

## **Appendix D**

### **Structural Borne Noise Assessment**

## GROUND/STRUCTURAL BORNE NOISE PREDICTION

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### ANNEX I

#### TBM DATA

Test data of vibration is available from the operation of TBM in the Lok Ma Chau line. A maximum peak average vibration level (Transverse), 95dB(V) re.  $10^{-6}$  in/s recorded on 29 Oct 2004 and at a monitoring location with the shortest distance to the TBM source of 19.5mPD and 6.5m from the TBM centreline on 29 Oct 2004 was adopted based on the worst case scenario. It was found that the data was recorded when the TBM was drilling rock.

The tunnel in this study is 6m-7.2m compared to 8 m of the tunnel in Lok Ma Chau . TBM power is assumed to be the same.

Rock drilling data was collected from Lo Ma Chau

Peak Leq 95 dB at a monitoring distance 6.5m from the sources. Leq is the average for 30 seconds. The peak is the highest of all the Leq data obtained during the whole day of operation.

Description							
Octave Band Frequency	16	31.5	63	125	250	500	Hz
Vibration Velocity, ref $10^{-6}$ in/s	79.4	92.3	87.5	84	82.4	76.5	dB(V)
Vibration Velocity, ref $10^{-6}$ mm/s	107	120	116	112	110	105	dB(V)

## GROUND/STRUCTURAL BORNE NOISE PREDICTION

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Test data was also obtained at 6.5 m from a breaker drilling on rock. It can be seen the vibration power source is about 15 dB lower than that of TBM . The breaker is excavator mounted breaker

breaker	
Octave Band Frequency	16 31.5 63 125 250 500 Hz
Vibration Velocity, ref 10 <sup>-6</sup> mm/s	60 70 70 80 95 90 dB(V)

## **ANNEX II**

### **SITE MEASUREMENT**

Site tests were performed near VH10 which is close to NSR2. The test were used to evaluate the attenuation due the soil or rock layer by comparing the vibration at the source of impact by steel pipe and the vibration at the receiver on the surface of concrete structure sitting on the rock layers. Only the useful data are reported below.

The site measurement at VH1 did not give accurate data for soil attenuation and was not reported in here.

#### Calculation results for test on VH10

From section 2

receiver vibration level -85 dBg at 50 Hz

From section 3

source level at the pipe for 1.6 m drop -23dBg at 50 Hz

using equation of distance attenuation ,the attenuation constant can be found.

The source is measured at 0.07 m from the center of pipe, measurement point at 70m

Distance attenuation = $20\log 70/0.07=60$

Thus ,additional attenuation =  $-23-(-85)-60=2$  dB

Average attenuation for 70m = $2/70=0.03$  dB/m

The vibration attenuation in NSR 2 is found to be 0.03 dB/m .

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## GROUND/STRUCTURAL BORNE NOISE PREDICTION

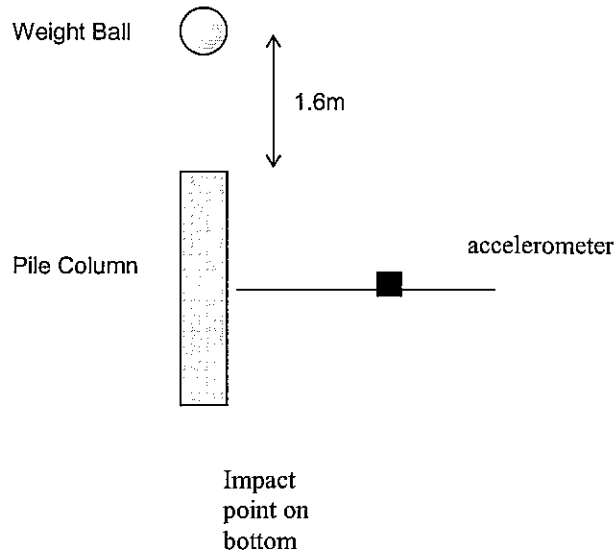
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### 1. First Vibration Measurement

Date: 05 March 2004

Location: Site near VH10 in Pok Fu Lam

#### 1.1 test set-up



Accelerometer was set on the surface on a concrete box on the ground. The pipe column was set into the pitch hole at 70m below ground. A 2kg weight ball was released at 1.6m above the pipe column which hit the bottom of the hole. The vibration level transmitted from this impact was recorded on the surface.

The vibration level was measured in term of 1/3 octave band from 12.5Hz to 135Hz. The measurement duration was 5 second with 0.0625s sample interval.

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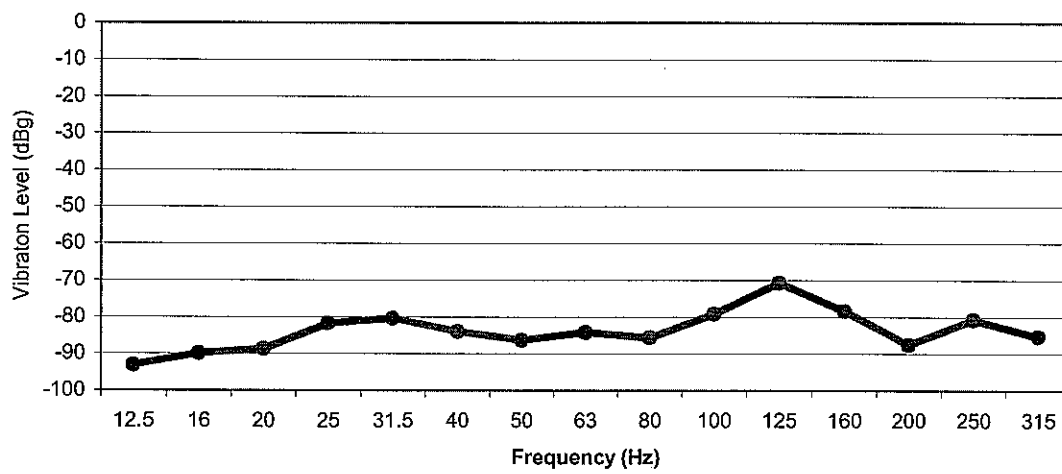
## GROUND/STRUCTURAL BORNE NOISE PREDICTION

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1.2 data at the receiver on the surface

File: 106B

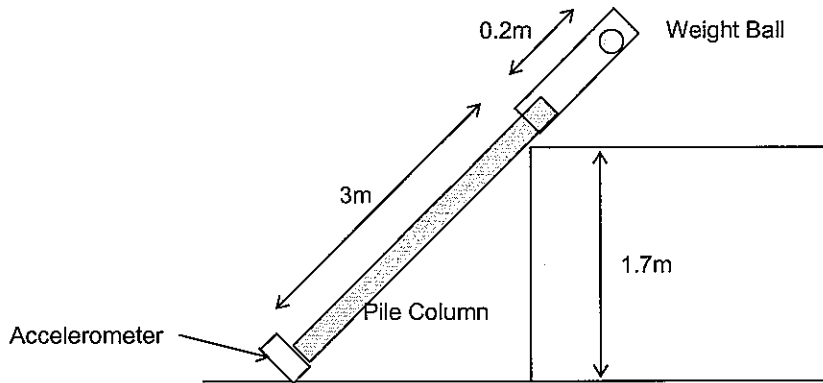
Frequency Spectrum at Peak Level



# GROUND/STRUCTURAL BORNE NOISE PREDICTION

## 2. Source Vibration Calibration Measurement

### 2.1 Test set-up:

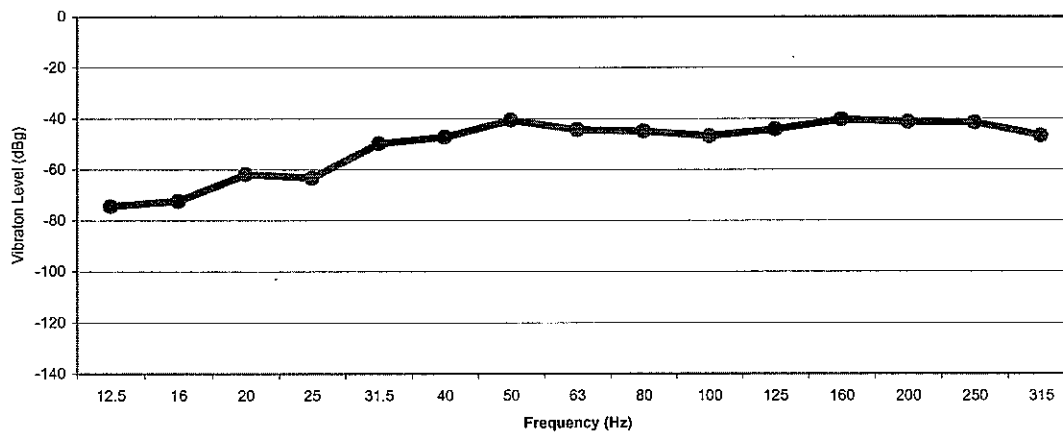


The pipe column was set-up as above diagram. An accelerometer was placed at the end of the pile column. A 2kg weight ball was placed in an additional pile, it was released from the 0.2m position apart from the head of the pile column and hit the pile column. The vibration level from this event was recorded. The vibration level for 1.6m drop is calculated.

### 2.2. Measurement data of the impact source

File: 207A

Frequency Spectrum at Peak Level



## **GROUND/STRUCTURAL BORNE NOISE PREDICTION**

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### **3. Source vibration level for 1.6 m of drop of steel ball**

from 2.2 above

source level at the pipe for 0.1 m drop -40dBg at 50 Hz

source level at the pipe for 1.6 m drop -23dBg at 50 Hz

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## **ANNEX III**

### **RESULT OF GEOLOGICAL INVESTIGATION**

Hole no. VH1 is at 60m from NSR3 and it showed a layer of sand down to 1m below surface and cobbles down to 2.27 m . The path of transmission is mainly rock of depth 60m

Hole no. VH10 is at 70m from NSR2 and it showed a layer of sand & silt at 55.1 to 55.7 below surface . This contribute to additional attenuation of vibration .



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **HR1**  
 SHEET **1** OF **3**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement in Northern Hong Kong Island

METHOD	Rotary Cored	CO-ORDINATES	WORKS ORDER NO.
MACHINE & NO.	DR127	E 837352.45 N 814016.18	GCE/2004/02/SI/R
FLUSHING MEDIUM	Water	ORIENTATION	DATE FROM 17/04/2004 TO 20/04/2004
		Vertical	GROUND LEVEL 52.70 mPD

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
17/04/2004	HX							INSPECTION PIT	52.70	0.00			SHOTCRETE SURFACE Brown, dappled grey, clayey silty fine to coarse SAND with some angular to subangular fine to coarse gravel sized rock, occasional steel, brick fragments and nylon pieces. (FILL)
21/04/2004 19/04/2004		Dry at 18:00 Dry at 08:00	83					1 2 3 4 5 6 7 8	50.70	2.00		V/IV	Extremely weak to very weak, greyish brown, spotted white, completely to highly decomposed, medium grained GRANITE. (Silty fine to coarse SAND with some angular to subangular fine to coarse gravel sized rock fragments)
			0					11.37 100/60mm (100bls/60mm)	47.20	5.50		IV	From 4.50m to 5.50m : Pinkish grey, silty fine to coarse sand with much angular to subangular fine to coarse gravel sized rock fragments.
	HX 6.00		56	6	0	>20		T2101	46.54	6.16		V/IV	Weak, brownish grey, spotted white and black, highly decomposed, medium grained GRANITE. Joints are very closely to closely spaced, rough planar, rough stepped and rough undulating, extremely narrow to very narrow, iron and manganese oxide stained, dipping at 10° to 20°, 20° to 30° and 50° to 60°.
			71	39	12	16.0		T2101	46.03	6.67		IV/III	From 6.16m to 6.67m : No core recovered, assumed to be completely to highly decomposed granite.
			98	98	92	6.0		T2101	45.43	7.27		IV	Moderately weak, pinkish to brownish grey, spotted black and white, highly to moderately decomposed, medium grained GRANITE. Joints are closely to medium spaced, rough planar, rough stepped and rough undulating, extremely narrow to very narrow, iron and manganese oxide stained, kaolin infilled (1mm thick), dipping at 0° to 10° and 20° to 30°.
			100	94	90			T2101	45.18	7.52		IV/III	From 6.92m to 7.27m : Moderately weak and highly decomposed.
								T2101	43.55	9.15		III	From 7.27m to 7.52m : No core recovered, assumed to be completely to highly decomposed granite. Moderately strong, pinkish to brownish grey, spotted black and white, moderately

- SMALL DISTURBED SAMPLE    ▲ WATER SAMPLE
- LARGE DISTURBED SAMPLE    ▲ PIEZOMETER TIP
- ▬ SPT LINER SAMPLE            ▲ STANDPIPE
- ▬ U75 UNDISTURBED SAMPLE    ▬ STANDARD PENETRATION TEST
- ▬ U100 UNDISTURBED SAMPLE   ▬ PERMEABILITY TEST
- ▬ MAZIER SAMPLE                ▬ IMPRESSION PACKER TEST
- ▬ PISTON SAMPLE                 ▬ IN-SITU VANE SHEAR TEST
- ▬ PACKER TEST

LOGGED Y.K. Lee  
 DATE 21/04/2004  
 CHECKED James Lu  
 DATE 22/04/2004

REMARKS  
 1. Packer (Water absorption) test was carried out from the depths of 12.00m to 15.00m.  
 2. Acoustic borehole televiwer survey was carried out from the depths of 9.00m to 19.00m.  
 3. Water sample was taken at a depth of 20.00m.  
 4. Standpipe was installed at a depth of 19.50m.



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**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **HR1**  
 SHEET **2** OF **3**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT	Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement in Northern Hong Kong Island		
METHOD	Rotary Cored	CO-ORDINATES	WORKS ORDER NO. GCE/2004/02/SI/R
MACHINE & NO.	DR127	E 837352.45 N 814016.18	DATE FROM 17/04/2004 TO 20/04/2004
FLUSHING MEDIUM	Water	ORIENTATION	Vertical
		GROUND LEVEL	52.70 mPD

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
			97	95	95	>20		T2101		10.34	+		decomposed, medium grained GRANITE. Joints are closely to medium spaced, locally very closely spaced, rough planar, rough stepped and rough undulating, extremely narrow to very narrow, iron and manganese oxide stained, locally kaolin coated, dipping at 20° to 30°, 40° to 50° and 60° to 70°.
		1.25m at 18:00				4.5		T2101		11.47	+		
		7.25m at 08:00	100	95	92	2.0		T2101		11.47	+		Moderately strong to strong, pinkish grey, spotted black, moderately to slightly decomposed, medium grained GRANITE. Joints are closely to medium spaced, locally widely spaced, rough planar and rough undulating, extremely narrow to very narrow, iron and manganese oxide stained, kaolin coated, dipping at 20° to 30°, 60° to 70° and locally 70° to 80°.
						11.1		T2101		12.75	+	III/II	
			100	100	100	1.7		T2101	39.95	12.75	+		Moderately strong to strong, greyish pink, spotted black and white, mottled white and pink, moderately to slightly decomposed, medium grained QUARTZ SYENITE. Joints are closely to medium spaced, rough planar, rough undulating and slickensided planar, extremely narrow to very narrow, iron and manganese oxide stained, chlorite and kaolin coated, dipping at 10° to 20° and 70° to 80°. From 17.95m to 18.65m : With subvertical iron bearing quartz veins of 30mm x 40mm thick.
						5.1		T2101		15.49	+		
			100	93	93	0.9		T2101		15.49	+		Moderately strong to strong, greyish pink, spotted black and white, mottled white and pink, moderately to slightly decomposed, medium grained QUARTZ SYENITE. Joints are closely to medium spaced, rough planar, rough undulating and slickensided planar, extremely narrow to very narrow, iron and manganese oxide stained, chlorite and kaolin coated, dipping at 10° to 20° and 70° to 80°. From 17.95m to 18.65m : With subvertical iron bearing quartz veins of 30mm x 40mm thick.
						0.9		T2101		16.80	+		
			100	100	85	9.9		T2101	35.90	16.80	x	III/II	Moderately strong to strong, greyish pink, spotted black and white, mottled white and pink, moderately to slightly decomposed, medium grained QUARTZ SYENITE. Joints are closely to medium spaced, rough planar, rough undulating and slickensided planar, extremely narrow to very narrow, iron and manganese oxide stained, chlorite and kaolin coated, dipping at 10° to 20° and 70° to 80°. From 17.95m to 18.65m : With subvertical iron bearing quartz veins of 30mm x 40mm thick.
						2.6		T2101		16.99	x		
			100	100	89	4.5		T2101		18.48	x		Moderately strong to strong, greyish pink, spotted black and white, mottled white and pink, moderately to slightly decomposed, medium grained QUARTZ SYENITE. Joints are closely to medium spaced, rough planar, rough undulating and slickensided planar, extremely narrow to very narrow, iron and manganese oxide stained, chlorite and kaolin coated, dipping at 10° to 20° and 70° to 80°. From 17.95m to 18.65m : With subvertical iron bearing quartz veins of 30mm x 40mm thick.
						13.6		T2101		20.01	x		
		1.60m at 18:00				3.2		T2101		20.01	x		

- SMALL DISTURBED SAMPLE
- ▲ WATER SAMPLE
- ⬇ LARGE DISTURBED SAMPLE
- ▲ PIEZOMETER TIP
- SPT LINER SAMPLE
- ▲ STANDPIPE
- ▨ U75 UNDISTURBED SAMPLE
- ⬇ STANDARD PENETRATION TEST
- U100 UNDISTURBED SAMPLE
- ⬇ PERMEABILITY TEST
- ▨ MAZIER SAMPLE
- ⬇ IMPRESSION PACKER TEST
- ▨ PISTON SAMPLE
- ⬇ IN-SITU VANE SHEAR TEST
- ⬇ PACKER TEST

LOGGED Y.K. Lee  
 DATE 21/04/2004  
 CHECKED James Lu  
 DATE 22/04/2004

REMARKS



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **HR1**  
 SHEET **3** OF **3**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement in Northern Hong Kong Island

METHOD **Rotary Cored**

CO-ORDINATES  
**E 837352.45**  
**N 814016.18**

WORKS ORDER NO. **GCE/2004/02/SI/R**

MACHINE & NO. **DR127**

DATE FROM **17/04/2004** TO **20/04/2004**

FLUSHING MEDIUM **Water**

ORIENTATION **Vertical**

GROUND LEVEL **52.70 mPD**

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
20.04/2004										20.00			See sheet 2 of 3 for details. Hole completed at 20.01m.
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													

- SMALL DISTURBED SAMPLE    △ WATER SAMPLE
- ◄ LARGE DISTURBED SAMPLE    ▲ PIEZOMETER TIP
- SPT LINER SAMPLE            ▽ STANDPIPE
- ▨ U76 UNDISTURBED SAMPLE    ⊥ STANDARD PENETRATION TEST
- ▩ U100 UNDISTURBED SAMPLE    ⊥ PERMEABILITY TEST
- ▧ MAZIER SAMPLE              ⊥ IMPRESSION PACKER TEST
- ▨ PISTON SAMPLE                ∨ IN-SITU VANE SHEAR TEST
- ⊥ PACKER TEST

LOGGED Y.K. Lee  
 DATE 21/04/2004  
 CHECKED James Lu  
 DATE 22/04/2004

REMARKS



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **VH1**  
 SHEET **1** OF **4**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement In Northern Hong Kong Island

METHOD	Rotary Cored	CO-ORDINATES	WORKS ORDER NO.
MACHINE & NO.	DR122	E 838241.94 N 815221.08	GCE/2004/02/SI/R
FLUSHING MEDIUM	Water	ORIENTATION	DATE FROM
		Vertical	04/03/2004 TO 08/03/2004
			GROUND LEVEL
			73.29 mPD

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
04/03/2004	HX								73.29	0.00			Greyish brown, slightly silty fine to coarse SAND with some angular to subangular fine to medium gravel sized rock fragments and occasional rootlets. (FILL)
			52					1	72.79	0.50			Yellowish brown, fine to coarse SAND with occasional subangular fine to medium gravel sized rock and quartz fragments. (FILL)
			40					2	72.29	1.00			Greyish brown, locally brownish grey, angular to subangular COBBLE with much coarse gravel and occasional boulder sized moderately decomposed granite and occasional quartz fragments. (COLLUVIUM)
			91	71	49	5.9		T2101	71.02	1.77		III	From 1.10m to 1.36m : Boulder of moderately decomposed granite.
	HX 2.62		100	100	94	12.5		T2101	70.75	2.27		IV	Weak to moderately strong, greyish brown, spotted black, moderately decomposed, fine to medium grained GRANITE.
			100			1.7		T2101		2.54		III	Joints are very closely to closely spaced, rough planar, extremely narrow to very narrow, iron oxide and manganese oxide stained, kaolin (1mm to 2mm thick) infilled, dipping at 10° to 20° and 20° to 30°.
						20.0		T2101		2.62		III	From 2.44m to 2.54m : Weak and highly decomposed.
			100	98	85	3.5		T2101		4.05		II	Moderately strong, greyish brown, locally pinkish grey, spotted black, moderately decomposed, fine to medium grained GRANITE.
						13.2		T2101		5.56		III	Joints are closely to medium spaced, rough planar and rough undulating, extremely narrow to very narrow, iron oxide and manganese oxide stained, kaolin (1mm thick) infilled, dipping at 10° to 20°, 20° to 30° and 50° to 60°.
			97	95	78	9.1		T2101		6.22		II/III	At 2.60m : Pegmatite vein of 30mm thick. From 2.70m to 3.05m : Strong and slightly decomposed.
						2.9		T2101	67.07	6.22		II/III	From 3.55m to 4.00m : Moderately strong to strong and moderately to slightly decomposed.
			100	96	91	3.6		T2101		6.86		II	From 4.00m to 4.25m : Strong and slightly decomposed.
						10.0		T2101		8.35		II	From 4.25m to 4.43m : Moderately strong to strong and moderately to slightly decomposed.
						52.0		T2101		8.8		II	Moderately strong to strong, brownish grey, locally pinkish grey and greyish brown, spotted black, moderately to slightly decomposed, fine to medium grained GRANITE.
			98	92	92	9.1		T2101		9.1		III/II	Joints are closely to medium spaced, rough planar and rough undulating, extremely narrow to very narrow, iron oxide and manganese oxide stained, kaolin (<1mm thick) infilled, dipping at 10° to 20°, 30° to 40° and 50° to 60°.
						3.7		T2101		9.51		III/II	From 7.80m to 8.50m : Strong and slightly decomposed.
		0.00m at 18:00				8.8		T2101		9.88			From 9.20m to 9.62m : A subvertical joint.
04/03/2004		1.02m at 08:00	97	95	70			T2101					
05/03/2004			100	99	93	3.3		T2101					

- SMALL DISTURBED SAMPLE
- LARGE DISTURBED SAMPLE
- SPT LINER SAMPLE
- ▨ U76 UNDISTURBED SAMPLE
- ▩ U100 UNDISTURBED SAMPLE
- ▧ MAZIER SAMPLE
- ▦ PISTON SAMPLE
- △ WATER SAMPLE
- ▲ PIEZOMETER TIP
- ▴ STANDPIPE
- ⊥ STANDARD PENETRATION TEST
- ⊥ PERMEABILITY TEST
- ⊥ IMPRESSION PACKER TEST
- ∇ IN-SITU VANE SHEAR TEST
- ⊥ PACKER TEST

LOGGED Y.K. Lee  
 DATE 09/03/2004  
 CHECKED James Lu  
 DATE 10/03/2004

REMARKS  
 1. Packer (Water absorption) test failed to be carried out from the depths of 8.50m to 10.50m, 11.00m to 13.00m and 25.00m to 27.00m.  
 2. Acoustic borehole televiewer survey was carried out from the depths of 17.00m to 27.00m.  
 3. Standpipe was installed at a depth of 29.80m.



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **VH1**  
 SHEET **2** OF **4**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement in Northern Hong Kong Island

METHOD <b>Rotary Cored</b>	CO-ORDINATES <b>E 838241.94</b> <b>N 815221.08</b>	WORKS ORDER NO. <b>GCE/2004/02/S1/R</b>
MACHINE & NO. <b>DR122</b>		DATE FROM <b>04/03/2004</b> TO <b>08/03/2004</b>
FLUSHING MEDIUM <b>Water</b>	ORIENTATION <b>Vertical</b>	GROUND LEVEL <b>73.29 mPD</b>

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
10										78.00	+	II	From 9.95m to 10.25m : Strong and slightly decomposed.
11			100	84	58	15.0 4.9		T2101	81.47	11.23	+	III/II	
12			100	96	88	14.3 3.3 15.0		T2101	80.29	11.82	+	III	Moderately strong, greyish brown, spotted black, moderately decomposed, fine to medium grained GRANITE. Joints are closely to medium spaced, locally very closely spaced, rough planar and rough undulating, extremely narrow to very narrow, iron oxide and manganese oxide stained, kaolin (1mm thick) infilled, dipping at 10° to 20°, 40° to 50° and 60° to 70°.
13			100	96	88	2.7		T2101	80.29	12.60	+	III/II	
14			100	86	86	9.4 4.4		T2101	57.29	14.02	+	II III/II	Moderately strong to strong, brownish grey, locally pinkish grey, spotted black, moderately to slightly decomposed, fine to medium grained GRANITE. Joints are closely to medium spaced, rough planar and rough undulating, extremely narrow to very narrow, iron oxide and manganese oxide stained, kaolin (<1mm thick) infilled, dipping at 0° to 10°, 20° to 30°, 40° to 50° and 60° to 70°. From 13.70m to 14.02m : Strong and slightly decomposed. From 14.92m to 15.30m : Strong and slightly decomposed.
15			100	96	79	10.0		T2101	57.29	15.55	+	II III/II	
16			100	100	100	3.1 0.8		T2101	57.29	16.00	+	II	Strong, pinkish grey, spotted black, slightly decomposed, fine to medium grained GRANITE. Joints are medium to widely spaced, locally closely spaced, rough planar and rough undulating, extremely narrow to very narrow, iron oxide and manganese oxide stained, kaolin coated, dipping at 10° to 20°, 30° to 40° and 60° to 70°. At 16.25m : Pegmatite patch.
17			100	100	100	5.0		T2101		16.97	+		
18		0.00m at 16:00 1.12m at 08:00	100	100	100	1.0		T2101		17.70	+		
19			100	100	88			T2101		19.11	+		
20			100	100	100	6.5		T2101		19.87	+		

- SMALL DISTURBED SAMPLE
- ▲ WATER SAMPLE
- ▬ LARGE DISTURBED SAMPLE
- ▲ PIEZOMETER TIP
- ▬ SPT LINER SAMPLE
- ▲ STANDPIPE
- ▬ U76 UNDISTURBED SAMPLE
- ▬ STANDARD PENETRATION TEST
- ▬ U100 UNDISTURBED SAMPLE
- ▬ PERMEABILITY TEST
- ▬ MAZIER SAMPLE
- ▬ IMPRESSION PACKER TEST
- ▬ PISTON SAMPLE
- ▬ IN-SITU VANE SHEAR TEST
- ▬ PACKER TEST

LOGGED Y.K. Lee  
 DATE 09/03/2004  
 CHECKED James Lu  
 DATE 10/03/2004

REMARKS



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **VH1**  
 SHEET **3** OF **4**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement in Northern Hong Kong Island

METHOD	Rotary Cored	CO-ORDINATES	WORKS ORDER NO.
MACHINE & NO.	DR122	E 838241.94 N 815221.08	GCE/2004/02/SI/R
FLUSHING MEDIUM	Water	ORIENTATION	DATE FROM
		Vertical	04/03/2004 TO 08/03/2004
			GROUND LEVEL <b>73.29 mPD</b>

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
						0.6		T2101		20.00	+		See sheet 2 of 4 for details.
			100	100	100			T2101		20.89	+		
			100	100	100	2.0		T2101		21.65	+		
			100	98	98	9.5		T2101		22.34	+		
			100	98	98	0.7		T2101		23.50	+		
		1.07m at 18:00						T2101		24.23	+		
		1.38m at 08:00						T2101		25.05	+		
			100	74	52	7.1		T2101	48.24	25.05	+	II/VI	
			100	84	78	1.9	>20	T2101		25.87	+	III	
			100	100	94	4.3	20.0	T2101		26.61	+	II	
						1.7		T2101		28.13	+	II/VI	
			100	82	73	5.4		T2101		29.59	+	II	
			100	97	97	1.3		T2101		29.59	+	II	

Moderately strong to strong, brownish grey, locally pinkish grey, spotted black, moderately to slightly decomposed, fine to medium grained GRANITE.  
 Joints are closely to medium spaced, locally widely and very closely spaced, rough planar and rough undulating, locally rough stepped, extremely narrow to very narrow, iron oxide and manganese oxide stained, kaolin (<1mm thick) infilled, dipping at 10° to 20°, 60° to 70° and 70° to 80°.  
 From 25.28m to 25.95m : A subvertical joint.  
 From 25.77m to 25.87m : Moderately strong and moderately decomposed.  
 From 26.03m to 26.41m : Strong and slightly decomposed fine grained granite.  
 From 26.41m to 26.61m : Moderately strong and moderately decomposed.  
 From 26.41m to 27.30m : A subvertical joint.  
 From 27.40m to 27.75m : Strong and slightly decomposed.  
 From 27.87m to 29.39m : A subvertical joint.  
 From 29.39m to 30.15m : Strong and slightly decomposed.

<ul style="list-style-type: none"> <li>• SMALL DISTURBED SAMPLE</li> <li>◻ LARGE DISTURBED SAMPLE</li> <li>◻ SPT LINER SAMPLE</li> <li>◻ U76 UNDISTURBED SAMPLE</li> <li>◻ U100 UNDISTURBED SAMPLE</li> <li>◻ MAZIER SAMPLE</li> <li>◻ PISTON SAMPLE</li> <li>△ WATER SAMPLE</li> <li>▲ PIEZOMETER TIP</li> <li>▲ STANDPIPE</li> <li>↓ STANDARD PENETRATION TEST</li> <li>⊥ PERMEABILITY TEST</li> <li>⊥ IMPRESSION PACKER TEST</li> <li>∇ IN-SITU VANE SHEAR TEST</li> <li>⊥ PACKER TEST</li> </ul>	LOGGED <u>Y.K. Lee</u> DATE <u>09/03/2004</u> CHECKED <u>James Lu</u> DATE <u>10/03/2004</u>	REMARKS
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**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **VH1**

SHEET **4** OF **4**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement in Northern Hong Kong Island

METHOD	Rotary Cored	CO-ORDINATES	WORKS ORDER NO.
MACHINE & NO.	DR122	E 838241.94 N 815221.08	GCE/2004/02/SI/R
FLUSHING MEDIUM	Water	ORIENTATION	DATE FROM
		Vertical	04/03/2004 TO 08/03/2004
			GROUND LEVEL
			73.29 mPD

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
06/03/2004		0.67m at 18:00	///			11.8		T201	42.97	30.32	+	III/II	At 30.12m : Pegmatite patch. From 30.20m to 30.32m : A subvertical joint. Hole completed at 30.32m.
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													

- SMALL DISTURBED SAMPLE    ▲ WATER SAMPLE
- LARGE DISTURBED SAMPLE    ▴ PIEZOMETER TIP
- SPT LINER SAMPLE            ▽ STANDPIPE
- ▨ U76 UNDISTURBED SAMPLE    ⊥ STANDARD PENETRATION TEST
- U100 UNDISTURBED SAMPLE    ⊥ PERMEABILITY TEST
- ▨ MAZIER SAMPLE                ⊥ IMPRESSION PACKER TEST
- ▨ PISTON SAMPLE                 ⊥ IN-SITU VANE SHEAR TEST
- ⊥ PACKER TEST

LOGGED Y.K. Lee

DATE 09/03/2004

CHECKED James Lu

DATE 10/03/2004

REMARKS





**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **VH10**  
 SHEET **1** OF **8**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement in Northern Hong Kong Island

METHOD **Rotary Cored**

CO-ORDINATES

WORKS ORDER NO. **GCE/2004/02/S1/R**

MACHINE & NO. **DR125**

**E 831472.42**

DATE FROM **25/02/2004** TO **03/03/2004**

**N 814336.47**

FLUSHING MEDIUM **Water**

ORIENTATION **Vertical**

GROUND LEVEL **72.89** MPD

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
25/02/2004			100	100	5.2			T2101	72.32	0.57	△ △ △ △		CONCRETE SLAB.
			100	89	81			T2101	72.07	0.82	+	II	EMPTY SPACE due to relief topography that makes concrete cannot be detached well with slightly decomposed granite.
			100	100	90	>20		T2101		1.20	+		Strong, brown, spotted white and black, porphyritic, slightly decomposed, fine grained GRANITE.
			100	100	90	3.1		T2101		1.92	+		Joints are medium to closely spaced, locally very closely spaced, rough planar and smooth planar, extremely narrow to very narrow, manganese oxide and iron oxide stained, dipping at 20° to 30°, 40° to 50° and 70° to 80°.
			100	100	63	14.9		T2101		3.39	+		From 2.63m to 2.83m : An incipient joint, dipping at 70° to 80°.
			100	80	30	6.5		T2101		4.31	+	II	From 3.02m to 3.12m : An incipient joint, dipping at 40° to 50°.
			100	50	47	10.6		T2101	68.58	4.31	+		From 3.49m to 3.56m : A quartz vein (3mm thick), dipping at 70° to 80°.
			100	100	100	3.4		T2101		5.36	+		From 3.75m to 4.15m : A quartz vein (2mm thick), dipping at 70° to 80°.
			100	81	75	20.0		T2101		5.74	+		Strong, greyish pink, spotted white and black, slightly decomposed, fine grained GRANITE with some randomly orientated incipient joints.
			100	91	65	6.4		T2101		6.85	+		Joints are medium to closely spaced, locally very closely and widely spaced, smooth planar and rough planar, locally slickensided undulating, extremely narrow, manganese oxide and iron oxide stained, chlorite and calcite infilled, locally kaolin infilled (<1mm thick), dipping at 10° to 20°, 30° to 40°, 50° to 60° and 70° to 80°.
			100	91	34	10.1		T2101		8.16	+		From 5.11m to 5.26m : An iron oxide stained incipient joint, dipping at 50° to 60°.
			100	91	34			T2101		9.65	+		From 9.63m to 9.79m : An 80° to 90° joint.

- SMALL DISTURBED SAMPLE
- LARGE DISTURBED SAMPLE
- SPT LINER SAMPLE
- ▨ U76 UNDISTURBED SAMPLE
- U100 UNDISTURBED SAMPLE
- ▩ MAZIER SAMPLE
- ▧ PISTON SAMPLE
- △ WATER SAMPLE
- ▲ PIEZOMETER TIP
- ⊙ STANDPIPE
- ⊖ STANDARD PENETRATION TEST
- ⊥ PERMEABILITY TEST
- ⊓ IMPRESSION PACKER TEST
- ∇ IN-SITU VANE SHEAR TEST
- ⊥ PACKER TEST

LOGGED D.Y. Yip  
 DATE 04/03/2004  
 CHECKED James Lu  
 DATE 05/03/2004

REMARKS  
 1. Packer (Water absorption) tests were carried out from the depths of 41.50m to 50.50m and 61.50m to 63.50m.  
 2. Packer (Water absorption) test failed to be carried out from the depths of 51.00m to 58.50m.  
 3. Acoustic borehole televiewer survey was carried out from the depths of 56.00m to 66.00m.  
 4. Hydraulic fracture test was carried out at the depths of 32.50m to 33.50m.



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **VH10**

SHEET **2** OF **8**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement in Northern Hong Kong Island

METHOD **Rotary Cored**

CO-ORDINATES  
**E 831472.42**  
**N 814336.47**

WORKS ORDER NO. **GCE/2004/02/SI/R**

MACHINE & NO. **DR125**

DATE FROM **25/02/2004** TO **03/03/2004**

FLUSHING MEDIUM **Water**

ORIENTATION **Vertical**

GROUND LEVEL **72.89 mPD**

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
10										10.00			
11		0.00m at 18:00						T2101		11.08			
		0.21m at 08:00	100	100	100			T2101					
12						5.1		T2101		12.23			
			100	51	51			T2101					
13								T2101		13.07			
			100	95	89			T2101					
14								T2101		14.47			
			100	100	98			T2101					
15								T2101		15.59			
			100	78	62	18.5		T2101					
16						10.3		T2101		16.75			
			100	100	73			T2101					
17								T2101		17.68			
			100	100	91	0.6		T2101					
18								T2101		18.87			
			100	100	100			T2101		19.18			
			100	95	90			T2101	53.56	19.33			
19								T2101					
20						4.7		T2101				II	Strong, pinkish brown, spotted black and orangish brown, porphyritic, slightly decomposed, fine grained GRANITE. Joints are medium to closely spaced, smooth

- SMALL DISTURBED SAMPLE
- ▲ LARGE DISTURBED SAMPLE
- SPT LINER SAMPLE
- ▨ U78 UNDISTURBED SAMPLE
- U100 UNDISTURBED SAMPLE
- ▩ MAZIER SAMPLE
- ▧ PISTON SAMPLE
- ▲ WATER SAMPLE
- ▲ PIEZOMETER TIP
- ▩ STANDPIPE
- ⊥ STANDARD PENETRATION TEST
- ⊥ PERMEABILITY TEST
- ⊥ IMPRESSION PACKER TEST
- ⊥ IN-SITU VANE SHEAR TEST
- ⊥ PACKER TEST

LOGGED D.Y. Yip  
 DATE 04/03/2004  
 CHECKED James Lu  
 DATE 05/03/2004

REMARKS



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **VH10**  
 SHEET **3** OF **8**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement in Northern Hong Kong Island

METHOD	Rotary Cored	CO-ORDINATES	WORKS ORDER NO.
MACHINE & NO.	DR125	E 831472.42 N 814336.47	GCE/2004/02/SI/R
FLUSHING MEDIUM	Water	ORIENTATION	DATE FROM 25/02/2004 TO 03/03/2004
		Vertical	GROUND LEVEL 72.89 mPD

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
20			100	100	81			T2101		20.00	+		planar and smooth undulating, extremely narrow, chlorite, calcite infilled, dipping at 10° to 20° and 20° to 30°.
								T2101		20.49	+		
21			100	94	58	10.6		T2101	51.94	20.95	+	II	Strong, greyish pink, spotted black and brown, slightly decomposed, fine grained GRANITE. Joints are closely to medium spaced, locally very closely spaced, smooth planar and rough planar, extremely narrow to very narrow, calcite, chlorite and locally epidote infilled, dipping at 0° to 10°, 10 to 20°, 20° to 30°, 50° to 60° and 70° to 80°.
		0.00m at 18:00 0.24m at 08:00	100	94	58			T2101		22.00	+		
22			100	68	48			T2101		23.52	+		From 24.95m to 25.30m : Moderately strong and moderately decomposed, brecciated granite along a joint, dipping at 70° to 80°. From 25.06m to 25.30m : Rough undulating joint. From 25.74m to 26.30m : Some chlorite veins (maximum thickness is 2mm), dipping at 70° to 80°. From 26.48m to 27.00m : An incipient joint, dipping at 70° to 80°.
23			100	68	48			T2101		24.95	+	III	
24			100	52	47	>20		T2101		24.95	+	II	
25			100	67	63	6.6		T2101		26.14	+		
26			100	67	63	5.0		T2101		26.14	+		
27			100	95	89			T2101		27.69	+		
28			100	86	86			T2101		29.21	+		
29			100	86	86			T2101		29.21	+		
30			100	86	86			T2101		29.21	+		

- SMALL DISTURBED SAMPLE
- LARGE DISTURBED SAMPLE
- SPT LINER SAMPLE
- ▨ U76 UNDISTURBED SAMPLE
- U100 UNDISTURBED SAMPLE
- ▤ MAZIER SAMPLE
- ▥ PISTON SAMPLE
- △ WATER SAMPLE
- ▲ PIEZOMETER TIP
- ⊠ STANDPIPE
- ⊥ STANDARD PENETRATION TEST
- ⊥ PERMEABILITY TEST
- ⊥ IMPRESSION PACKER TEST
- ∇ IN-SITU VANE SHEAR TEST
- ⊥ PACKER TEST

LOGGED D.Y. Yip  
 DATE 04/03/2004  
 CHECKED James Lu  
 DATE 05/03/2004

REMARKS



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **VH10**  
 SHEET **4 OF 8**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement in Northern Hong Kong Island

METHOD	Rotary Cored	CO-ORDINATES	WORKS ORDER NO. GCE/2004/02/SI/R
MACHINE & NO.	DR125	E 831472.42 N 814336.47	DATE FROM 25/02/2004 TO 03/03/2004
FLUSHING MEDIUM	Water	ORIENTATION Vertical	GROUND LEVEL 72.89 mPD

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
30								T2101		30.00	+		
31			100	100	100			T2101		30.75	+		From 31.45m to 31.75m : A calcite infilled incipient joint, dipping at 70° to 80°.
32			100	97	93			T2101		32.15	+		
33			100	83	83			T2101		33.64	+		From 33.60m to 33.87m : A subvertical joint, dipping at 75° to 85°.
34			100	84	76	>20		T2101		35.14	+		At 34.74m : Epidote infilled joint.
35			100	80	56	>20		T2101		36.61	+		
36			100	98	72	8.6		T2101		37.32	+		From 36.90m to 37.73m : With much manganese oxide and calcite infilled incipient joints, dipping at 0° to 10° and 10° to 20°.
37		0.00m at 18:00	100	89	44			T2101		38.32	+		From 37.82m to 38.17m : A subvertical calcite infilled incipient joint (1mm thick).
38		0.29m at 08:00	100	73	24			T2101		39.30	+		
39			100	72	21			T2101		39.79	+		
40								T2101			+		

- SMALL DISTURBED SAMPLE
- ▲ WATER SAMPLE
- ◄ LARGE DISTURBED SAMPLE
- ▲ PIEZOMETER TIP
- SPT LINER SAMPLE
- STANDPIPE
- ◻ U75 UNDISTURBED SAMPLE
- STANDARD PENETRATION TEST
- ◻ U100 UNDISTURBED SAMPLE
- PERMEABILITY TEST
- ▨ MAZIER SAMPLE
- IMPRESSION PACKER TEST
- ▨ PISTON SAMPLE
- ∨ IN-SITU VANE SHEAR TEST
- ∨ PACKER TEST

LOGGED D.Y. Yip  
 DATE 04/03/2004  
 CHECKED James Lu  
 DATE 05/03/2004

REMARKS



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **VH10**  
 SHEET **5 OF 8**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground investigation Works for Drainage Improvement in Northern Hong Kong Island

METHOD **Rotary Cored**

CO-ORDINATES

WORKS ORDER NO. **GCE/2004/02/SI/R**

MACHINE & NO. **DR125**

**E 831472.42**

DATE FROM **25/02/2004** TO **03/03/2004**

**N 814336.47**

FLUSHING MEDIUM **Water**

ORIENTATION **Vertical**

GROUND LEVEL **72.89 mPD**

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
36						19.4				40.50			
			100	96	90	6.6		T2101		40.51	+		
41			100	86	71			T2101		41.31	+		
42								T2101			+		
43			100	81	53			T2101		42.81	+		From 42.81m to 42.91m : An 80° to 90° joint.
44						12.6		T2101			+		
45			100	70	61			T2101		44.20	+		
46			100	98	80	4.5		T2101	27.57	45.32	+	ii	Strong, greyish pink, spotted white and black, striped white and dark green, porphyritic, slightly decomposed, fine grained GRANITE with some chlorite and calcite infilled incipient joints. Joints are closely to medium spaced, locally very closely spaced, smooth planar and smooth undulating, locally slickensided planar, extremely narrow, chlorite and calcite infilled, locally kaolin coated, dipping at 0° to 10°, 10° to 20°, 50° to 60° and 70° to 80°.
47			100	31	0	>20		T2101		46.81	+	iii	From 47.20m to 47.40m : Moderately strong and moderately decomposed.
48			100	82	71	11.3		T2101		47.58	+	ii	From 48.29m to 48.49m : A calcite (2mm thick) infilled incipient joint, dipping at 70° to 80°. From 48.62m to 48.92m : With some calcite infilled incipient joints.
49		0.00m at 18:00						T2101		49.06	+		From 49.06m to 49.21m : A subvertical incipient joint.
50		0.69m at 08:00	100	57	57	2.4		T2101		49.97	+		
						>20			22.92	49.97	+		

- SMALL DISTURBED SAMPLE
- ▲ LARGE DISTURBED SAMPLE
- SPT LINER SAMPLE
- ▨ U76 UNDISTURBED SAMPLE
- ▩ U100 UNDISTURBED SAMPLE
- ▧ MAZIER SAMPLE
- ▨ PISTON SAMPLE
- △ WATER SAMPLE
- ▲ PIEZOMETER TIP
- STANDPIPE
- ▨ STANDARD PENETRATION TEST
- ▩ PERMEABILITY TEST
- ▨ IMPRESSION PACKER TEST
- ∇ IN-SITU VANE SHEAR TEST
- ⊥ PACKER TEST

LOGGED D.Y. Yip  
 DATE 04/03/2004  
 CHECKED James Lu  
 DATE 05/03/2004

REMARKS



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **VH10**  
 SHEET **6** OF **8**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement In Northern Hong Kong Island

METHOD	Rotary Cored	CO-ORDINATES	WORKS ORDER NO.
MACHINE & NO.	DR125	E 831472.42 N 814336.47	GCE/2004/02/SI/R
FLUSHING MEDIUM	Water	ORIENTATION	Vertical
		GROUND LEVEL	72.89 mPD

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
50			98	87	83	5.9	■	T2101	19.39	50.60	+	III	Moderately strong, pink, spotted dark green and white, porphyritic, moderately decomposed, fine grained GRANITE. Joints are closely to medium spaced, smooth planar and rough planar, extremely narrow to very narrow, chlorite and kaolin (<1mm thick) infilled, dipping at 30° to 40°, 50° to 60° and 70° to 80°.
						2.6				50.43			
						12.0				51.70			
						3.6				53.03			
						14.3				53.50			
						4.0				54.20			
						>20				54.74			
						11.8				54.95			
						>20				55.04			
						>20				55.16			
						>20				55.70			
						51							
52			100	60	38	NI	T2101	17.19	55.16	+	III	Stiff, light greenish grey, mottled dark green, sandy SILT with much angular fine to coarse gravel sized rock fragments. (FAULT GOUGE) From 55.16m to 55.26m : Weak and highly decomposed fault breccia, highly fractured.	
53			100	41	36	>20	T2101	14.88	55.70	+	III/IV	Moderately strong, greyish pink, spotted white and black, dappled light green, moderately decomposed, fine grained GRANITE. Joints are closely to very closely spaced, locally medium spaced, smooth planar, rough planar and rough undulating, extremely narrow to very narrow, chlorite, calcite and locally kaolin (1mm thick) infilled, dipping at 10° to 20°, 50° to 60° and 70° to 80°.	
54			99	14	0	>20	T2101	14.88	56.57	+	III	From 55.70m to 55.85m : Moderately weak and moderately to highly decomposed.	
55			100	92	63	15.5	T2101	14.88	57.80	+	II	From 56.41m to 56.60m : Two 80° to 90° joints. From 57.00m to 57.19m : An 80° to 90° joint.	
56			96	96	96	4.5	T2101	14.88	58.03	+	II	Strong, pinkish brown, spotted white and dark green, porphyritic, slightly decomposed, fine grained GRANITE. Joints are closely to medium spaced, locally very closely and widely spaced, smooth planar and smooth undulating, locally slickensided undulating, extremely narrow, chlorite infilled, dipping at 20° to 30°, 50° to 60° and 70° to 80°.	
57			100	69	0	44.3	T2101	14.88	58.32	+	II	From 57.00m to 57.19m : An 80° to 90° joint. Strong, pinkish brown, spotted white and dark green, porphyritic, slightly decomposed, fine grained GRANITE. Joints are closely to medium spaced, locally very closely and widely spaced, smooth planar and smooth undulating, locally slickensided undulating, extremely narrow, chlorite infilled, dipping at 20° to 30°, 50° to 60° and 70° to 80°.	
58			100	100	73	9.2	T2101	14.88	59.82	+	II	From 58.56m to 58.78m : A chlorite vein (2mm thick), dipping at 70° to 80°.	
59			99	97	93		T2101	14.88		+	II		

- SMALL DISTURBED SAMPLE
- ▲ WATER SAMPLE
- ⬆️ LARGE DISTURBED SAMPLE
- ▲ PIEZOMETER TIP
- SPT LINER SAMPLE
- ▲ STANDPIPE
- ▨ U76 UNDISTURBED SAMPLE
- ⬇️ STANDARD PENETRATION TEST
- U100 UNDISTURBED SAMPLE
- ⊥ PERMEABILITY TEST
- ▨ MAZIER SAMPLE
- ∨ IMPRESSION PACKER TEST
- ▨ PISTON SAMPLE
- ∨ IN-SITU VANE SHEAR TEST
- ⊥ PACKER TEST

LOGGED D.Y. Yip  
 DATE 04/03/2004  
 CHECKED James Lu  
 DATE 05/03/2004

REMARKS



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **VH10**

SHEET **7** OF **8**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement in Northern Hong Kong Island

METHOD	Rotary Cored	CO-ORDINATES	WORKS ORDER NO.
MACHINE & NO.	DR125	E 831472.42 N 814336.47	GCE/2004/02/SI/R
FLUSHING MEDIUM	Water	ORIENTATION	Vertical
		GROUND LEVEL	72.89 mPD

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
60						1.6		TNW		60.20	+		From 59.70m to 59.92m : A chlorite vein (2mm thick), dipping at 70° to 80°.
61						7.7		TNW	11.54	61.32 61.35	+		From 59.82m to 59.90m : An 80° to 90° joint.
62			96	85	57	>20		TNW		62.06	+	II	From 60.24m to 60.86m : Widely spaced joints.
63			99	99	99	4.9		TNW		62.68	+		Strong, pinkish grey, spotted white and black, locally streaked white, porphyritic, slightly decomposed, fine grained GRANITE with much chlorite veins.
64						1.9		TNW		63.54	+		Joints are medium to closely spaced, locally very closely spaced, smooth planar and rough planar, extremely narrow, chlorite and calcite infilled, locally manganese oxide stained, dipping at 10° to 20°, 40° to 50°, 60° to 70° and 70° to 80°.
65			100	100	87	4.1		TNW		63.54	+		From 62.42m to 62.68m : A quartz patch (13mm x 26mm).
66						4.3 2.9		TNW		65.04	+		From 62.68m to 62.72m : A calcite patch (6mm x 4mm).
67		0.17m at 18:00 0.97m at 08:00	100	100	89	>20 8.1		TNW		65.04	+		From 62.83m to 62.91m : A calcite patch (15mm x 8mm).
68						2.9		TNW		66.52	+		From 62.94m to 63.08m : A quartz patch (12mm x 14mm).
69			98	98	98	>20 5.9		TNW		66.52	+		From 62.94m to 63.22m : Brecciated by chlorite veins.
70						2.5		TNW		68.05	+		From 63.16m to 63.54m : Chlorite vein (2mm thick), dipping at 70° to 80°.
						8.7		TNW		68.40	+		From 63.81m to 63.98m : A quartz vein (8mm thick), dipping at 65° to 75°.
			98	99	90	2.4		TNW		68.40	+		From 68.30m to 68.62m : A manganese oxide stained joints, dipping at 70° to 80°.
						7.1 4.3		TNW		68.94	+		From 68.62m to 68.79m : An 80° to 90° joint.

- SMALL DISTURBED SAMPLE
- LARGE DISTURBED SAMPLE
- SPT LINER SAMPLE
- ▨ U76 UNDISTURBED SAMPLE
- ▩ U100 UNDISTURBED SAMPLE
- ▧ MAZIER SAMPLE
- ▩ PISTON SAMPLE
- △ WATER SAMPLE
- ▲ PIEZOMETER TIP
- STANDPIPE
- ▽ STANDARD PENETRATION TEST
- ⊥ PERMEABILITY TEST
- ⊥ IMPRESSION PACKER TEST
- ∇ IN-SITU VANE SHEAR TEST
- ⊥ PACKER TEST

LOGGED D.Y. Yip  
 DATE 04/03/2004  
 CHECKED James Lu  
 DATE 05/03/2004

REMARKS



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **VH10**  
 SHEET **8** OF **8**

**DRILLHOLE RECORD**

CONTRACT NO. DC/2003/10

PROJECT Contract No. DC/2003/10, Ground Investigation Works for Drainage Improvement in Northern Hong Kong Island

METHOD **Rotary Cored**

CO-ORDINATES  
**E 831472.42**  
**N 814336.47**

WORKS ORDER NO. **GCE/2004/02/SI/R**

MACHINE & NO. **DR125**

DATE FROM **25/02/2004** TO **03/03/2004**

FLUSHING MEDIUM **Water**

ORIENTATION **Vertical**

GROUND LEVEL **72.89 mPD**

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
70		0.00m at 12:00	100	100	92					70.00	+++		See sheet 7 of 8 for details.
03/03/2004								TNW	2.38	70.53	+++		Hole completed at 70.53m.
71													
72													
73													
74													
75													
76													
77													
78													
79													
80													

- SMALL DISTURBED SAMPLE
- ▲ WATER SAMPLE
- ↑ LARGE DISTURBED SAMPLE
- ▲ PIEZOMETER TIP
- SPT LINER SAMPLE
- ▲ STANDPIPE
- ▨ U76 UNDISTURBED SAMPLE
- ↓ STANDARD PENETRATION TEST
- ▨ U100 UNDISTURBED SAMPLE
- ⊥ PERMEABILITY TEST
- ▨ MAZIER SAMPLE
- ⊥ IMPRESSION PACKER TEST
- ▨ PISTON SAMPLE
- ∨ IN-SITU VANE SHEAR TEST
- ⊥ PACKER TEST

LOGGED D.Y. Yip  
 DATE 04/03/2004  
 CHECKED James Lu  
 DATE 05/03/2004

REMARKS



**ANNEX IV  
COUPLING LOSS OF VIBRATION TRANSMITTED INTO  
BUILDING**

The reference is "Transit Noise and Vibration Impact Assessment", Final Report, April 1995, prepared by Harris Miller Miller & Hanson Inc. 15 New England Executive Park Burlington, Massachusetts 01803

**The graph (solid line) for building on piles will be used.**

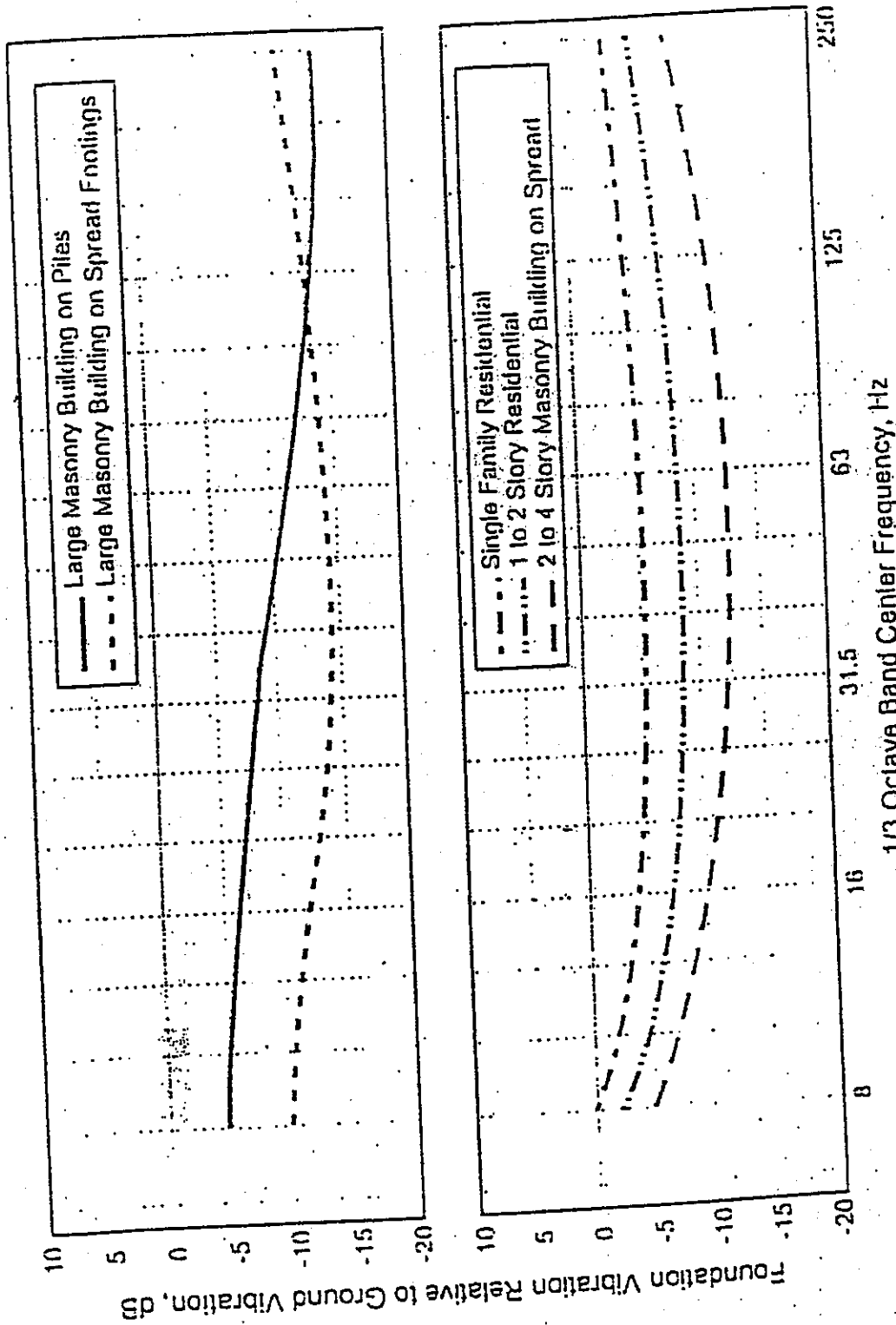


Figure 11-5 Foundation Response for Various Types of Buildings

## **ANNEX V**

### **FINITE ELEMENT ANALYSIS**

Finite element analysis package SAP 2000 was used to predict the mode shape and longitudinal and lateral resonance frequencies of the floors and walls of the buildings. The resonance frequencies were in the octave band of 31.5 Hz to 63 Hz.

For NSR1, Room size 2.7 m x2mx3m for bedrooms

Resonance frequencies are 33Hz,53Hz,77Hz,85 Hz, 97 Hz (see results pages )

For NSRs 2 & 3 Room size 4 m x4mx3m for classrooms

Resonance frequencies are 25Hz,40Hz,52Hz,63Hz,78 Hz

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SAP2000 (R)

Structural Analysis Programs

Nonlinear Version 7.10

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This copy of SAP2000 is for the exclusive use of

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Unauthorized use is in violation of Federal copyright laws

It is the responsibility of the user to verify all  
results produced by this program

Program SAP2000 Nonlinear Version 7.10  
NOFRAME.OUT

File:5-STOR 6

Page

DISPLACEMENT DEGREES OF FREEDOM

(A) = Active DOF, equilibrium equation  
(-) = Restrained DOF, reaction computed  
(+) = Constrained DOF  
( ) = Null DOF

JOINTS		UX	UY	UZ	RX	RY	RZ
1 TO	20	A	A	A	-	-	-
21 TO	24	-	-	-	-	-	-

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Page

ASSEMBLED JOINT MASSES

IN GLOBAL COORDINATES

JOINT	UX	UY	UZ	RX	RY
1	5.040630	5.040630	5.040630	.000000	.000000
2	5.040630	5.040630	5.040630	.000000	.000000
3	5.040630	5.040630	5.040630	.000000	.000000
4	5.040630	5.040630	5.040630	.000000	.000000
5	7.920990	7.920990	7.920990	.000000	.000000
6	7.920990	7.920990	7.920990	.000000	.000000

7	7.920990	7.920990	7.920990	.000000	.000000
8	7.920990	7.920990	7.920990	.000000	.000000
9	7.920990	7.920990	7.920990	.000000	.000000
10	7.920990	7.920990	7.920990	.000000	.000000
11	7.920990	7.920990	7.920990	.000000	.000000
12	7.920990	7.920990	7.920990	.000000	.000000
13	7.920990	7.920990	7.920990	.000000	.000000
14	7.920990	7.920990	7.920990	.000000	.000000
15	7.920990	7.920990	7.920990	.000000	.000000
16	7.920990	7.920990	7.920990	.000000	.000000
17	7.920990	7.920990	7.920990	.000000	.000000
18	7.920990	7.920990	7.920990	.000000	.000000
19	7.920990	7.920990	7.920990	.000000	.000000
20	7.920990	7.920990	7.920990	.000000	.000000
21	5.040630	5.040630	5.040630	.000000	.000000
22	5.040630	5.040630	5.040630	.000000	.000000
23	5.040630	5.040630	5.040630	.000000	.000000
24	5.040630	5.040630	5.040630	.000000	.000000

TOTAL ASSEMBLED JOINT MASSES  
IN GLOBAL COORDINATES

	UX	UY	UZ	RX	RY
SR					
TOTAL	167.060880	167.060880	167.060880	.000000	.000000

TOTAL ACCELERATED MASS AND LOCATION

TOTAL MASS ACTIVATED BY ACCELERATION LOADS, IN GLOBAL COORDINATES

	UX	UY	UZ
MASS	146.898360	146.898360	146.898360
X-LOC	-2.42E-17	-2.42E-17	-2.42E-17
Y-LOC	-9.67E-17	-9.67E-17	-9.67E-17
E-LOC	11.372549	11.372549	11.372549

MODAL PERIODS AND FREQUENCIES

MODE	PERIOD (TIME)	FREQUENCY (CYC/TIME)	FREQUENCY (RAD/TIME)	EIGENVALUE (RAD/TIME)**2
1	0.084154	11.882968	74.662887	5574.547
2	0.084154	11.882968	74.662887	5574.547
3	0.031559	31.687138	199.096159	39639.280
4	0.029755	<u>33.607523</u>	211.162297	44589.516
5	0.028820	34.698192	218.015171	47530.615
6	0.028820	34.698193	218.015174	47530.616
7	0.018601	<u>53.760328</u>	337.786101	114099.450
8	0.016382	<u>61.042987</u>	383.544399	147106.306
9	0.016382	61.043016	383.544584	147106.448
10	0.013082	76.443414	480.308136	230695.906
11	0.013082	76.443552	480.309002	230696.738
12	0.012980	<u>77.044036</u>	484.081954	234335.338
13	0.012899	77.527824	487.121687	237287.538
14	0.011708	<u>85.408426</u>	536.636970	287979.238
15	0.011460	<u>87.257161</u>	548.252910	300581.253
16	0.011144	89.730614	563.794073	317863.757
17	0.011144	89.730672	563.794438	317864.168
18	0.010540	94.874276	596.112654	355350.296
19	0.010412	96.040865	603.442554	364142.916
20	0.010412	96.041138	603.444269	364144.986
21	0.010306	<u>97.028851</u>	609.650252	371673.430
22	0.010178	<u>98.251023</u>	617.329384	381095.569
23	0.010178	98.251079	617.329736	381096.003
24	0.010115	98.860139	621.156574	385835.489
25	0.009954	100.458358	631.198477	398411.518
26	0.009954	100.458630	631.200188	398413.678
27	0.009533	104.895098	659.075338	434380.301
28	0.009530	104.937157	659.339601	434728.710
29	0.009530	104.937272	659.340328	434729.668
30	0.009180	108.937783	684.476274	468507.770
31	0.009178	108.957899	684.602669	468680.815
32	0.009178	108.957503	684.600185	468677.413
33	0.008817	113.421307	712.647091	507865.876
34	0.008806	113.555197	713.488343	509065.615
35	0.008806	113.556162	713.494407	509074.269
36	0.008656	115.527526	725.880855	526903.015
37	0.008470	118.064825	741.823175	550301.623
38	0.008391	119.176913	748.810630	560717.359
39	0.008391	119.177731	748.815769	560725.055
40	0.008137	122.899307	772.199117	596291.476
41	0.008045	124.304427	781.027752	610004.349
42	0.007865	127.144557	798.872810	638197.766
43	0.007756	128.936570	810.132360	656314.440
44	0.007691	130.014916	816.907812	667338.374
45	0.007669	130.397504	819.311680	671271.628
46	0.007476	133.753243	840.396410	706266.126
47	0.007427	134.643535	845.990282	715699.557
48	0.007268	137.595878	864.540400	747430.103
49	0.007252	137.885634	866.360992	750581.368
50	0.007252	137.887072	866.370024	750597.019
51	0.007104	140.758959	884.414623	782189.226
52	0.007047	141.908919	891.640035	795021.953
53	0.006744	148.289018	931.727380	868115.911
54	0.006331	157.952789	992.446643	984950.339
55	0.006161	162.319503	1019.884	1.0402E+06
56	0.006161	162.320065	1019.887	1.0402E+06
57	0.005645	177.149906	1113.066	1.2389E+06

**ANNEX VI**

**Structural Acoustic Analysis Result**

Groundborne Noise Calculation for TBM

Screening  
daytime operation

Item	Description	breaker Rock Drilling						TBM Rock drilling						Assumption		
		16	31.5	63	125	250	500	Hz	16	31.5	63	125	250		500	Hz
1	Octave Band Frequency Vibration Velocity, ref 10 <sup>-6</sup> in/s	32.4	42.3	31.5	52	67.4	61.5	dB(V)	79.4	92.3	87.5	84	82.4	76.5	dB(V)	Rock drilling data from Lo Ma Chau Peak Leq 95 dB at a monitoring distance 6.5m FROM ANNEX I
2	rms velocity	0.001	0.003	1E-03	0.01	0.06	0.03	mm/s	0.237	1.047	0.602	0.403	0.335	0.17	mm/s	
3	Vibration Velocity, ref 10 <sup>-6</sup> mm/s	60	70	70	80	95	90	dB(V)	107	120	116	112	110	105	dB(V)	
4	Ro R Distance Attenuation	6.5 3 7	6.5 3 7	6.5 3 7	6.5 3 7	6.5 3 7	6.5 3 7	m m dB	6.5 20 -10	6.5 20 -10	6.5 20 -10	6.5 20 -10	6.5 20 -10	6.5 20 -10	m m dB	Reference distance of TBM cutter head to the measurement point Distance between TBM to NSR
5	Soil Damping	0	0	0	0	0	0	dB	0	0	0	0	0	0	dB	FROM ANNEX II ,III
6	Building Coupling Loss	-7	-9	-13	-15	-15	-15	dB	-7	-9	-13	-15	-15	-15	dB	FROM ANNEX IV
7	Floor to Floor Attenuation	0	6	6	0	0	0	dB	0	6	6	0	0	0	dB	FROM ANNEX V
8	Conversion from Vibration to Noise	-27	-27	-27	-27	-27	-27	dB	-27	-27	-27	-27	-27	-27	dB	Standard acoustic principle
9	Conversion to A-weighted Noise	-56.7	-39.4	-26.2	-16.1	-8.6	-3.2	dB(A)	-56.7	-39.4	-26.2	-16.1	-8.6	-3.2	dB(A)	Standard acoustic principle
10	Individual Groundborne Noise	-24	7	17	29	51	52	dB(A)	7	41	46	44	50	50	dB(A)	
11	Predicted Groundborne Noise for each Vibration Path						54	dB(A)						54	dB(A)	Day time criteria 60 dB(A) Evening time criteria 55 dB(A) Night time criteria 40 dB(A)



Groundborne Noise Calculation for TBM

Night Time Screening

Item	Description	breaker Rock Drilling						TBM Rock drilling						Assumption			
		16	31.5	63	125	250	500	Hz	16	31.5	63	125	250		500	Hz	
1	Octave Band Frequency Vibration Velocity, ref 10 <sup>-6</sup> in/s	32.4	42.3	31.5	52	67.4	61.5	dB(V)	79.4	92.3	87.5	84	82.4	76.5	dB(V)	Rock drilling data from Lo Ma Chau Peak Leq 95 dB at a monitoring distance 6.5m FROM ANNEX I	
2	rms velocity	0.001	0.003	1E-03	0.01	0.06	0.03	mm/s	0.237	1.047	0.602	0.403	0.335	0.17	mm/s		
3	Vibration Velocity, ref 10 <sup>-6</sup> mm/s	60	70	70	80	95	90	dB(V)	107	120	116	112	110	105	dB(V)		
4	Ro R Distance Attenuation	6.5 15 -7	6.5 15 -7	6.5 15 -7	6.5 15 -7	6.5 15 -7	6.5 15 -7	m m dB	6.5 100 -24	6.5 100 -24	6.5 100 -24	6.5 100 -24	6.5 100 -24	6.5 100 -24	m m dB	Reference distance of TBM cutter head to the measurement point Distance between TBM to NSR	
5	Soil Damping	0	0	0	0	0	0	dB	0	0	0	0	0	0	dB	FROM ANNEX II ,III	
6	Building Coupling Loss	-7	-9	-13	-15	-15	-15	dB	-7	-9	-13	-15	-15	-15	dB	FROM ANNEX IV	
7	Floor to Floor Attenuation	0	6	6	0	0	0	dB	0	6	6	0	0	0	dB	FROM ANNEX V	
8	Conversion from Vibration to Noise	-27	-27	-27	-27	-27	-27	dB	-27	-27	-27	-27	-27	-27	dB	Standard acoustic principle	
9	Conversion to A-weighted Noise	-56.7	-39.4	-26.2	-16.1	-8.6	-3.2	dB(A)	-56.7	-39.4	-26.2	-16.1	-8.6	-3.2	dB(A)	Standard acoustic principle	
10	Individual Groundborne Noise	-38	-7	3	15	37	38	dB(A)	-7	27	32	30	36	36	dB(A)		
11	Predicted Groundborne Noise for each Vibration Path							40	dB(A)						40	dB(A)	Day time criteria 60 dB(A) Evening time criteria 55 dB(A) Night time criteria 40 dB(A)

Groundborne Noise Calculation for TBM

NSR Western Portal

Item	Description	NSR1 Rock Drilling							NSR2 Rock drilling							Assumption
		16	31.5	63	125	250	500	Hz	16	31.5	63	125	250	500	Hz	
1	Octave Band Frequency Vibration Velocity, ref 10 <sup>-6</sup> in/s	79.4	92.3	87.5	84	82.4	76.5	dB(V)	79.4	92.3	87.5	84	82.4	76.5	dB(V)	Rock drilling data from Lo Ma Chau Peak Leq 95 dB at a monitoring distance 6.5m FROM ANNEX I
2	rms velocity	0.237	1.047	0.602	0.403	0.335	0.17	mm/s	0.237	1.047	0.602	0.403	0.335	0.17	mm/s	
3	Vibration Velocity, ref 10 <sup>-6</sup> mm/s	107	120	116	112	110	105	dB(V)	107	120	116	112	110	105	dB(V)	
4	Ro R Distance Attenuation	6.5 80 -22	6.5 80 -22	6.5 80 -22	6.5 80 -22	6.5 80 -22	6.5 80 -22	m m dB	6.5 70 -21	6.5 70 -21	6.5 70 -21	6.5 70 -21	6.5 70 -21	6.5 70 -21	m m dB	Reference distance of TBM cutter head to the measurement point Distance between TBM to NSR FROM FIG.5.2
5	Soil Damping	0	0	0	0	0	0	dB	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	dB	FROM ANNEX II ,III
6	Building Coupling Loss	-7	-9	-13	-15	-15	-15	dB	-7	-9	-13	-15	-15	-15	dB	FROM ANNEX IV
7	Floor to Floor Attenuation	0	6	6	0	0	0	dB	0	6	6	0	0	0	dB	FROM ANNEX V
8	Conversion from Vibration to Noise	-27	-27	-27	-27	-27	-27	dB	-27	-27	-27	-27	-27	-27	dB	Standard acoustic principle
9	Conversion to A-weighted Noise	-56.7	-39.4	-26.2	-16.1	-8.6	-3.2	dB(A)	-56.7	-39.4	-26.2	-16.1	-8.6	-3.2	dB(A)	Standard acoustic principle
10	Individual Groundborne Noise	-5	29	34	32	38	38	dB(A)	-6	28	33	31	37	37	dB(A)	
11	Predicted Groundborne Noise for each Vibration Path							42 dB(A)							41 dB(A)	Day time criteria 60 dB(A) Evening time criteria 55 dB(A) Night time criteria 40 dB(A)

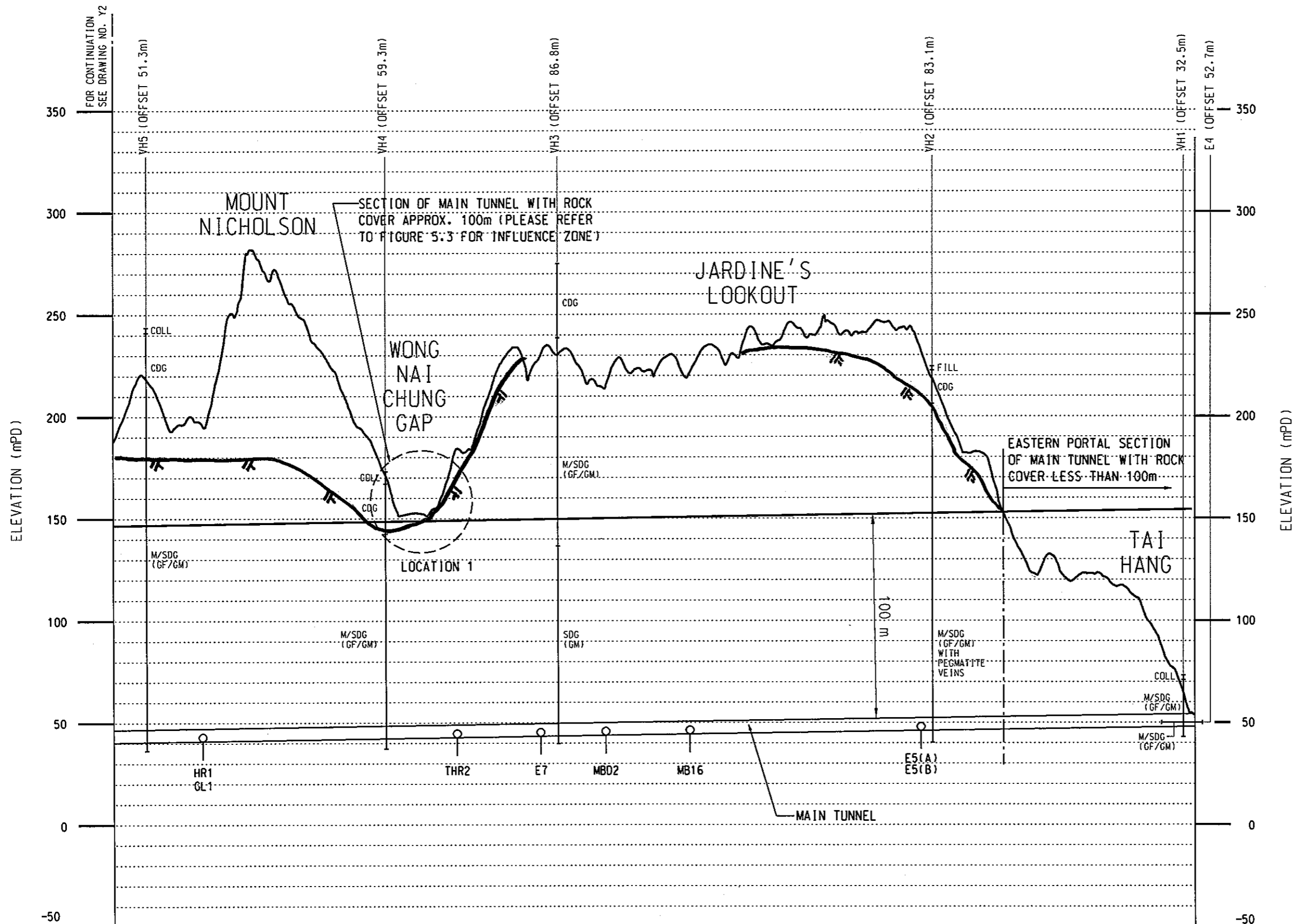
Groundborne Noise Calculation for TBM

NSR Eastern portal

Item	Description	NSR3b Rock Drilling							NSE3a Rock drilling							Assumption
		16	31.5	63	125	250	500	Hz	16	31.5	63	125	250	500	Hz	
1	Octave Band Frequency Vibration Velocity, ref 10 <sup>-6</sup> in/s	79.4	92.3	87.5	84	82.4	76.5	dB(V)	79.4	92.3	87.5	84	82.4	76.5	dB(V)	Rock drilling data from Lo Ma Chau Peak Leq 95 dB at a monitoring distance 6.5m FROM ANNEX I
2	rms velocity	0.237	1.047	0.602	0.403	0.335	0.17	mm/s	0.237	1.047	0.602	0.403	0.335	0.17	mm/s	
3	Vibration Velocity, ref 10 <sup>-6</sup> mm/s	107	120	116	112	110	105	dB(V)	107	120	116	112	110	105	dB(V)	
4	R <sub>o</sub> R Distance Attenuation	6.5	6.5	6.5	6.5	6.5	6.5	m	6.5	6.5	6.5	6.5	6.5	6.5	m	Reference distance of TBM cutter head to the measurement point Distance between TBM to NSR from fig. 5.1
		60	60	60	60	60	60	m	70	70	70	70	70	70	m	
		-19	-19	-19	-19	-19	-19	dB	-21	-21	-21	-21	-21	-21	dB	
5	Soil Damping	0	0	0	0	0	0	dB	0	0	0	0	0	0	dB	FROM ANNEX II ,III
6	Building Coupling Loss	-7	-9	-13	-15	-15	-15	dB	-7	-9	-13	-15	-15	-15	dB	FROM ANNEX IV
7	Floor to Floor Attenuation	0	6	6	0	0	0	dB	0	6	6	0	0	0	dB	FROM ANNEX V
8	Conversion from Vibration to Noise	-27	-27	-27	-27	-27	-27	dB	-27	-27	-27	-27	-27	-27	dB	Standard acoustic principle
9	Conversion to A-weighted Noise	-56.7	-39.4	-26.2	-16.1	-8.6	-3.2	dB(A)	-56.7	-39.4	-26.2	-16.1	-8.6	-3.2	dB(A)	Standard acoustic principle
10	Individual Groundborne Noise	-3	32	36	35	41	40	dB(A)	-4	30	35	33	39	39	dB(A)	
11	Predicted Groundborne Noise for each Vibration Path							45 dB(A)							43 dB(A)	Day time criteria 60 dB(A) Evening time criteria 55 dB(A) Night time criteria 40 dB(A)

**ANNEX VII**

**Longitudinal Profile of the Main Tunnel**



Revision	Date	Description	Initial

Initial	Date	Approved

Agreement no. CE 25/2002 (DS)

Contract title  
DRAINAGE IMPROVEMENT IN NORTHERN HONG KONG ISLAND - HONG KONG WEST DRAINAGE TUNNEL AND LOWER CATCHMENT IMPROVEMENT - INVESTIGATION

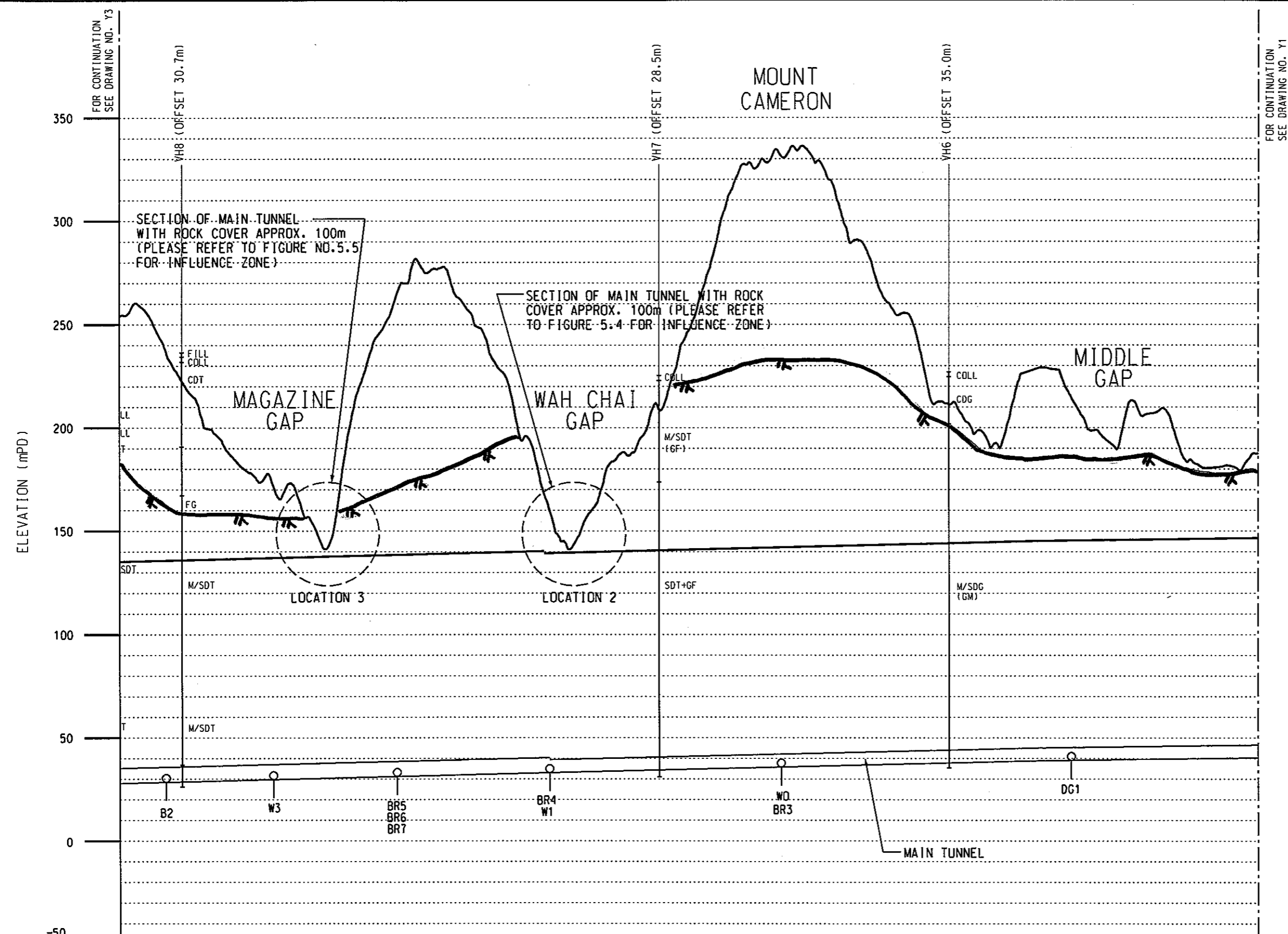
Figure title  
INFLUENCE ZONE OF STRUCTURAL BORNE NOISE AT MAIN TUNNEL (SHEET 1 OF 4)

Figure no.	Scale
1	AS SHOWN

香港特別行政區政府渠務署  
THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION  
DRAINAGE SERVICES DEPARTMENT

BLACK & VEATCH HONG KONG LIMITED  
博威工程顧問有限公司

CHAINAGE	194 2500	196 2430	181 2000	184 1805	228 1600	224 1500	214 1440	221 1235	243 1000	233 670	75 500	48.00 52 0	CHAINAGE
GROUND LEVEL	194	196	181	184	228	224	214	221	243	233	75	48.00	GROUND LEVEL
INVERT LEVEL	41.04	41.04	42.83	42.83	43.41	43.87	43.87	44.46	44.46	46.08	46.08	48.00	INVERT LEVEL
GRADIENT	1 IN 348.90												GRADIENT
TUNNEL SIZE	6.25m DIA.												TUNNEL SIZE



FOR CONTINUATION  
SEE DRAWING NO. Y3

FOR CONTINUATION  
SEE DRAWING NO. Y1

Revision	Date	Description			Initial
		Designed	Checked	Drawn	
Initial					
Date					

Approved

Agreement no. CE 25/2002 (DS)

Contract title  
DRAINAGE IMPROVEMENT IN  
NORTHERN HONG KONG ISLAND -  
HONG KONG WEST  
DRAINAGE TUNNEL AND LOWER CATCHMENT  
IMPROVEMENT - INVESTIGATION

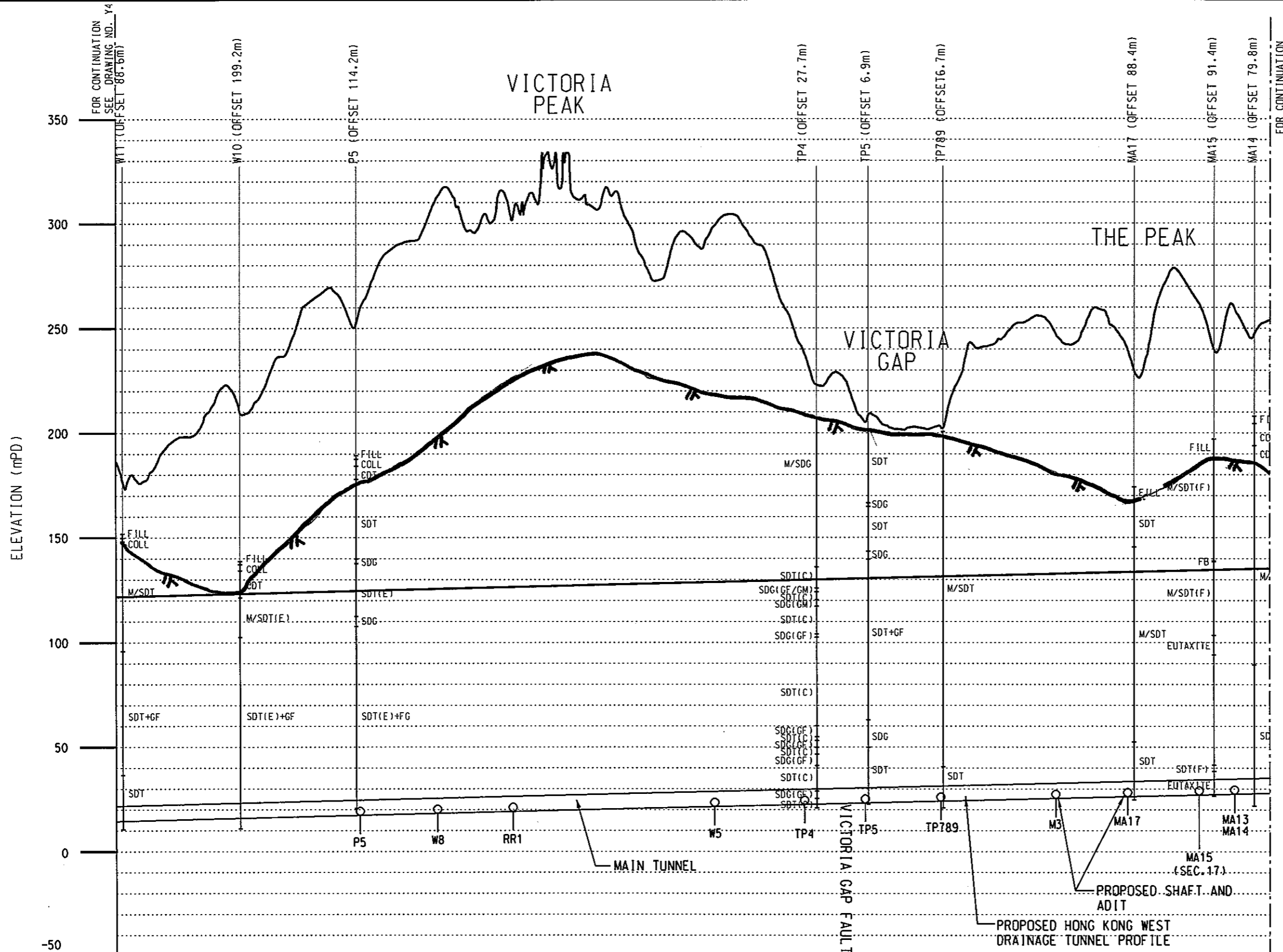
Figure title  
INFLUENCE ZONE OF  
STRUCTURAL BORNE NOISE  
AT MAIN TUNNEL  
(SHEET 2 OF 4)

Figure no.	2	Scale	AS SHOWN
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香港特別行政區政府渠務署  
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HONG KONG  
SPECIAL ADMINISTRATIVE REGION  
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BLACK & VEATCH HONG KONG LIMITED  
博威工程顧問有限公司

CHAINAGE	5290	5030	5000	4730	4500	4360	4000	3800	3500	3175	3100	3000
GROUND LEVEL	237	172	171	265	235	161	261	332	256	229	215	192
INVERT LEVEL	28.34	29.81		31.28		33.09		35.84		38.90	39.11	
GRADIENT												
TUNNEL SIZE												



CHAINAGE	8000	7570	7500	7385	7205	7000	6725	6510	6500	6365	6185	6000	5910	5740	5570	5500	5490
GROUND LEVEL	198	258	287	313	302	307	299	238	233	205	203	253	247	240	262	259	261
INVERT LEVEL		17.36		18.27	19.15		21.50	22.56		23.27	24.15		25.50	26.33	27.16		27.58
GRADIENT	1 IN 204.04																
TUNNEL SIZE	7.25m DIA.																

LONGITUDINAL PROFILE

Revision	Date	Description			Initial
		Designed	Checked	Drawn	
Initial					
Date					

Approved

Agreement no. CE 26/2002 (DS)

Contract title  
DRAINAGE IMPROVEMENT IN NORTHERN HONG KONG ISLAND - HONG KONG WEST DRAINAGE TUNNEL AND LOWER CATCHMENT IMPROVEMENT - INVESTIGATION

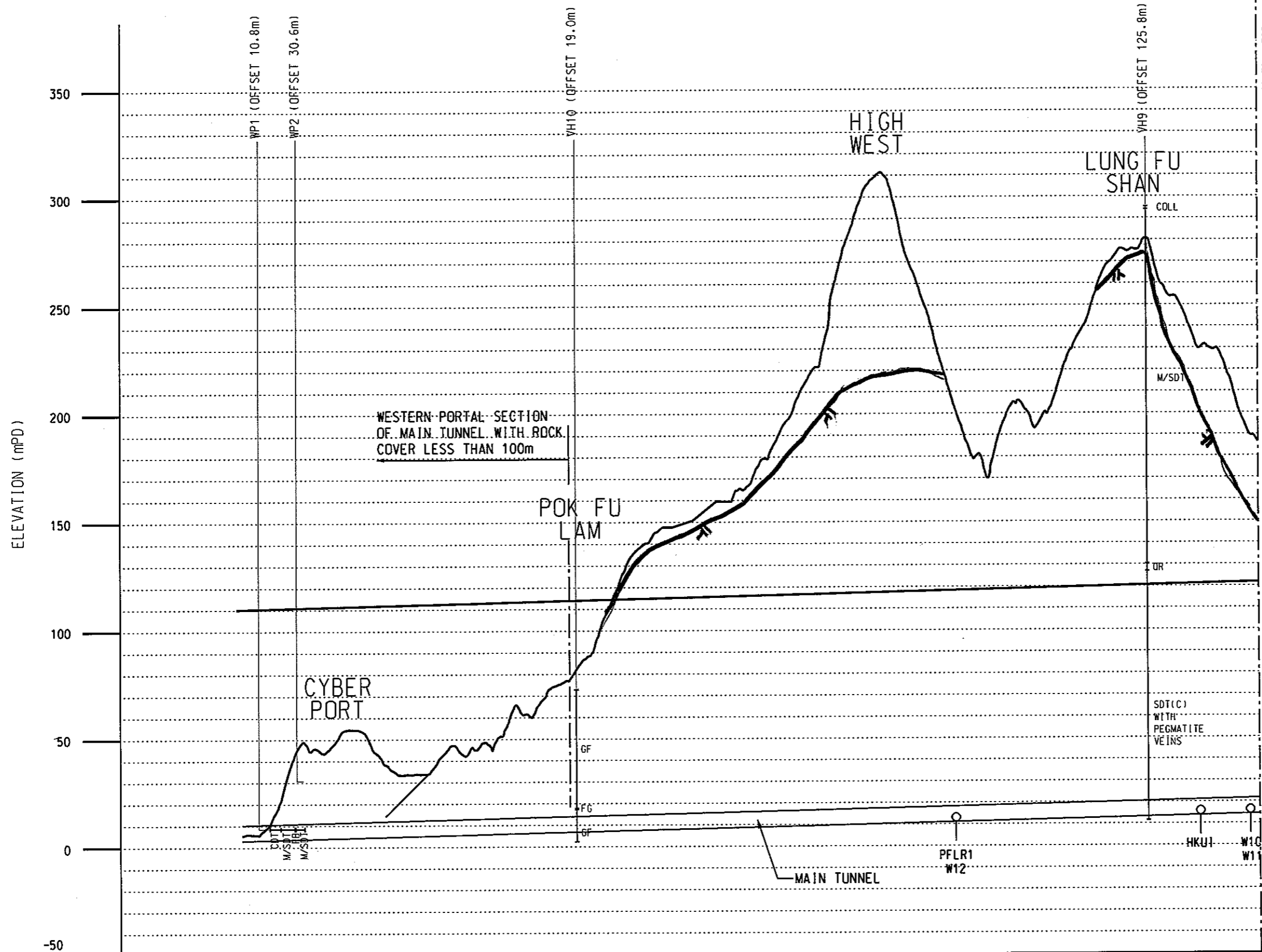
Figure title  
INFLUENCE ZONE OF STRUCTURAL BORNE NOISE AT MAIN TUNNEL (SHEET 3 OF 4)

Figure no.	3	Scale	AS SHOWN
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DRAINAGE SERVICES DEPARTMENT

BLACK & VEATCH HONG KONG LIMITED  
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Plot Date: 05 JUL 2005



FOR CONTINUATION  
SEE DRAWING NO. Y3

CHAINAGE	10504	10000	9500	8998	8855	8500	8290	8175
GROUND LEVEL	5	44	148	302	204	269	230	191
INVERT LEVEL	3.00				11.06		13.83	14.39
GRADIENT								
TUNNEL SIZE								

Revision	Date	Description	Initial

Initial  
Date  
Approved

Agreement no.  
CE 25/2002 (DS)

Contract title  
DRAINAGE IMPROVEMENT IN  
NORTHERN HONG KONG ISLAND -  
HONG KONG WEST  
DRAINAGE TUNNEL AND LOWER CATCHMENT  
IMPROVEMENT - INVESTIGATION

Figure title  
INFLUENCE ZONE OF  
STRUCTURAL BORNE NOISE  
AT MAIN TUNNEL  
(SHEET 4 OF 4)

Figure no.	4	Scale	AS SHOWN
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DRAINAGE SERVICES DEPARTMENT

BLACK & VEATCH HONG KONG LIMITED  
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**ANNEX VIII**

**Geological Summary at Intake Shafts**

Table 1 - Geological Profile at Intake Shaft

GI Station	G.L. (mPD)	Rockhead (mPD)	Adits Level (mPD)	Soil Depth (m)	Rock Depth (m)	Shaft Depth (m)
E5A	115	99	52	16	47	63
E5B	129	117	52	12	65	77
MB16	172	169	48	3	121	124
MBD2	170	153	48	17	105	122
E7	86	79	48	7	30	37
THR2	114	85	47	30	38	67
HR1	53	44	46	7	0	7
GL1	101	85	45	15	40	55
DG1	172	166	43	5	123	128
W0	71	53	42	18	11	29
BR3	121	113	41	7	72	79
BR4	113	109	39	3	71	74
W1	47	53	38	-6	15	10
BR5	120	118	36	2	82	84
BR6	117	117	36	0	81	81
BR7	120	113	36	7	77	84
W3	54	48	35	6	13	19
B2	118	116	33	3	83	85
MA13	208	174	31	34	142	177
MA14	203	186	31	17	154	172
MA15	202	188	31	14	158	171
MA17	175	168	30	7	138	145
M3	179	170	29	9	141	150
TP789	196	200	27	-4	173	169
TP5	202	201	27	1	175	175
TP4	207	203	26	4	177	181
W5	79	34	27	45	7	52
RR1	122	39	24	82	15	98
W8	80	39	23	41	16	56
P5	189	173	21	16	152	168
W10	136	121	20	15	101	116
W11	151	148	18	3	130	133
HKU1	82	63	20	19	43	62
PFLR1	110	109	16	1	92	93
W12	110	111	16	0	95	95

Notes:

\* : metre in length for E4, WP1 and WP2

V : Volcanic; G : Granite; C : Completely; H : Highly; M : Moderately; D : Decomposed; FP : Fracture plane