipment is more than 300m,  
 no significant noise impact is considered due to construction activities.  
 \* Temporary noise barrier is applied at SR2 only.



*Appendix H*  
*附件 H*



**KEY PLAN**

- NOTES:
1. ALL CO-ORDINATES ARE IN ACCORDANCE WITH THE 1980 HONG KONG METRIC GRID SYSTEM.
  2. ALL LEVELS ARE IN METRES ABOVE THE PRINCIPAL DATUM (HPD) AND RELATE TO THE SETTING-OUT LINES.

- LEGEND:
- DENOTES WORKS LIMIT
  - DENOTES PRINCIPAL SETTING OUT LINE
  - DENOTES FOOTPATH
  - DENOTES EDGE OF CARRIAGEWAY
  - DENOTES NEW SOIL CUT SLOPE
  - DENOTES NEW ROCK CUT SLOPE
  - DENOTES NEW SOIL OR ROCK FILL SLOPE
  - DENOTES SLOPE MAINTENANCE STAIRWAY
  - DENOTES RETAINING WALL
  - DENOTES SLOPE TO BE STABILISED
  - NO PLANTING ABOVE 1.05m AS PER SIGHTLINE REQUIREMENT
  - RETAINED TREE
  - FINAL LOCATION FOR TRANSPLANTED TREE
  - HEAVY STANDARD TREE
  - HEAVY STANDARD TREE WITH TREE GRILL
  - WOODLAND MIX
  - SHRUBS AND GROUND COVER
  - 300mm WIDE CLIMBERS
  - DEMARCATION OF MAINTENANCE RESPONSIBILITY

Rev	Issue Status	Amendment	By	Chk.	App.	Date

Major Works Project Management Office,  
Highways Department,  
Hong Kong

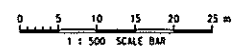
Project No. 6553TH Contract No. \_\_\_\_\_

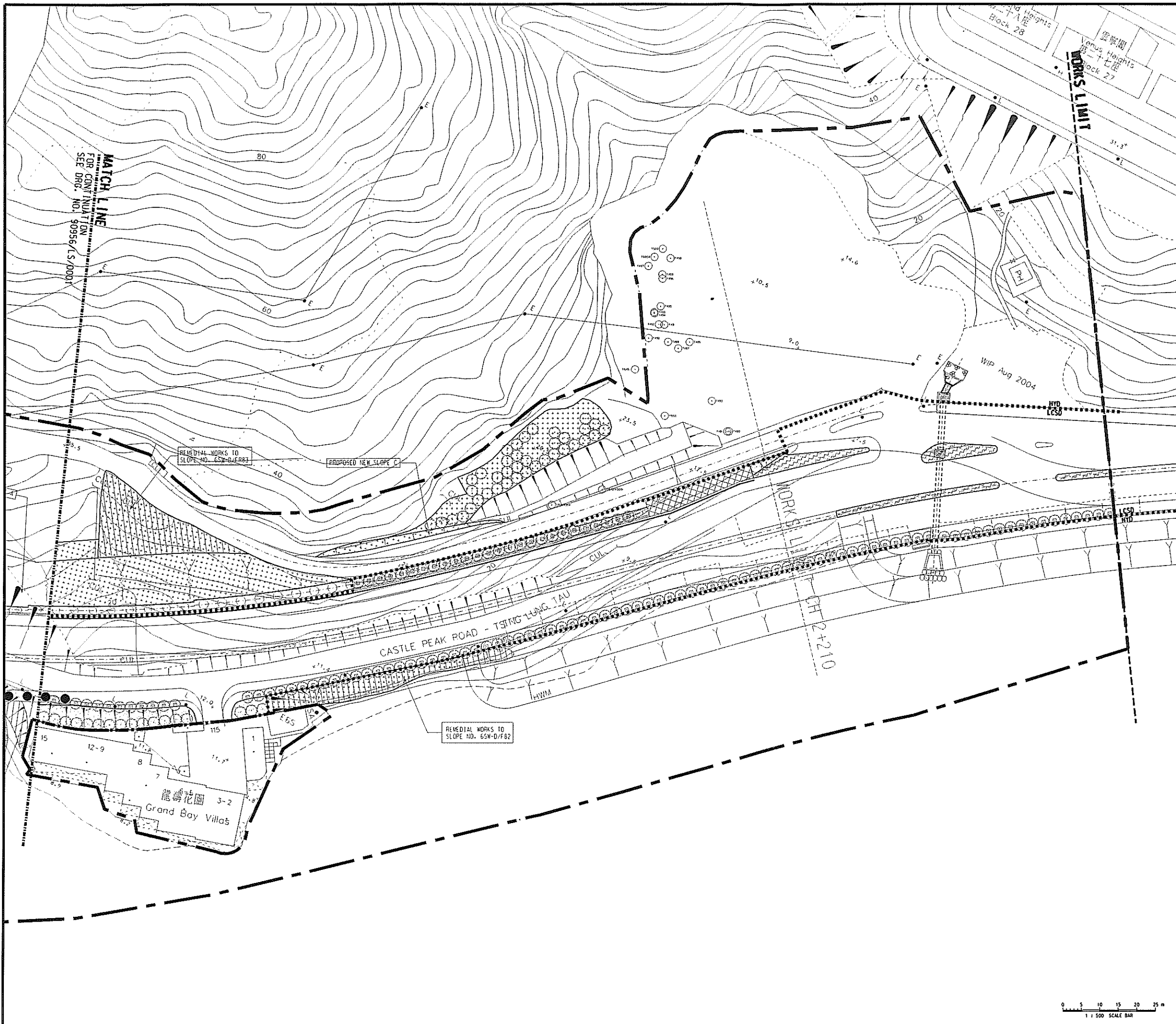
**Mouchel Halcrow JV**  
Sub-Consultants ACL Asia

Contract Title  
Castle Peak Road Improvement  
West of Tsing Lung Tau

Drawing Title  
**COMPENSATORY PLANTING PLAN**  
SHEET 1 OF 2

Drawn	PEL	Checked	CYW	Approved	XAL
Scale	1:500	CAD File No.	TSS17704.DGN	Date	MARCH 2005
Date Issued	MARCH 2005	Drawing No.	90956/LS/0001	Rev.	-





**KEY PLAN**

- NOTES:**
1. ALL CO-ORDINATES ARE IN ACCORDANCE WITH THE 1980 HONG KONG METRIC GRID SYSTEM.
  2. ALL LEVELS ARE IN METRES ABOVE THE PRINCIPAL DATUM (mPD) AND RELATE TO THE SETTING-OUT LINES.

- LEGEND:**
- DENOTES WORKS LIMIT
  - DENOTES PRINCIPAL SETTING OUT LINE
  - DENOTES FOOTPATH
  - DENOTES EDGE OF CARRIAGEWAY
  - DENOTES NEW SOIL CUT SLOPE
  - DENOTES NEW ROCK CUT SLOPE
  - DENOTES NEW SOIL OR ROCK FILL SLOPE
  - DENOTES SLOPE MAINTENANCE STAIRWAY
  - DENOTES RETAINING WALL
  - DENOTES SLOPE TO BE STABILISED
  - NO PLANTING ABOVE 1.05m AS PER SIGHTLINE REQUIREMENT
  - RETAINED TREE
  - FINAL LOCATION FOR TRANSPLANTED TREE
  - HEAVY STANDARD TREE
  - HEAVY STANDARD TREE WITH TREE GRILL
  - WOODLAND MIX
  - SHRUBS AND GROUNDCOVER
  - 300mm WIDE CLIMBERS
  - DEMARCATION OF MAINTENANCE RESPONSIBILITY

Rev	Issue Status	Amendment	By	CHK.	App.	Date

Major Works Project Management Office,  
Highways Department,  
Hong Kong

Project No. 6553TH Contract No.

**Mouchel Halcrow JV**  
Sub-Consultants ACL Asia

Contract Title  
Castle Peak Road Improvement  
West of Tsing Lung Tau

Drawing Title  
**COMPENSATORY PLANTING PLAN**  
SHEET 2 OF 2

Drawn	PEL	Checked	CYW	Approved	XAL
Scale	1:500	CAD File No.	TSS17705.DGN	Date	MARCH 2005
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