


MTR Corporation Limited

Kwun Tong Line Extension (KTE)

Monthly EM&A Report (June 2012)

Verified by:  \_\_\_\_\_


Position: Independent Environmental Checker

Date: 12 July 2012

MTR Corporation Limited

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Certified by:  \_\_\_\_\_

Position: Environmental Team Leader

Date: 12 JUL 2012

## ***EXECUTIVE SUMMARY***

The Kwun Tong Line Extension (KTE) Project was awarded to the respective contractors in late May 2011. The EM&A programme for the Kwun Tong Line Extension (KTE) Project commenced on 20 June 2011, the commencement date of construction of the Project. This is the 12th monthly Environmental Monitoring and Audit (EM&A) Report for Kwun Tong Line Extension (KTE) Project. The Report presents the results of EM&A works and the impact monitoring for the construction works undertaken during the period of 1 June 2012 to 30 June 2012. The major construction activities in the reporting period included utility and drainage diversions, installation of noise enclosures, temporary road & traffic diversion, piling works, bulk excavation, ground improvement works, shaft excavation, soil nailing and structure demolition. .

Impact monitoring for air quality and noise were conducted in accordance with the EM&A Manual in the reporting period. Three noise exceedances were found at the roof of Yee Fu Building (CN4), which exceeded the respective Limit Level, but not exceeding the predicted construction noise level as anticipated in the EIA report.

No exceedance on dust monitoring was recorded.

No environmental notification of summon and prosecution were received in the reporting period.

However, three public complaints in May on construction dust and noise were referred from EPD on 14 and 22 June 2012. Three noise complaints were received through MTRC Projects Hotline regarding the vent shaft construction at Wan Hoi Street. Therefore, six Action Level of construction noise were triggered. Details of the complaints could be referred to Section 7 and Appendix H.

Regular joint site inspections, led by the ER with the presence with representatives from the Contractors and Environmental Team, were conducted on a weekly basis to monitor Contractors' performance on environmental management and implementation of environmental pollution control and mitigation measures for the Project. No non-conformance was identified in the reporting period. Some environmental concerned items raised during the site inspections have been followed up the respective contractors in a responsible manner.

As required by EP Condition 4.1, MTRC shall submit the Review Plan for Operational Groundborne Noise within one month of the completion of tunnel excavation. Owing to the large tunnel depth at some sections, it may not be practical to obtain meaningful vibration signals on the ground surface using hammer impact test. Alternatively, measurement of vibration during tunnel excavation by drill rig is proposed. As such the Review Plan for Operational Groundborne Noise, which has been certified by the ET leader and verified by the IEC, was submitted to EPD for comment before tunnel excavation. The Review Plan is attached in Appendix I for information and will be re-submitted to EPD in accordance with the EP Condition 4.1 to re-confirm whether additional hammer test is required or not.

The Environmental Permit (EP-399/2010/B) dated on 7 June 2012 is being used for the KTE Project.

## **EXECUTIVE SUMMARY**

### **1 INTRODUCTION**

- 1.1 Project Background**
- 1.2 Project Programme**
- 1.3 Coverage of the EM&A Report**

### **2 PROJECT INFORMATION**

- 2.1 Project Management Organization and Contact Details**
- 2.2 Project Works Areas and Environmental Monitoring Locations**
- 2.3 Summary of EM&A Requirements**
- 2.4 Implementation of Environmental Mitigation Measures**
- 2.5 Construction Activities in the Reporting Month**
- 2.6 Construction Activities for the Coming Month**

### **3 IMPACT MONITORING**

- 3.1 Air Quality**
- 3.2 Noise**
- 3.3 Action taken in Event of Exceedance**

### **4 LANDSCAPE AND VISUAL**

- 4.1 Monitoring Requirements**
- 4.2 Audit Results**
- 4.3 Action Taken in Event of Non-Conformance**

### **5 WASTE MANAGEMENT**

### **6 WATER QUALITY**

### **7 RECORD OF ENVIRONMENTAL COMPLAINTS**

### **8 RECORD OF NON- COMPLIANCES**

### **9 NOTIFICATION OF SUMMONS AND PROSECUTIONS**

### **10 STATUS OF STATUTORY SUBMISSIONS**

- 10.1 Submissions required under Environmental Permits**
- 10.2 Statutory Permits and Licenses**

### **11 SITE INSPECTIONS**

- 11.1 Observations**
- 11.2 Other Notable Events**

### **12 FUTURE KEY ISSUES**

- 12.1 Key Issues for the Coming Month**
- 12.2 Effectiveness and Efficiency of Mitigation Measures**

### **13 CONCLUSIONS**

## **List of Appendices**

Appendix A	Figures
Appendix B	Environmental Quality Performance Limits
Appendix C	Event Action Plans
Appendix D	Implementation of Environmental Mitigation Measures
Appendix E	Calibration Details
Appendix F	Impact Monitoring Graphical Plots
Appendix G	Monitoring Schedule for the Present and Next Reporting Period
Appendix H	Complaint Report
Appendix I	Review Plan for Operational Groundborne Noise for KTE (April 2012)

# 1 INTRODUCTION

## 1.1 Project Background

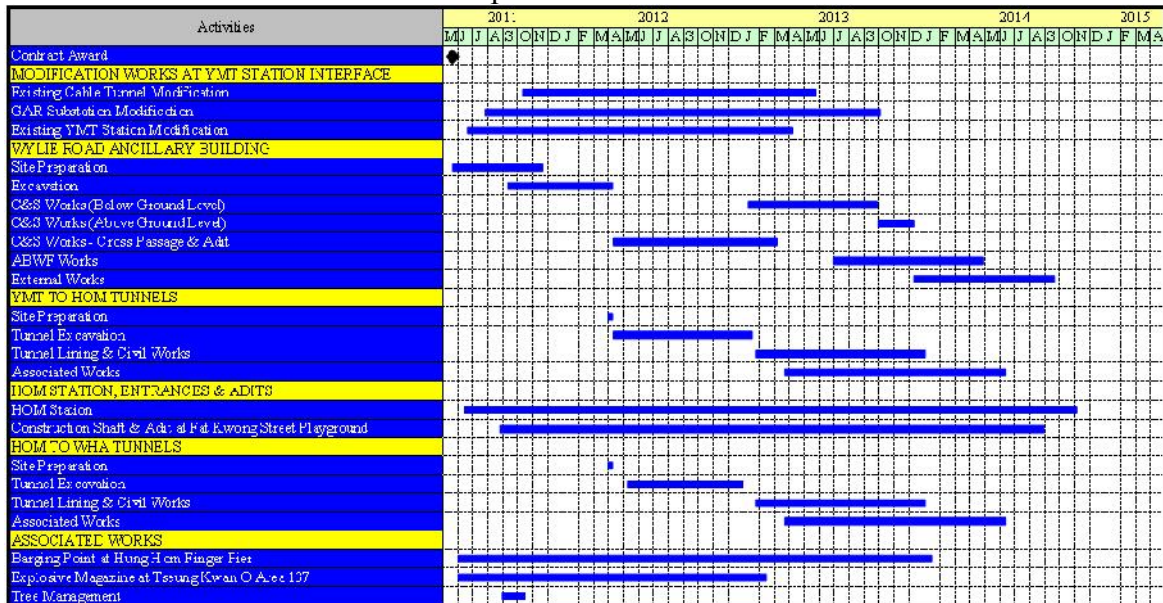
MTR Corporation Limited (MTRCL) proposes to build a new railway line, the Kwun Tong Line Extension (KTE), otherwise referred to as ‘the Project’, which is an extension of the existing Kwun Tong Line from Yau Ma Tei Station to Whampoa area. The route length of the fully underground KTE is approximately 2.6 km with two new stations namely Ho Man Tin Station (HOM) and Whampoa Station (WHA), and a new ancillary ventilation building at Wylie Road.

## 1.2 Project Programme

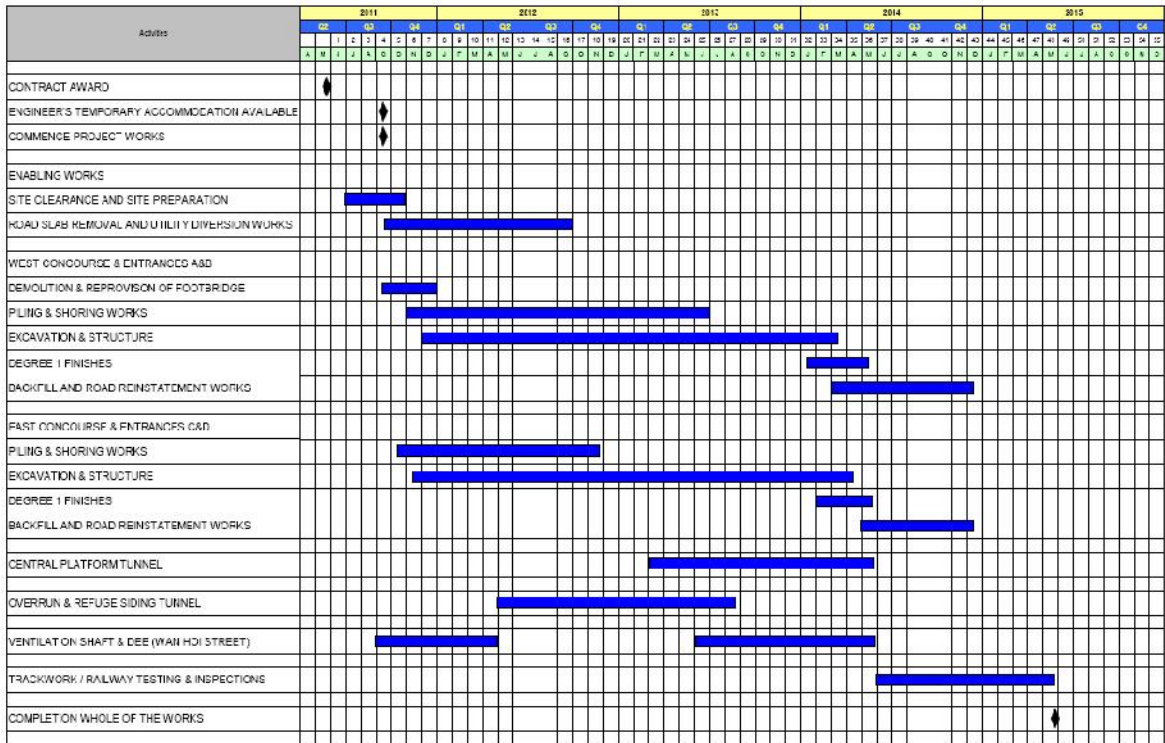
The Kwun Tong Line Extension (KTE) Project was awarded to the respective Contractors Nishimatsu Construction Co. Ltd (NCC) and Chun Wo-Hip Hing Joint Venture (CHJV) for construction in late May 2011. The commencement of construction was on 20 June 2011. The commencement of operation of the Project is scheduled to be in 2015. Contractors’ summary programme for Contract 1001 and Contract 1002 are presented below.

NCC, as the Contractor of Contract 1001, is responsible for the construction of alignment link from the existing Yau Ma Tei Station to Wuhu Street at Whampoa and the new Ho Man Tin Station as well as the ancillary ventilation building at Wylie Road. CHJV, as the Contractor of Contract 1002, is responsible for the construction of the underground Whampoa Station and a platform & overrun tunnel.

Contract 1001 – Yau Ma Tei to Whampoa Tunnels and Ho Man Tin Station



## Contract 1002 – Kwun Tong Line Extension Whampoa Station and Overrun Tunnel



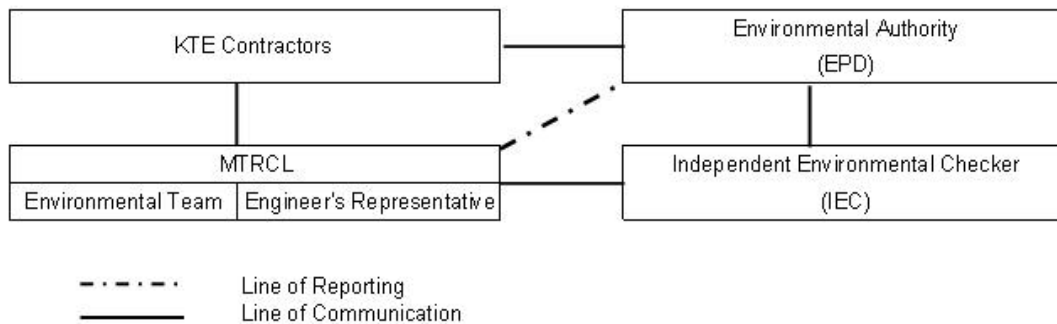
### 1.3 Coverage of the EM&A Report

The EM&A programme for the Kwun Tong Line Extension (KTE) Project commenced on 20 June 2011. This is the eleventh Monthly Environmental Monitoring and Audit (EM&A) Report for the Project. The Report presents the results of EM&A works and the impact monitoring for the construction works undertaken by respective Contractors during the period of 1 June 2012 to 30 June 2012.

## 2 PROJECT INFORMATION

### 2.1 Project Management Organization and Contact Details

The KTE Project organization chart is presented in Figure 1. Contacts of key environmental personnel of the Project are shown in Tables 1a, 1b and 1c respectively.



**Figure 1.** Project Organization

**Table 1a** Contact List of Key Personnel for Project Management

<b>Organization</b>	<b>Name</b>	<b>Telephone</b>
<b>Engineer's Representative</b>		
Project Manager	James Chow	2163 6283
Construction Manager	Kenny Kong	3441 3101
Construction Manager	Nelson Yeung	3940 3398
<b>Independent Environmental Checker</b>		
Consultant – Arup	Jacky Chan	3447 6051
<b>Environmental Team</b>		
Environmental Team Leader	Richard Kwan	2688 1179
<b>Contact 1001 Contractor</b>		
Project Manager	M. Matsuzaki	9136 5832
Environmental Officer	Ricky Tse	9221 0368
<b>Contact 1002 Contractor</b>		
Project Manager	Eric Wu	2743 3711
Senior Environmental Engineer	Louie Chan	92701390

**Table 1b** Contact List of Environmental Authority

<b>Organization</b>	<b>Name</b>	<b>Telephone</b>
<b>Environmental Protection Department</b>		
Sr Env Protection Offr(Metro Assessment) 2	Colin Keung	2835 1125
Sr Env Protection Offr(Regional E) 6	C L Wong	2150 8002
Sr Env Protection Offr(Regional E) 5	Warren Wong	2117 7538
Sr Env Protection Offr(Regional E) 4	Louis Chan	2117 7502



## 2.2 *Project Works Sites and Areas and Environmental Monitoring Locations*

The KTE Project works sites and areas are summarized in Table 2 below and shown in Appendix A Figures 1 to 8. The locations of environmental monitoring stations are indicated in Appendix A Figures 2 to 8. Table 3 shows the details of the active monitoring stations as reported in Sections 3.1 and 3.2.

**Table 2** Summary of KTE Project Works Sites and Areas

<i>Contract 1001 Works Sites and Areas</i>	
Works Site A	Gascoigne Road Rest Garden
Works Site B	Underground Tunnel between Yau Ma Tei Station and Wylie Road Ancillary Building
Works Site C	Wylie Road Ancillary Building
Works Site D	Underground Tunnel between Wylie Road Ancillary Building and Ho Man Tin Station
Works Site E	Ho Man Tin Station
Works Site F	Fat Kwong Street Playground
Works Site G	Underground Tunnel between Ho Man Tin Station and Whampoa Station
Works Area J	Finger Pier Barging Point
Works Area K	Tseung Kwan O Area 137 Magazine Site

<i>Contract 1002 Works Sites and Areas</i>	
Works Site H	Whampoa Station West Concourse
Works Site I	Whampoa Station East Concourse
Works Area L	Hung Lok Road Site Office

**Table 3** Summary of impact air quality and noise monitoring stations

<b>ID</b>	<b>Monitoring Station</b>
<b>Air</b>	
CD1	Queen Elizabeth Hospital – Specialist Clinic
CD2	Yee Fu Building
CD3a	No. 238 Chatham Road North
CD4a	Ka Fu Building, Whampoa Estate
CD5	Fung Kei Millennium Primary School
CD6a	Site boundary of Finger Pier adjacent to Harbourfront Horizon
<b>Noise</b>	
CN1	Alhambra Building
CN2	Methodist College
CN3	Queen Elizabeth Hospital – Specialist Clinic
CN4	Yee Fu Building
CN5*	Caritas Bianchi College of Careers
CN6	Lok Do Building

<b>ID</b>	<b>Monitoring Station</b>
CN7	Block Y, Ki Fu Building, Whampoa Estate
CN8	Block I, Lok Wah Building, Whampoa Estate
CN9	Block 13, Bauhinia Mansions, Whampoa Garden Site 11
CN10	Block 1, Oak Mansions, Whampoa Garden Site 5
CN11	Fung Kei Millennium Primary School
CN12	GCEPSA Whampoa Primary School

Note: Alternative monitoring locations were proposed in the Alternative Proposal which was submitted on 14 Apr 2011 and agreed by the Environmental Protection Department on 29 Apr 2011. The noise monitoring location at Caritas Bianchi College of Careers, which has been relocated to Tiu Keng Leng with the original premise unoccupied and inaccessible, is suspended until the premises are occupied by similar educational use. No noise monitoring will be conducted for CN5.

### 2.3 Summary of EM&A Requirements

The EM&A programme mainly requires environmental monitoring for air quality, noise, landscape and visual, water quality and waste management as specified in the EM&A Manual.

A summary of impact EM&A requirements as applicable to this EM&A Report is presented in Table 4 below.

**Table 4** Summary of impact EM&A Requirements

<b>Parameters</b>	<b>Descriptions</b>	<b>Locations</b>	<b>Monitoring Frequencies</b>	<b>Duration</b>
Air Quality	24-hr TSP	Shown in Table 2	Once per 6 days	Construction stage
Noise	Leq(30min)	Shown in Table 2	Once a week	Construction stage
Landscape and visual	On-Site Audit	Active Works Sites	Bi-weekly	Construction stage
Waste	On-Site Audit	Active Works Sites	Weekly	Construction stage
Wastewater	On-Site Audit	Active Works Sites	Weekly and in accordance to the discharge licences	Construction stage
General Site Conditions	Environmental Site Inspection	Active Works Sites	Weekly	Construction stage

Environmental Quality Performance Limits for air quality and noise are shown in **Appendix B**. The Event Action Plan for air quality and noise are shown in **Appendix C**.

## 2.4 *Implementation of Environmental Mitigation Measures*

The KTE Civil Works Contractors are required to implement the mitigation measures as specified in the EP, EIA Report and EM&A Manual. During the regular environmental site inspections, the Contractors' implementation of mitigation measures were inspected and reviewed. A schedule of the implementation of mitigation measures identified in the KTE EIA is given in **Appendix D**.

## 2.5 *Construction Activities in the Reporting Month*

Major construction activities carried out by the respective KTE Civil Works Contractors during the reporting period include:

### **Contract 1001 - Works Sites and Areas**

#### Works Site A (Gascoigne Road Rest Garden)

- Cable trench protection works
- Modification of additional ventilation fan and shaft hoist
- YMT platform modification works

#### Works Site B (Underground Tunnel between Yau Ma Tei Station and Wylie Road Ancillary Building)

- Nil

#### Works Site C (Wylie Road Ancillary Building)

- Shaft excavation and temporary support installation

#### Works Site D (Underground Tunnel between Wylie Road Ancillary Building and Ho Man Tin Station)

- Nil

#### Works Site E (Ho Man Tin Station)

- Bulk excavation
- Installation of geotechnical instrumentation
- Rock blasting
- Fabrication of blasting cages
- Installation of soil nailing
- Construction of crest channels
- Installation of grout curtain walls

#### Works Site F (Fat Kwong Street Playground)

- Shaft excavation
- Rock blasting

#### Works Site G (Underground Tunnel between Ho Man Tin Station and Whampoa Station)

- Nil

#### Works Area J (Hung Hom Barging Point)

- Nil

#### Works Area K (Tseung Kwan O Area 137 Magazine Site)

- Nil

### **Contract 1002 - Works Sites and Areas**

#### Works Site H (Whampoa Station West Concourse)

- Diversion of utilities and drain pipes
- Temporary traffic management implementation
- Ground instrument installation work
- Predrilling, grouting and pipe piling works

#### Works Site I (Whampoa Station East Concourse)

- Utilities diversion and ground instrument installation work
- Pre-drilling works
- Abutment wall construction
- Pipe piling works
- Grouting works
- Rock drilling at ventilation shaft

#### Works Area L (Hung Lok Road Site Office)

- Nil

## **2.6 Construction Activities for the Coming Month**

According to the construction programme for the Civil Works Contracts, the scheduled major construction activities in the next reporting month are as follows:

### **Contract 1001 - Works Sites and Areas**

#### Works Site A (Gascoigne Road Rest Garden)

- YMT platform modification works

#### Works Site B (Underground Tunnel between Yau Ma Tei Station and Wylie Road Ancillary Building)

- Nil

#### Works Site C (Wylie Road Ancillary Building)

- Shaft excavation and temporary support installation
- Construction of muck pit

#### Works Site D (Underground Tunnel between Wylie Road Ancillary Building and Ho Man Tin Station)

- Nil

#### Works Site E (Ho Man Tin Station)

- Bulk excavation
- Installation of soil nailing
- Shotcreting works for slope protection
- Drilling works for pumping test and instrumentation installation
- Construction works of Gate 4 and Gate 5 near Yan Fung Street and Winslow Street

#### Works Site F (Fat Kwong Street Playground)

- Shaft excavation
- Construction of muck pit

Works Site G (Underground Tunnel between Ho Man Tin Station and Whampoa Station)

- Nil

Works Area J (Hung Hom Barging Point)

- Nil

Works Area K (Tseung Kwan O Area 137 Magazine Site)

- Nil

**Contract 1002 - Works Sites and Area**

Works Site H (Whampoa Station West Concourse)

- Diversion of utilities and drain pipes
- Temporary traffic management implementation
- Ground instrument installation work
- Pre-drilling and pipe piling works
- Grouting work

Works Site I (Whampoa Station East Concourse)

- Utilities diversion and ground instrument installation work
- Pre-drilling works
- Pipe piling works
- Excavation work at Junction of Tak On Street and Shueng King Street
- Excavation work for ventilation Shaft at Wan Hoi Street
- Construction and maintenance of noise enclosure at Wan Hoi Street
- Rock drilling at ventilation shaft

Works Area L (Hung Lok Road Site Office)

- Nil

**3 IMPACT MONITORING**

**3.1 Air Quality**

24-Hour TSP Levels Monitoring

The sampling procedure follows that described in the App. B of Pt 50 in 40CFR Ch.1 (U.S. Environmental Protection Agency). TSP is sampled by drawing air through a conditioned, pre-weighed filter paper inside the high volume sampler at a controlled rate. After 24-hour sampling the filter paper with retained particles is collected and returned to the laboratory for drying in a desiccator followed by weighing. TSP levels are calculated from the ratio of the mass of particulate retained on the filter paper to the total volume of air sampled.

The samplers should be properly maintained. Prior to dust monitoring commencing, appropriate checks should be made to ensure that all equipment and necessary power

supply are in good working condition.

### Calibration Requirements

The flow rate of the high volume sampler with mass flow controller will be calibrated using an orifice calibrator. Initial calibration (five points) will be conducted upon installation and prior to commissioning. Calibration will be carried out every six months. Calibration certificates are attached in **Appendix E**.

To examine the construction dust levels, 24-hour TSP monitoring was undertaken according to the EM&A Manual. The dust monitoring locations are shown in the Section 2.2 above. Monitoring results are presented in the following table and **Appendix F** for graphical plot. The 24-hour TSP monitoring results in the range from 29.5 to 63 ug/m<sup>3</sup> recorded in the monitoring period shows that the dust levels generated by the active construction activities were within the Action Levels with no exceedance. This indicates that the construction activities did not have a noticeable adverse effect on the general air quality for the works areas.

<b>CD1 Queen Elizabeth Hospital – Special Clinic</b>					
Date	TSP (µg/m <sup>3</sup> )	Action Level (µg/m <sup>3</sup> )	Limit Level (µg/m <sup>3</sup> )	Compliance (Yes /No)	Weather Condition
04/06/2012	50.9	171	260	Yes	Sunny
11/06/2012	50.5	171	260	Yes	Cloudy
18/06/2012	34.7	171	260	Yes	Rainy
25/06/2012	45.5	171	260	Yes	Cloudy
29/06/2012	57.9	171	260	Yes	Cloudy
<b>CD2 Yee Fu Building</b>					
Date	TSP (µg/m <sup>3</sup> )	Action Level (µg/m <sup>3</sup> )	Limit Level (µg/m <sup>3</sup> )	Compliance (Yes /No)	Weather Condition
04/06/2012	63.0	183	260	Yes	Sunny
11/06/2012	61.1	183	260	Yes	Cloudy
18/06/2012	38.4	183	260	Yes	Rainy
25/06/2012	50.9	183	260	Yes	Cloudy
28/06/2012	53.5	183	260	Yes	Sunny
<b>CD3a No.238 Chatham Road North*</b>					
Date	TSP (µg/m <sup>3</sup> )	Action Level (µg/m <sup>3</sup> )	Limit Level (µg/m <sup>3</sup> )	Compliance (Yes /No)	Weather Condition
04/06/2012	57.3	192	260	Yes	Sunny
11/06/2012	55.3	192	260	Yes	Cloudy
18/06/2012	35.6	192	260	Yes	Rainy
25/06/2012	55.0	192	260	Yes	Cloudy
28/06/2012	46.0	192	260	Yes	Sunny
<b>CD4a Ka Fu Building, Whampoa Estate*</b>					

Date	TSP ( $\mu\text{g}/\text{m}^3$ )	Action Level ( $\mu\text{g}/\text{m}^3$ )	Limit Level ( $\mu\text{g}/\text{m}^3$ )	Compliance (Yes /No)	Weather Condition
01/06/2012	46.2	187	260	Yes	Cloudy
05/06/2012	38.8	187	260	Yes	Sunny
12/06/2012	34.7	187	260	Yes	Cloudy
15/06/2012	29.5	187	260	Yes	Sunny
21/06/2012	33.9	187	260	Yes	Rainy
28/06/2012	44.8	187	260	Yes	Sunny
<b>CD5 Fung Kei Millennium Primary School</b>					
Date	TSP ( $\mu\text{g}/\text{m}^3$ )	Action Level ( $\mu\text{g}/\text{m}^3$ )	Limit Level ( $\mu\text{g}/\text{m}^3$ )	Compliance (Yes /No)	Weather Condition
01/06/2012	58.2	168	260	Yes	Cloudy
05/06/2012	37.2	168	260	Yes	Sunny
12/06/2012	32.3	168	260	Yes	Cloudy
15/06/2012	33.8	168	260	Yes	Sunny
21/06/2012	33.5	168	260	Yes	Rainy
28/06/2012	56.2	168	260	Yes	Sunny
<b>CD6a Site boundary of Finger Pier adjacent to Harbourfront Horizon*</b>					
Date	TSP ( $\mu\text{g}/\text{m}^3$ )	Action Level ( $\mu\text{g}/\text{m}^3$ )	Limit Level ( $\mu\text{g}/\text{m}^3$ )	Compliance (Yes /No)	Weather Condition
04/06/2012	47.8	182	260	Yes	Sunny
11/06/2012	50.5	182	260	Yes	Cloudy
18/06/2012	37.7	182	260	Yes	Rainy
25/06/2012	48.1	182	260	Yes	Cloudy
28/06/2012	42.8	182	260	Yes	Sunny

### 3.2 Noise

B&K 2250 sound level meters which complied with the International Electrotechnical Commission Publication 651:1979 (Type 1) and 804:1985 (Type 1), specification as referred to in the Technical Memoranda to the NCO were used for the construction noise impact monitoring. The B&K sound level meters and B&K 4231 calibrator are verified by the certified laboratory or manufacturer once every two years to ensure they perform to the same level of accuracy as stated in the manufacturer's specifications. In this reporting period, two sound level meters with serial number 2731886 and 2741136 were used. All relevant calibration certificates are attached in **Appendix E**.

Immediately prior to and following each set of measurements at any NSR, the accuracy of the sound level meter was checked using an acoustic calibrator generating a known sound pressure level at a known frequency. If the calibration levels before and after the measurement differs by more than 1.0dB the measurement shall be repeated to obtain a

reliable result. Periods of prolonged or repeated overloading of the sound level meter detector were avoided by setting the meter with adequate headroom prior to commencing measurements. Measurements were recorded to the nearest whole dB, with values of 0.5 or more being rounded up.

Impact noise monitoring of LAeq(30min) was undertaken to measure construction noise levels in accordance with the EM&A Manual. The noise monitoring locations are shown in Section 2.2 above.

The monitoring results corrected to the baselines in the range from 61 to 77 dBA are presented in the following table and **Appendix F** for graphical plot.

<b>CN1- Alhambra building</b>								
Date	Time	Measured Leq(dBA)	Baseline Leq (dBA)	Corrected Leq(dBA)#	Limit Level (dBA)	Exceedance of Limit Level	Residual Level (dBA)##	Exceedance of Residual Level
07/06/2012	8:30	70	71	***	75	No	-	-
14/06/2012	9:00	70	71	***	75	No	-	-
19/06/2012	17:30	71	71	***	75	No	-	-
29/06/2012	11:00	69	71	***	75	No	-	-
<b>CN2- Methodist College</b>								
07/06/2012	9:30	74	75	***	70	No	75	No
14/06/2012	10:00	74	75	***	70	No	75	No
20/06/2012	9:00	74	75	***	70	No	75	No
29/06/2012	11:30	73	75	***	70	No	75	No
<b>CN3- Queen Elizabeth Hospital – Specialist Clinic</b>								
07/06/2012	10:00	66	63	61	75	No	-	-
14/06/2012	11:00	67	64	64	75	No	-	-
20/06/2012	10:00	63	63	***	75	No	-	-
29/06/2012	13:00	63	64	***	75	No	-	-
<b>CN4- Yee Fu Building</b>								
01/06/2012	15:00	78	70	77	75	Yes	77	No
06/06/2012	17:30	75	70	73	75	No	77	No
13/06/2012	17:30	77	70	76	75	Yes	77	No
22/06/2012	15:00	76	70	74	75	No	77	No
27/06/2012	17:30	77	70	77	75	Yes	77	No
<b>CN6- Lok Do Building</b>								
06/06/2012	15:30	74	71	71	75	No	-	-
14/06/2012	12:00	74	71	71	75	No	-	-
20/06/2012	17:30	73	71	69	75	No	-	-
27/06/2012	17:00	72	71	66	75	No	-	-
<b>CN7- Block Y, Ki Fu Building, Whampoa Estate</b>								
01/06/2012	15:00	71	71	***	75	No	83	No
05/06/2012	9:30	73	71	68	75	No	83	No
12/06/2012	13:30	70	71	***	75	No	83	No
22/06/2012	17:00	75	71	72	75	No	83	No
29/06/2012	14:30	76	71	75	75	No	83	No
<b>CN8- Block I, Lok Wah Building, Whampoa Garden</b>								
01/06/2012	15:30	70	70	***	75	No	81	No
05/06/2012	10:30	73	69	71	75	No	81	No
12/06/2012	13:00	68	70	***	75	No	81	No
22/06/2012	17:30	68	69	***	75	No	81	No
29/06/2012	13:30	74	70	72	75	No	81	No
<b>CN9- Block 13, Bauhinia Mansions, Whampoa Garden Site 11</b>								
01/06/2012	16:00	71	70	65	75	No	79	No



05/06/2012	11:30	66	69	***	75	No	79	No
12/06/2012	17:00	71	70	65	75	No	79	No
19/06/2012	11:30	68	69	***	75	No	79	No
27/06/2012	11:30	72	69	68	75	No	79	No
<b>CN10- Block 1, Oak Mansions, Whampoa Garden Site 5</b>								
01/06/2012	17:00	73	67	72	75	No	82	No
05/06/2012	13:00	68	65	64	75	No	82	No
12/06/2012	15:30	70	67	68	75	No	82	No
19/06/2012	15:00	69	67	64	75	No	82	No
27/06/2012	10:30	68	66	65	75	No	82	No
<b>CN11- Fung Kei Millennium Primary School</b>								
05/06/2012	11:30	65	64	60	70	No	78	No
12/06/2012	16:30	66	64	61	70	No	78	No
19/06/2012	14:00	66	64	61	70	No	78	No
27/06/2012	10:00	67	64	65	70	No	78	No
<b>CN12- GCEPSA Whampoa Primary School</b>								
05/06/2012	14:00	70	64	68	70	No	76	No
12/06/2012	14:00	71	64	70	70	No	76	No
19/06/2012	13:30	71	64	70	70	No	76	No
27/06/2012	9:30	66	64	61	70	No	76	No

Notes:

It is noted that all noise monitoring were not undergone in the raining period. The weather condition is fine and with wind speed < 2m/s.

Decimal point of measured and baseline monitoring data is used to calculate the corrected noise level.

# The Measured Leq is corrected against the corresponding Baseline Level.

\*\*\* Refers to the Measured Leq is lower than the Baseline Level.

## Residual Level refers to the maximum predicted construction noise levels in the EIA report when residual impact is anticipated.

### 3.3 Action taken in Event of Exceedance

Three noise exceedances were found at Yee Fu Building (CN4), which exceeded the respective Limit Level, but not exceeding the predicted construction noise level as anticipated in the EIA report

No exceedance on dust monitoring was recorded. Therefore, no action shall be taken.

## 4 LANDSCAPE AND VISUAL

### 4.1 Monitoring Requirements

Monitoring of the implementation of the landscape and visual mitigation measures during construction phase was conducted in accordance with the requirements as stipulated in the EM&A Manual.

The landscape and visual monitoring and audit will be conducted once every two weeks throughout the construction stage.

### 4.2 Audit Results

Monitoring and audit was undertaken in accordance with the EM&A Manual.

#### Tree Felling at Contract 1001 Works Sites / Areas

A total of 12 numbers of trees were felled in Works Site E during the reporting month in

accordance to the Tree Removal Application Report.

Tree Felling at Contract 1002 Works Sites / Areas

No tree was felled during the reporting month.

Tree Transplantation in this reporting period for Contract 1001

A total of 16 numbers of trees were transplanted in Works Site E during the reporting month in accordance to the Tree Removal Application Report.

Tree Transplantation in this reporting period for Contract 1002

No tree was transplanted during the reporting month.

Bi-weekly inspection

The Registered Landscape Architect of Environmental Team or his representatives conducted inspections and audits and the tree protection works being planned and implemented by the respective contractors of Contract 1001 and 1002 were in progress. No non-conformance was identified in the reporting period.

**4.3 Action Taken in Event of Non-Conformance**

No actions on landscape and visual were required to be taken in this reporting period.

**5 WASTE MANAGEMENT**

Mitigation measures on waste management have been implemented in accordance with the requirements of the EM&A Manual. Suitable C&D materials were reused on-site or at other projects such as Andersen Road Quarry while the remaining C&D materials and non-inert wastes were disposed at the public filling reception facilities and the landfills respectively. The quantities disposed in the reporting period are summarized in the following table:

Amount of Construction Wastes Disposed				
Reporting Period	Inert C&D Materials to Public Fill (m <sup>3</sup> )	Inert C&D Materials Reused (m <sup>3</sup> )	Non-inert Waste to Landfill (m <sup>3</sup> )	Chemical Waste to designated treatment facility (trips)
Contract 1001 June – July 2011	588	0	66	0
August 2011	78	0	156	0
September 2011	960	0	78	0
October 2011	4542	0	54	0
November 2011	13842	2676	114	0
December 2011	8680	22092	246	0

January 2012	1882	43572	192	0
February 2012	2365	37874	174	0
March 2012	4331	47353	84	1
April 2012	3597	44308	108	0
May 2012	1102	31228	108	0
June 2012	2308	33080	240	0
Subtotal	44276	262183	1620	1
Contract 1002 June – July 2011	534	0	0	0
August 2011	602	0	5	0
September 2011	283	0	0	0
October 2011	854	0	0	0
November 2011	663	0	2	0
December 2011	101	0	2	0
January 2012	50	0	18	0
February 2012	443	10	12	1
March 2012	532	0	30	0
April 2012	488	5	36	0
May 2012	911	18	18	1
June 2012	4620	0	6	0
Subtotal	10081	33	129	2
Overall Total	54357	262216	1749	3

## **6 WATER QUALITY**

Monitoring of the implementation of the water quality mitigation measures during construction phase was conducted in accordance with the requirements as stipulated in the EM&A Manual.

Weekly site inspection will be conducted throughout the construction stage covering the entire project site areas to ensure the recommended mitigation measures are properly implemented.

In the reporting period, the water quality mitigation measures were implemented in accordance with the requirements as stipulated in the EM&A Manual and found in an acceptable manner.

Water sample tests were conducted for Works Sites A, C, E and F. Analytical results will be reported in accordance to the WPCO licenses.

## **7 RECORD OF ENVIRONMENTAL COMPLAINTS**

EPD referred a complaint case to MTRC on 14 June 2012 regarding an unknown public member complained on construction dust and general construction noise from construction site near Fat Kwong Street on 17 May 2012. Investigation conducted by EPD did not reveal any emission of construction dust and abnormal construction noise from MTRC construction site near Fat Kwong Street. The complaint is classified as invalid, but the Contractor was reminded to maintain the mitigation measures on dust and noise control.

On 22 June 2012, EPD referred another two complaints to MTRC regarding the construction noise and construction dust from construction site near Fat Kwong Street and Ping Chi Street on 30 May 2012. Investigation conducted by EPD revealed that general daytime construction noise affected nearby residents and did not reveal any emission of construction dust from the site. As investigated by the ET, regular noise monitoring was conducted on 30 May 2012 at the designated noise monitoring station near Ping Chi Street where no noise exceedance was occurred. These two complaint cases were also classified as invalid but the Contractor was advised to implement improvement measures.

For Whampoa area, three noise complaints were received through MTRC projects hotline regarding the construction works at Wan Hoi Street. Investigation was conducted by ET and the Contractor. The noise impact was attributed to the rock drilling / coring activities at Wan Hoi Street for the construction of vent shaft. ET has increased the monitoring frequency and the Contractor was urged to further improve the measures to reduce noise impact. Proposed corrective actions including the setting up of temporary noise enclosure to cover the rock drilling activities were completed and the noise level at NSR nearby was measured complied with the limit level or residual level. The monitoring frequency returned to normal.

Due to the noise complaints, six action levels of the construction noise were triggered. Details of three valid complaints could be referred to Appendix H.

Reporting Period	Invalid Complaint			Valid Complaint		
	Frequency	Nature	Status	Frequency	Nature	Status
June 2011	0	N/A	N/A	0	N/A	N/A
July 2011	0	N/A	N/A	0	N/A	N/A
August 2011	0	N/A	N/A	0	N/A	N/A
September 2011	1	Noise	Closed	0	N/A	N/A
October 2011	0	N/A	N/A	0	N/A	N/A
November 2011	0	N/A	N/A	1	Dust	Closed
December 2011	1	Water	Closed	0	N/A	N/A
January 2012	0	N/A	N/A	0	N/A	N/A
February 2012	1	Noise	Closed	1	Noise	Closed
March 2012	2	Noise & Dust	Closed	2	Noise	Closed
April 2012	1	N/A	N/A	1	Noise	Closed
May 2012	1	Water	Closed	0	N/A	N/A
June 2012	3	Noise & Dust	Closed	3	Noise	Closed
Cumulative	10	N/A	N/A	8	N/A	N/A

## **8 RECORD OF NON-COMPLIANCES**

There was no non-compliance identified in the reporting period.

## **9 NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS**

No summon or prosecution related to environmental issue was recorded in the reporting period. A summary of environmental prosecution since commencement of construction is shown below:-

Reporting Period	Frequency	Cumulative	Nature	Status
June – December 2011	0	0	N/A	N/A
January – May 2012	0	0	N/A	N/A
June 2012	0	0	N/A	N/A
Cumulative	0	0	N/A	N/A

## **10 STATUS OF STATUTORY SUBMISSIONS**

### **10.1 Submissions required under Environmental Permit**

A summary of the status of submissions required under the KTE Environmental Permit as of 30 June 2012 is shown below:

EP-399/2010/A Part C Clause No.	Description		Status
1.12	1	Notification of commencement of construction	Submitted on 17 May 2011
2.1	2	Establishment of ET with ET Leader	Submitted on 1 April 2011
2.1	3	Establishment of Registered Landscape Architect	Submitted on 14 April 2011
2.2	4	Employment of IEC	Submitted on 1 April 2011 and 7 July 2011
2.3	5	Notification of the management organization of main construction companies and/or any form of JV	Submitted on 19 May 2011
2.4	6	Layout drawings with explanatory statement, showing Project boundary, alignment and associated work areas and works sites locations	Submitted on 10 June 2011 and 13 July 2011
2.5	7	Notification of setting up hotline to service complaints, comments, suggestions or requests for information	Submitted on 12 May 2011
3.7	8	Report any contamination hotspot(s) identified from the reconnaissance site visit to the kerosene store at Chung Hau Street	Submitted on 25 July 2011
5.3	9	Submission of Baseline Monitoring Report	Submitted on 4 May 2011 and 8 July 2011
6.2	10	Notification of Internet address to place EM&A data	Submitted on 1 August 2011
5.4	11	Monitoring Report for July 2011	Submitted on 12 August 2011
5.4	12	Monitoring Report for August 2011	Submitted on 15 September 2011
5.4	13	Monitoring Report for September 2011	Submitted on 17 October 2011
4.1	14	Review Plan for Operational Groundborne Noise	Submitted on 28 October 2011
5.4	15	Monitoring Report for October 2011	Submitted on 14 November 2011
5.4	16	Monitoring Report for November 2011	Submitted on 14 December 2011
5.4	17	Monitoring Report for December 2011	Submitted on 16 January 2012
5.4	18	Monitoring Report for January 2012	Submitted on 14 February 2012
4.1	19	Review Plan for Operational Groundborne Noise	Submitted on 29 February 2012
5.4	20	Monitoring Report for February 2012	Submitted on 14 March 2012
5.4	21	Monitoring Report for March 2012	Submitted on 17 April 2012
4.1	22	Review Plan for Operational Groundborne Noise	Submitted on 27 April 2012
5.4	23	Monitoring Report for April 2012	Submitted on 15 May 2012
3.7	24	Further Inspection to the Kerosene Store	Submitted on 8 Jun 2012
5.4	25	Monitoring Report for May 2012	Submitted on 14 Jun 2012

## 10.2 Statutory Permits and Licenses

A summary of the status of all relevant environmental permits and licenses as of 30 June 2012 is shown below:

Description	License/ Permit Reference	Issue Date	Expired Date
<b><u>Environmental Permit</u></b>			
Environmental Permit for Kwun Tong Line Extension Project (EP-399/2010)	(EP-399/2010) (superseded by EP-399/2010/A)	27 September 2010	NA
Variation of Environmental Permit for Kwun Tong Line Extension Project	(EP-399/2010/A) ) (superseded by EP-399/2010/B)	1 December 2010	NA
Variation of Environmental Permit for Kwun Tong Line Extension Project	(EP-399/2010/B)	7 June 2012	NA
<b><u>Contract 1001</u></b>			
Wastewater Discharge License	WT00009504-2011 (Works Site C),	14 July 2011	31 July 2016
	WT00009582-2011 (Works Site F),	27 July 2011	31 July 2016
	WT00009608-2011 (Works Site A),	1 August 2011	31 August 2016
	WT00009611-2011 (Works Area J)	9 August 2011	31 August 2016
	WT00012298-2012 (Works Site E)	19 April 2012	31 July 2016
Registration as a Chemical Waste Producer	5213-226-N2206-22 (Works Site A)	1 August 2011	NA
	5213-226-N2206-23 (Works Site C)	1 August 2011	NA
	5213-237-N2454-04 (Works Site E)	11 August 2011	NA
	5213-243-N2454-03 (Works Site F)	11 August 2011	NA
Disposal of Construction Waste	Billing Account no. 7012910 activated	26 May 2011	NA
Construction Noise Permit	GW-RE0461-12 (Works Site A)	18 June 2012	Valid from 19 Jun 2012 to 30 Nov 2012
	GW-RE0458-12 (Works Site C)	18 June 2012	Valid from 19 Jun 2012 to 30 Nov 2012
	GW-RE0468-12 (Works Site E)	19 June 2012	Valid from 20 Jun 2012 to 30 Nov 2012
	GW-RE0531-12 (Works Site F)	28 June 2012	Valid from 30 Jun 2012 to 30 Nov 2012

<b>Contract 1002</b>			
Wastewater Discharge License	WT00009415-2011 (Site office)	11 July 2011	30 Sep2016
	WT00010827-2011	8 December 2011	31 Oct 2016
Registration as a Chemical Waste Producer	Waste Producer No. 5213-245-C3672-01	16 June 2011	NA
Disposal of Construction Waste	Billing Account No. 7012934 activated	31 May 2011	NA

## 11 SITE INSPECTIONS

### 11.1 Observations

Regular site inspections led by the Engineer's Representative and anticipated by ET and respective Contractors were undertaken in accordance with the EM&A Manual in the reporting period. The contractors' performance on environmental matters were assessed and found in an acceptable manner. The inspection findings and the associated recommendations on improvement to the environmental protection and pollution control works were raised to the contractors for reference and/ or action.

Observations against the implementation of the mitigation measures recommended in the EP/EIA are summarized as follows:

Item	Description	Follow-up Status
<b>Contract 1001</b>		
1	The contractor was requested to cover the idle slope by tarpaulin.	Ongoing
2	The contractor was reminded to clean the accumulated silt in the surface channels at Works Site E.	Ongoing
3	The contractor was requested to provide acoustic blanket for the air compressor at Works Site E.	Completed
4	The contractor was requested to provide mobile noise barriers for the rock breaking operation at Works Site E.	Ongoing
5	The contractor was requested to remove debris and wastewater accumulated in the drip tray for air compressor at Works Site E.	Completed
<b>Contract 1002</b>		
1	Scrap metal should be separated from general refuse and should be recycled.	Ongoing
2	The damaged acoustic blanket of breaker should be replaced.	Completed
3	Exposed stockpiles should be covered by tarpaulin entirely.	Completed
4	The height of the sandbag bunding around the gully should be increased.	Completed
5	The silt and sediment in the sedimentation tank should be cleaned regularly to avoid accumulation.	Ongoing
6	The contractor should closely monitor the performance of wastewater treatment facilities to ensure the quality of discharge water complying with the WPCO's requirements.	Ongoing



The respective contractors have followed most of concerned items raised during the inspections for rectification in a responsible manner.

## **11.2 Other Notable Events**

### IEC Site Inspections

The IEC conducted site inspections for Works Areas on 19 and 13 June 2012 for Contract 1001 and 1002 respectively. Some observations including improving effluent control measures, enhancing noise and dust suppression measures were noted during the site inspections and the respective Contractors had followed up the issues as identified in the site inspections in a responsible manner.

### EPD Inspection

EPD has conducted inspection to Whampoa area on 28 June 2012. Staff of EPD reminded the Contractor to closely monitor the wastewater discharge quality.

## **12 FUTURE KEY ISSUES**

### **12.1 Key Issues for the Coming Month**

Future key issues envisaged in the coming month include the followings:

- Noise impact from operating equipment from site construction activities, e.g. pile/sheet piling and rock breaking works;
- Fugitive dust impact from bulk excavation activities and rock breaking works;
- Effluent discharge generated from various construction works;
- Tree protection, felling and transplant.

### **12.2 Effectiveness and Efficiency of Mitigation Measures**

Based on the environmental monitoring results of the reporting period, the effectiveness and efficiency of the mitigation measures implemented were found to be satisfactory. The respective contractors were reminded to carry out their future construction activities to comply with the requirements of the EP and the relevant contract requirements.

## **13 CONCLUSIONS**

The Report presents the results of EM&A works and the impact monitoring for the construction works undertaken during the period of June 2012. The major construction activities in the reporting period included utility and drainage diversions, installation of noise enclosures, temporary road & traffic diversion, piling works, bulk excavation, ground improvement works, shaft construction, soil nailing and structure demolition.

Three noise exceedances which exceeded the respective Limit Level was recorded at CN4, but complied with the maximum predicted construction noise levels as anticipated in the EIA report.

No exceedance on dust monitoring was recorded.

Three unknown public complaints were referred from EPD regarding the construction

noise and dust from MTR construction sites near Fat Kwong Street. The complaint cases were classified as invalid. Nevertheless, the Contractor was reminded to maintain mitigation measures on dust and noise control.

Three noise complaints were received through MTRC projects hotline regarding the noise impact generated from the construction sites of Wan Hoi Street. Action levels were triggered, and the Event and Action plan was followed. After the implementation of corrective measures proposed by contractor, the noise level at NSR nearby complied with the limit level or residual level.

Due to the noise complaints, six action levels of the construction noise were triggered.

No notification of summon and prosecution were received in the reporting period.

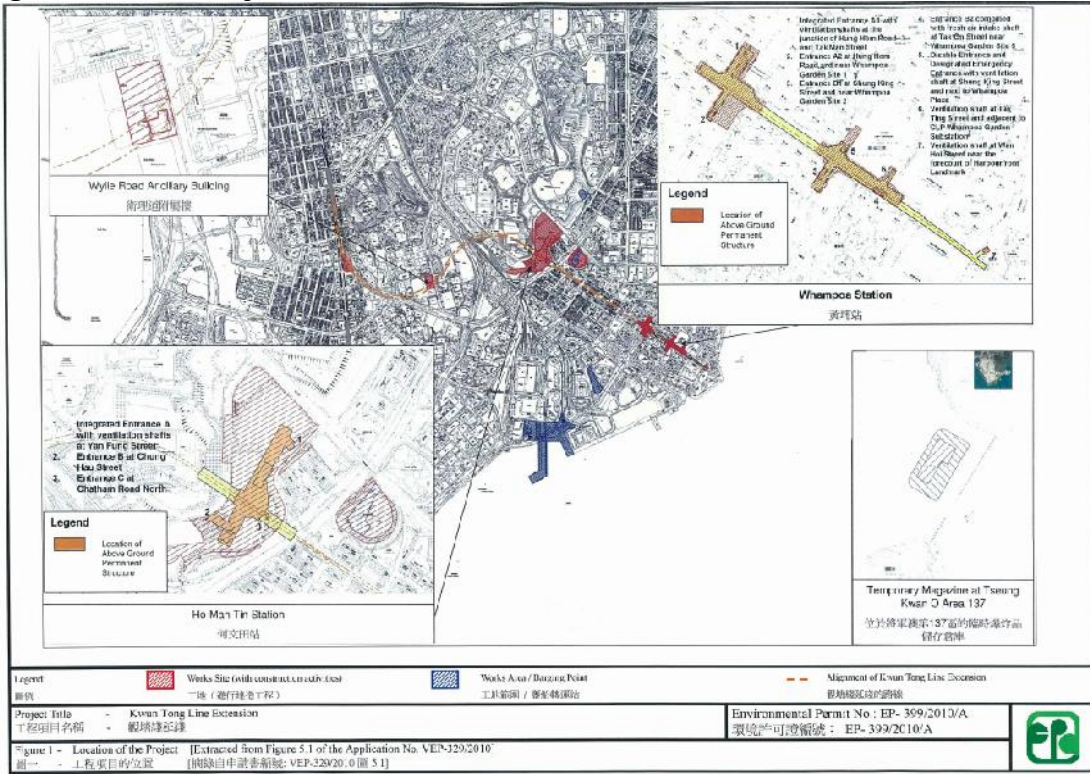
Regular site inspections led by the Engineer's Representative and anticipated by the representatives from ET and the respective Contractors' Team were conducted on a weekly basis to monitor the implementation of environmental pollution control and mitigation measures for the Project. No non-conformance to the environmental requirements was identified by the Environmental Team in the reporting period. The performances of the respective contractors on site environmental management were found in a responsible manner in this reporting period.

It is concluded from the environmental monitoring and audit works for the Kwun Tong Line Extension Project were undertaken in a responsible manner. The environmental protection and pollution control measures provided by respective contractors of Contract 1001 and 1002 were generally acceptable apart from some minor irregularities which were rectified timely by the respective civil works contractors.

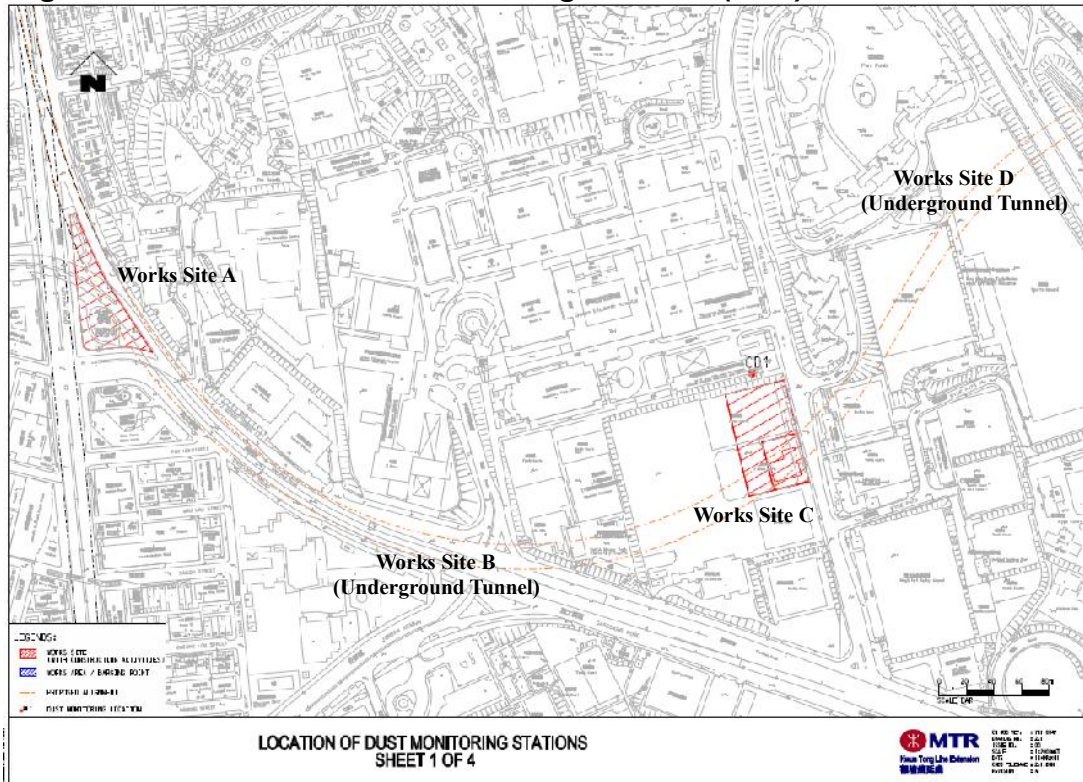
## **Appendix A**

### **Figures**

**Figure 1. KTE Project Works Area**

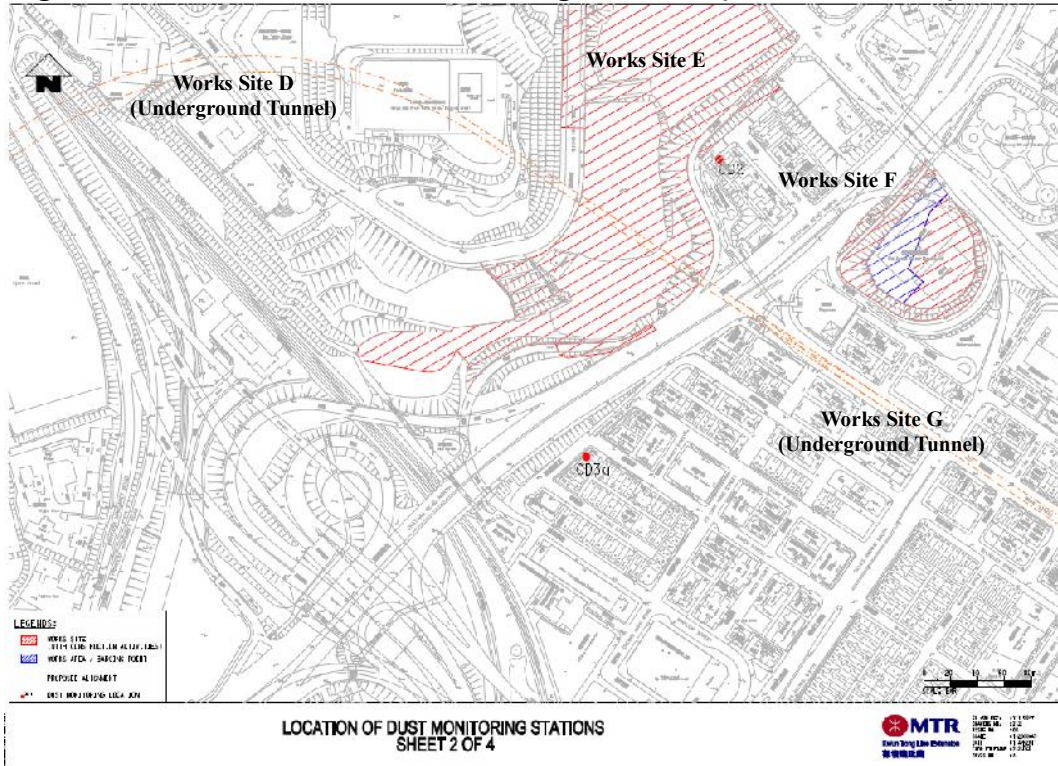


**Figure 2. Location of Dust Monitoring Stations (CD1)**

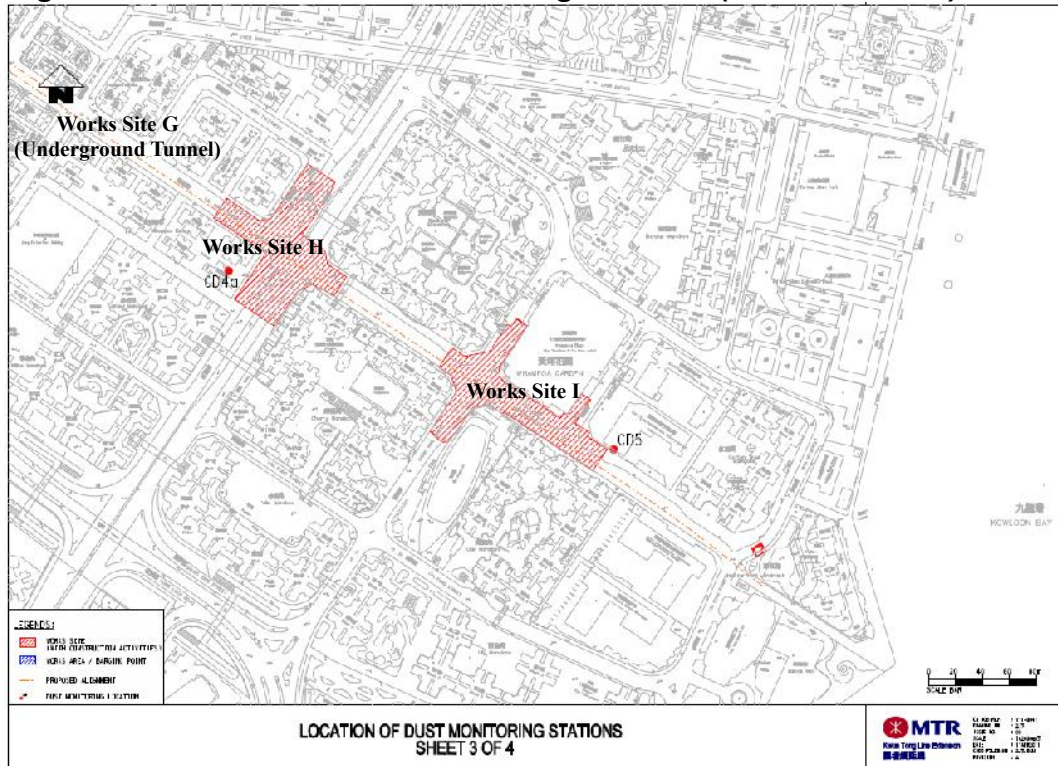




**Figure 3. Location of Dust Monitoring Stations (CD2 and CD3a)**

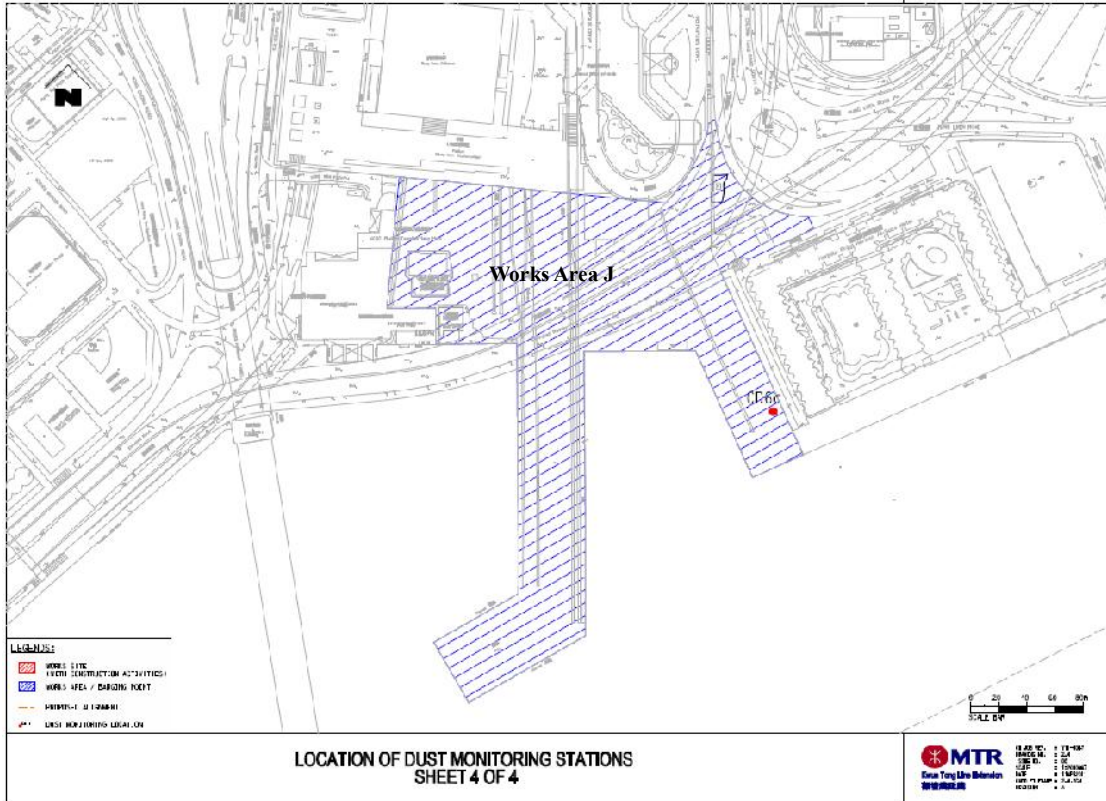


**Figure 4. Location of Dust Monitoring Stations (CD4a and CD5)**

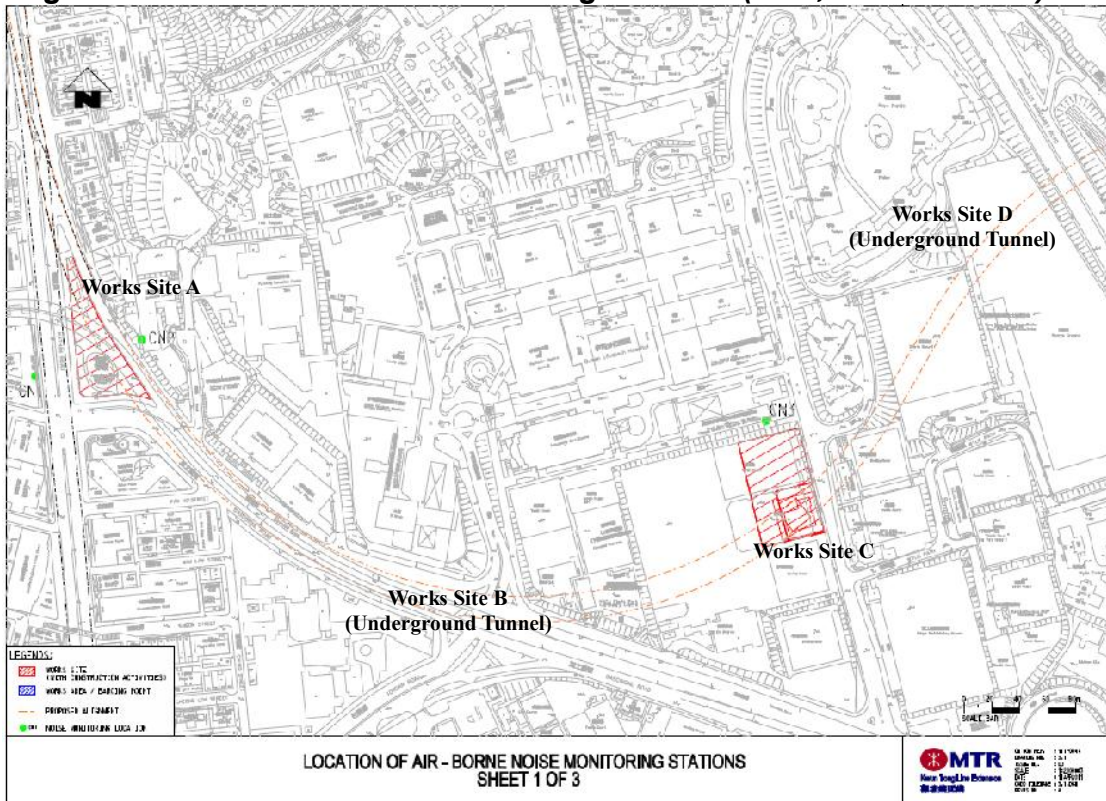




**Figure 5. Location of Dust Monitoring Stations (CD6a)**

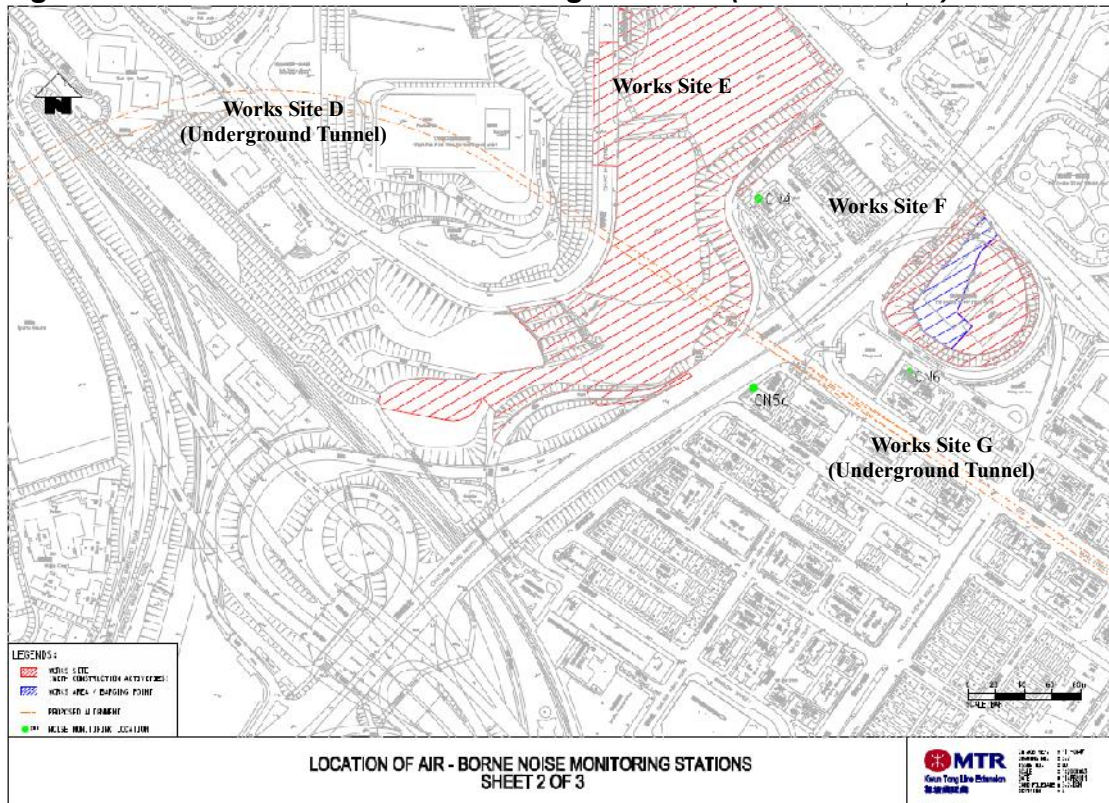


**Figure 6. Location of Noise Monitoring Stations (CN1, CN2 and CN3)**

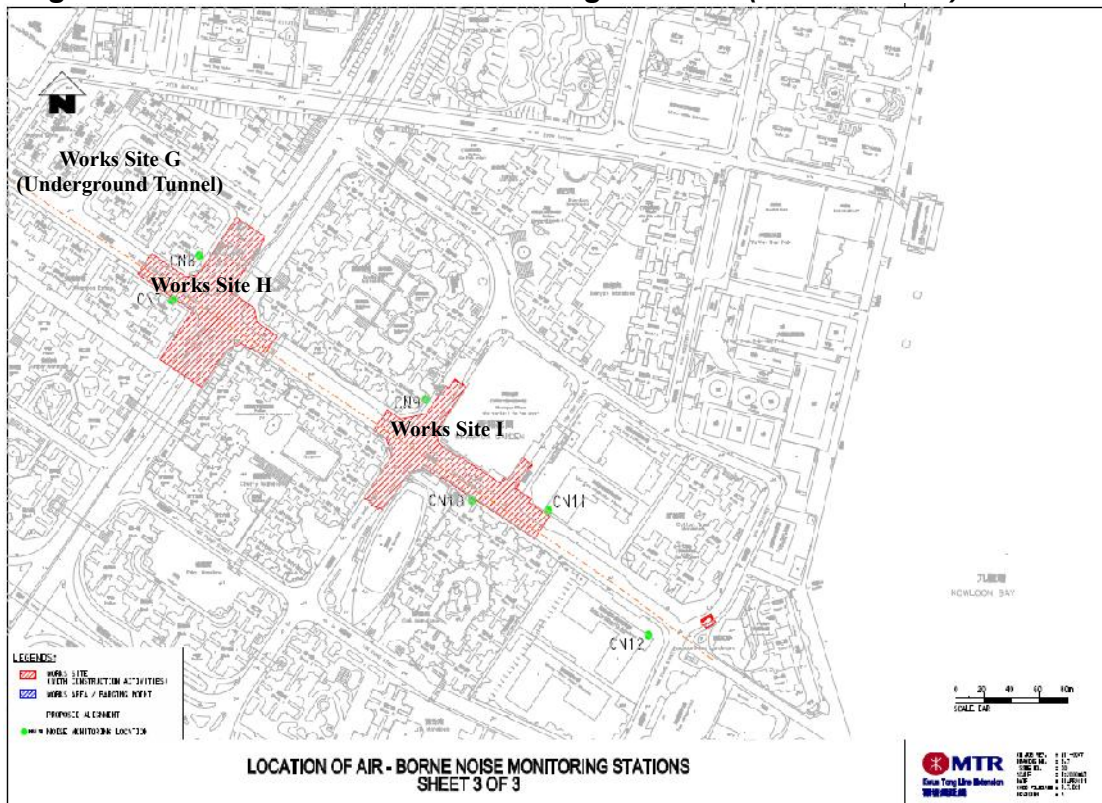




**Figure 7. Location of Noise Monitoring Stations (CN4 and CN6)**

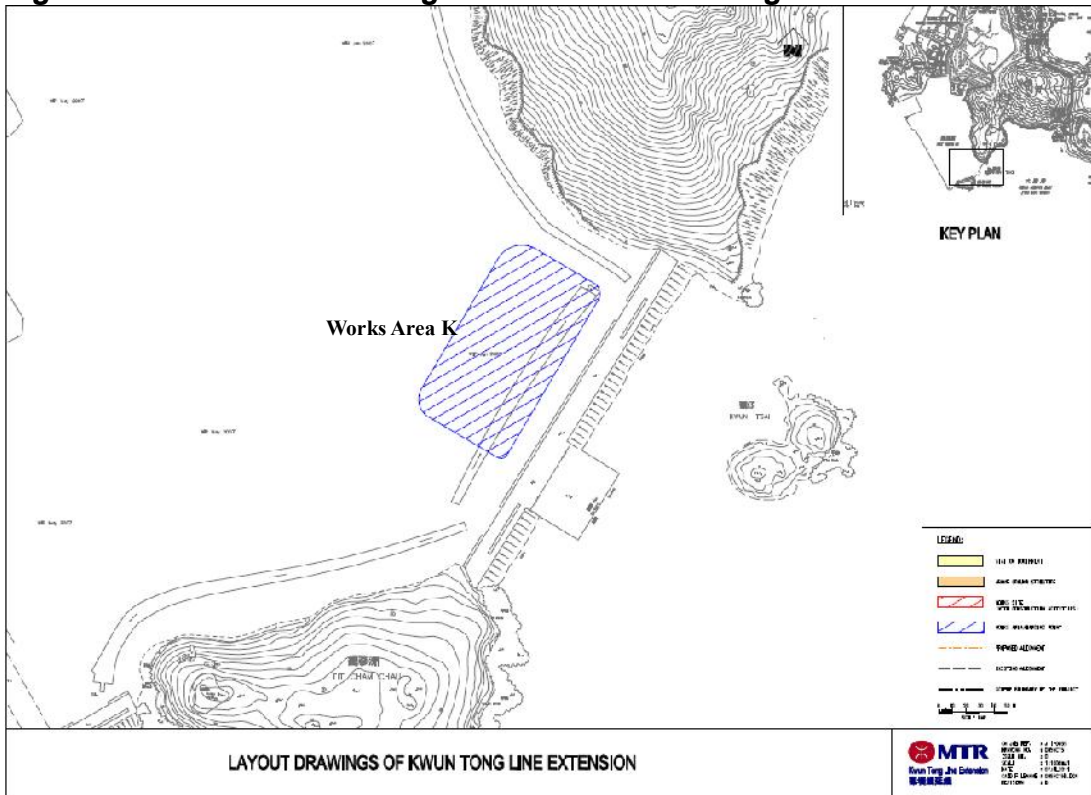


**Figure 8. Location of Noise Monitoring Stations (CN7 to CN12)**

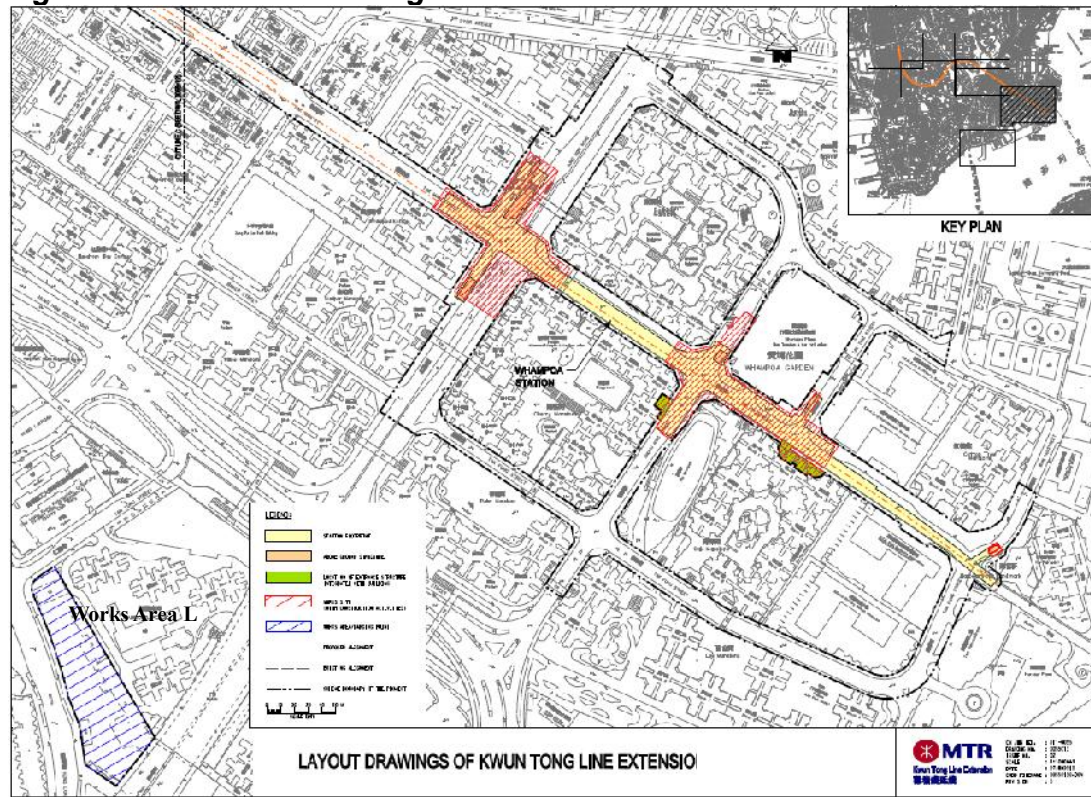




**Figure 9. Location of Tseung Kwan O Area 137 Magazine Site**



**Figure 10. Location of Hung Lok Road Site Office**





## **Appendix B**

### **Environmental Quality Performance Limits**

**Action and Limit Levels for 24-hour TSP**

Monitoring Station	Action Level ( $\mu\text{g}/\text{m}^3$ )	Limit Level ( $\mu\text{g}/\text{m}^3$ )
CD1	171	260
CD2	183	260
CD3a	192	260
CD4a	187	260
CD5	168	260
CD6a	182	260

**Action and Limit Levels for 1-hour TSP for Complaint Handling**

Monitoring Station	Action Level ( $\mu\text{g}/\text{m}^3$ )	Limit Level ( $\mu\text{g}/\text{m}^3$ )
CD1	310	500
CD2	301	500
CD3a	311	500
CD4a	303	500
CD5	309	500
CD6a	316	500

**Action and Limit Levels for Construction Noise**

Time Period	Action Level	Limit Level (dB(A)), Leq(30min)
0700-1900 hr on normal weekdays	When one documented complaint is received	75*

\* Limit for school is 70 dB(A) and 65 dB(A) during school examination periods.

## **Appendix C**

### **Event Action Plans**

**Table 4.4: Event and Action Plan for Construction Dust Monitoring**

EVENT	ACTION			
	ET <sup>(1)</sup>	IEC <sup>(1)</sup>	ER <sup>(1)</sup>	Contractor
<b>Action Level</b>				
1. Exceedance for one sample	<ol style="list-style-type: none"> <li>1. Identify sources, investigate the causes of complaint and propose remedial measures.</li> <li>2. Inform IEC and ER.</li> <li>3. Repeat measurement to confirm finding;</li> <li>4. Increase monitoring frequency.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by the ET.</li> <li>2. Check the Contractor's working methods.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Rectify any unacceptable practices.</li> <li>2. Amend working methods agreed with the ER as appropriate.</li> </ol>
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>1. Identify sources.</li> <li>2. Inform the IEC and ER.</li> <li>3. Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>4. Repeat measurements to confirm findings.</li> <li>5. Increase monitoring frequency to daily.</li> <li>6. Discuss with the IEC, ER and Contractor on remedial action required.</li> <li>7. If exceedance continues, arrange meeting with the IEC, Contractor and ER.</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by the ET.</li> <li>2. Check the Contractor's working methods.</li> <li>3. Discuss with the ET, ER and Contractor on possible remedial measures if required.</li> <li>4. Advise the ER on the effectiveness of proposed remedial measures if required.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the Contractor.</li> <li>2. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit proposals for remedial action to the ER within 3 working days of notification.</li> <li>2. Implement the agreed proposals.</li> <li>3. Amend proposal as appropriate.</li> </ol>

EVENT	ACTION			
	ET <sup>(1)</sup>	IEC <sup>(1)</sup>	ER <sup>(1)</sup>	Contractor
<b>Limit Level</b>				
1. Exceedance for one sample	<ol style="list-style-type: none"> <li>1. Identify sources, investigate causes of exceedance and proposed remedial measures.</li> <li>2. Inform the IEC, ER, and Contractor.</li> <li>3. Repeat measurement to confirm finding.</li> <li>4. Increase monitoring frequency to daily.</li> <li>5. Assess effectiveness of the Contractor's remedial action and keep the IEC and ER informed of the results.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by the ET.</li> <li>2. Check the Contractor's working methods.</li> <li>3. Discuss with the ET, ER and Contractor on possible remedial measures.</li> <li>4. Advise the ER and ET on the effectiveness of the proposed remedial measures.</li> <li>5. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of the notification of exceedance in writing.</li> <li>2. Notify the Contractor.</li> <li>3. Ensure remedial measures are properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance.</li> <li>2. Submit proposals for remedial action to the ER and copy to the ET and IEC within 3 working days of notification.</li> <li>3. Implement the agreed proposals.</li> <li>4. Amend proposal as appropriate.</li> </ol>

**Table 5.3: Event and Action Plan for Construction Noise Monitoring**

EVENT	ACTION			
	ET <sup>(1)</sup>	IEC <sup>(1)</sup>	ER <sup>(1)</sup>	Contractor
Action Level	<ol style="list-style-type: none"> <li>1. Notify the IEC, ER and Contractor.</li> <li>2. Carry out investigation.</li> <li>3. Report the results of investigation to the IEC and Contractor.</li> <li>4. Discuss jointly with the ER and Contractor and formulate remedial measures.</li> <li>5. Increase the monitoring frequency to check the mitigation effectiveness.</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the monitoring data submitted by the ET.</li> <li>2. Review the construction methods and proposed redial measures by the Contractor, and advise the ET and ER if the proposed remedial measures would be sufficient.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the Contractor.</li> <li>2. Require the Contractor to propose remedial measures for implementation if required.</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to the ER and copy to the IEC and ET.</li> <li>2. Implement noise mitigation proposals.</li> </ol>
Limit Level	<ol style="list-style-type: none"> <li>1. Notify the IEC, ER and Contractor.</li> <li>2. Identify sources.</li> <li>3. Repeat measurements to confirm findings.</li> <li>4. Carry out analysis of the Contractor's working procedures with the ER and Contractor to determine possible mitigations to be implemented.</li> <li>5. Record the causes and action taken for the exceedances.</li> <li>6. Increase the monitoring frequency.</li> <li>7. Assess the effectiveness of the Contractor's remedial action with the ER and keep the IEC informed of the results.</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst the ER, ET and Contractor on the potential remedial action.</li> <li>2. Review the Contractor's remedial action whenever necessary to assure their effectiveness and advise the ER accordingly.</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing.</li> <li>2. Notify the Contractor.</li> <li>3. Require the Contractor to propose remedial measures for the analysed noise problems.</li> <li>4. Ensure remedial measures are properly implemented.</li> <li>5. If exceedance continues, consider what portion of work is responsible and instruct the Contractor to stop that portion of works until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance.</li> <li>2. Submit proposals for remedial action to the ER and copy to the ET and IEC within 3 working days of notification.</li> <li>3. Implement the agreed proposals.</li> <li>4. Resubmit proposals if problems still not under control.</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

Note (1): ET – Environmental Team, IEC – Independent Environmental Checker, ER – Engineer's Representative

**Table 3.2: Event / Action Plan for Construction/Operational Phase**

<b>Action Level</b>	<b>ET</b>	<b>IEC</b>	<b>ER</b>	<b>Contractor</b>
Non-conformity on one occasion	<ol style="list-style-type: none"> <li>1. Identify Source</li> <li>2. Inform the IEC and the ER</li> <li>3. Discuss remedial actions with the IEC, the ER and the Contractor</li> <li>4. Monitor remedial actions until rectification has been completed</li> </ol>	<ol style="list-style-type: none"> <li>1. Check report</li> <li>2. Check the Contractor's working method</li> <li>3. Discuss with the ET and the Contractor on possible remedial measures</li> <li>4. Advise the ER on effectiveness of proposed remedial measures.</li> <li>5. Check implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify Contractor</li> <li>2. Ensure remedial measures are properly implemented</li> </ol>	<ol style="list-style-type: none"> <li>1. Amend working methods</li> <li>2. Rectify damage and undertake any necessary replacement</li> </ol>
Repeated Non-conformity	<ol style="list-style-type: none"> <li>1. Identify Source</li> <li>2. Inform the IEC and the ER</li> <li>3. Increase monitoring frequency</li> <li>4. Discuss remedial actions with the IEC, the ER and the Contractor</li> <li>5. Monitor remedial actions until rectification has been completed</li> <li>6. If exceedance stops, cease additional monitoring</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring report</li> <li>2. Check the Contractor's working method</li> <li>3. Discuss with the ET and the Contractor on possible remedial measures</li> <li>4. Advise the ER on effectiveness of proposed remedial measures</li> <li>5. Supervise implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the Contractor</li> <li>2. Ensure remedial measures are properly implemented</li> </ol>	<ol style="list-style-type: none"> <li>1. Amend working methods</li> <li>2. Rectify damage and undertake any necessary replacement</li> </ol>

Note:

- ET – Environmental Team
- IEC – Independent Environmental Checker
- ER – Engineer's Representative

## **Appendix D**

### **Implementation of Environmental Mitigation Measures**



**Appendix 1.1 Implementation Schedule for Environmental Mitigation Measures**

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
<b>Miscellaneous</b>											
3.4.2.1		<u>WSD Fresh Water Service Reservoir</u> Undertake an independent study of the effects of the drill and blast tunnelling on the reservoir to the satisfaction of WSD.	Ensure stability of the reservoir during construction	WSD Fresh Water Service Reservoir	MTR Corporation/ Main Contractor	-		✓		n/a	To be implemented as per construction programme
<b>Landscape and Visual</b>											
5.12.1.2		<u>Reuse of Existing Topsoil</u> Existing topsoil shall be re-used for new planting areas within the project. The Contractor's construction plan shall consider using the soil removed for backfilling. Suitable storage ground, gathering ground and mixing ground shall be set up if necessary.	Conservation of valuable natural landscape resources	Gascoigne Road Rest Garden, Hill slopes above Chatham Road North, Roadside planters at Hung Hom Road	MTR Corporation/ Main Contractor	EIA recommendation		✓		MTR Corporation / LandsD, LCSD / HyD	Implemented
5.12.1.2		<u>Tree Transplantation</u> Transplantation is proposed for a number of trees which are generally able to provide high amenity value and are likely to survive the transplantation process.	Conservation of valuable natural landscape resources	Gascoigne Road Rest Garden, HOM Station, Yan Fung Street Rest Garden Slopes surrounding Fat Kwong Street Playground, WHA Station	MTR Corporation/ Main Contractor/ Detailed Design Consultant	All transplantation will be carried out in accordance with ETWB TCW No. 3/2006.	✓	✓		MTR Corporation / LandsD / HyD / LCSD / AFCD	Implemented
5.12.1.2		<u>Erection of Decorative Hoardings</u> Temporary decorative screen hoardings shall be designed and erected to be compatible with the existing urban context, either brightly and imaginatively or with visually unobtrusive design and colours where more appropriate. All works sites and works areas shall be surrounded by such hoardings, which shall be removed at project completion.	Visual screening of works site during construction	All works sites and Temporary Works Areas	MTR Corporation/ Main Contractor/ Detailed Design Consultant	EIA recommendation	✓	✓		Contractor	Implemented
5.12.1.2		<u>Control of night-time lighting glare</u> All security floodlights for construction sites and temporary works areas shall be equipped with adjustable shield, frosted diffusers and reflective covers, and be carefully controlled	Restricting light pollution to nearby receivers	All works sites and Temporary Works Areas	Main Contractor	EIA recommendation		✓		Contractor	To be implemented as per construction programme

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
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		to minimize light pollution and night-time glare to nearby receivers.									
5.12.1.2		<p><u>Re-provision of Public Open Spaces</u>                      Every effort should be made to minimise use of public open spaces, however if affected by the Project they shall be re-provisioned to an equal or improved standard at completion of the project. Sensitive design and reinstatement of the affected Public Open Spaces (Gascoigne Road Rest Garden, Yan Fung Street Rest Garden, Fat Kwong Street Playground) shall be made, incorporating replacement facilities to those currently provided and using materials of quality suitable for long term use and acceptable to the relevant government departments including LCSD and PlanD, who shall be consulted on the design of the reinstated public open spaces at an early stage of the design process.</p>	Replacement of loss of resources	Gascoigne Road Rest Garden, Yan Fung Street Rest Garden, Fat Kwong Street Playground,	MTR Corporation / Main Contractor/ Detailed Design Consultant	EIA recommendation	✓	✓	✓	LCSD	To be implemented as per construction programme
5.12.1.2		<p><u>Compensatory Tree Planting</u>                      Suitable land pockets within the project area will be used for the implementation of compensatory mitigation to offset the net loss of key landscape resources and improve visual amenity.                      A compensatory tree planting proposal including locations of tree compensation will be submitted separately to seek relevant government department's approval, in accordance with ETWB TCW No. 3/2006.</p>	Replacement of loss of resources and Enhancement of visual amenity	Gascoigne Road Rest Garden, Yan Fung Street Rest Garden, Fat Kwong Street Playground, WAB, HOM Station WHA Station	MTR Corporation / Main Contractor/ Detailed Design Consultant	ETWB TCW No. 3/2006. WBTC 7/2002	✓	✓	✓	MTR Corporation / LandsD/ HyD/ LCSD/ AFCD	To be implemented as per construction programme
5.12.1.2		<p><u>Horizontal and Slope Greening</u>                      Shotcreting of cut rock slopes shall be avoided and greening applications employed throughout the project.                      At HOM Station the backfill slopes shall be hydroseeded and native seedling trees planted. The station roof shall be temporarily greened should there be no further on-site development within 1 year of completion of</p>	Mitigation of loss of resources and Enhancement of visual amenity	Gascoigne Road Rest Garden, Yan Fung Street Rest Garden, Fat Kwong Street Playground, WAB, HOM Station	MTR Corporation/ Main Contractor/ Detailed Design Consultant	WBTC 25/93 WBTC 17/2000	✓	✓	✓	MTR Corporation / LandsD	To be implemented as per construction programme

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
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		<p>KTE, until permanent measures are undertaken under the proposed property development stage.</p> <p>Parapets at WAB and HOM Station shall be provided with internal permanent planter boxes.</p> <p>The roof at WAB shall be greened to improve visual amelioration from surrounding high level viewers</p> <p>Station entrances at HOM and WHA shall utilise shrub planting areas to provide localised greening</p>		WHA Station							
5.12.1.2		<p><u>Planting</u>                      Vertical greening / climbers shall be applied to all above ground structures against exposed walls where appropriate. Further such localised planting systems shall be instigated subject to technical operational and maintenance constraints.</p>	Mitigation of loss of resources and Enhancement of visual amenity	WAB, HOM Station	MTR Corporation/ Main Contractor/ Detailed Design Consultant	EIA recommendation	✓	✓	✓	MTR Corporation	To be implemented as per construction programme
5.12.1.2		<p><u>Architectural Design Aesthetics for the WAB at Club de Recreio</u>                      The emergency access and ventilation building shall be designed in a way so as to ensure the form, material and surface detailing of this structure can fit sympathetically into the local context. The form shall consider the Cultural Heritage of the Club de Recreio site as well as other proximate buildings. The structure shall incorporate vertical greening / climbers.</p>	Enhancement of visual amenity	WAB	MTR Corporation/ Main Contractor/ Detailed Design Consultant	EIA recommendation	✓	✓	✓	MTR Corporation	To be implemented as per construction programme
5.12.1.2		<p><u>Architectural Design Aesthetics for Above-Ground Structures at HOM Station</u>                      All station entrances, vent shafts, chillers and other above-ground structures shall be designed in accordance with the standardised MTR Corporation architectural theme for the KTE and other current rail projects. However specific attention shall be undertaken to ensure the form, material and surface detailing of these structures is considered to</p>	Enhancement of visual amenity	HOM Station	MTR Corporation/ Main Contractor/ Detailed Design Consultant	EIA recommendation	✓	✓	✓	MTR Corporation	To be implemented as per construction programme

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
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		fit into the local context in terms of the architectural character of the site.									
5.12.1.2		<u>Architectural Design Aesthetics for Above-Ground Structures at WHA Station</u> These shall be designed in accordance with the standardised MTR Corporation architectural theme for the KTE and other current rail projects. However specific attention shall be undertaken to ensure the form, material and surface detailing of these structures is considered to fit into the local context in terms of the architectural character of the site.	Enhancement of visual amenity	WHA Station	MTR Corporation/ Main Contractor/ Detailed Design Consultant	EIA recommendation	✓	✓	✓	MTR Corporation	To be implemented as per construction programme
<b>Air Quality</b>											
S.6.7.1.7 & S.6.9.2.3		Cut-and-Cover areas in the vicinity of adits and shafts (if applicable):- <ul style="list-style-type: none"> <li>▪ Heavy construction activities and wind erosion at the cut-and-cover areas, active areas for heavy construction activities:                             <ul style="list-style-type: none"> <li>- Watering every hour at exposed soil.</li> </ul> </li> <li>▪ Trucks for transportation of materials:                             <ul style="list-style-type: none"> <li>- Wheel washing facilities should be provided at all site exits. Vehicles should be washed before leaving works sites. Spoil on trucks should be well covered before leaving works sites to minimise the generation of dusty materials.</li> <li>- Haul roads within works sites should be paved and water spraying would be provided to keep the wet condition.</li> </ul> </li> </ul>	To minimise dust impacts	All relevant works sites	MTR Corporation/ Main Contractor/ Detailed Design Consultant	Air Pollution Control Ordinance	✓	✓			Implemented
S.6.7.1.7 & S.6.9.2.3		Barging point at Hung Hom Finger Pier: <ul style="list-style-type: none"> <li>▪ For haul roads within the area of barging point for transportation of spoil, all road surfaces should be paved and hourly water spraying should be provided to keep the wet condition as far as practical.</li> <li>▪ The spoil unloading process should be</li> </ul>	To minimise dust impacts	Barging Point at Hung Hom Finger Pier	MTR Corporation/ Main Contractor/ Detailed Design Consultant	Air Pollution Control Ordinance	✓	✓			Implemented

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
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		undertaken within an enclosed tipping hall. Water spraying and 3-sided screen with top should be provided at the discharge point for dust suppression. <ul style="list-style-type: none"> <li>Vehicle wheel washing facilities should be provided at the exits of the barging point.</li> </ul>									
S.6.7.1.5 & S. 6.7.1.8		Rock crushing equipment at HOM Station and barging point at Hung Hom Finger Pier if operated during construction: <ul style="list-style-type: none"> <li>A dust enclosure with fabric baghouse/cartridge filter type dust extraction and collection system or equivalent system with 99% or more dust removal efficiency for the rock crushing equipment, haul road and unloading location; and</li> <li>Watering of paved roads within the area of the rock crushing facility as good site practice.</li> </ul>	To minimise dust impacts	Rock crushing equipment at HOM Station and Barging Point at Hung Hom Finger Pier	MTR Corporation/ Main Contractor/ Detailed Design Consultant	Air Pollution Control Ordinance	✓	✓			To be implemented as per construction programme
S.6.7.1.5 & S.6.9.2.2		Tarpaulin covers would be provided on wire mesh covered steel cages to prevent dust emission during open blasting at HOM Station;	To minimise dust impacts	Open blasting area at HOM Station	MTR Corporation/ Main Contractor/ Detailed Design Consultant	EIA recommendation	✓	✓			To be implemented as per construction programme
S.6.9.2.4		Dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation and good site practices: <ul style="list-style-type: none"> <li>Use of regular watering, to reduce dust emissions from exposed site surfaces and unpaved roads, particularly during dry weather.</li> <li>Use of frequent watering for particularly dusty construction areas and areas close to ASRs.</li> <li>Side enclosure and covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not</li> </ul>	To minimise dust impacts	All works sites	MTR Corporation/ Main Contractor /Detailed Design Consultant	Air Pollution Control Ordinance	✓	✓			Implemented

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
		practicable owing to frequent usage, watering should be applied to aggregate fines. <ul style="list-style-type: none"> <li>▪ Open temporary stockpiles should be avoided or covered. Prevent placing dusty material storage piles near ASRs.</li> <li>▪ Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations.</li> <li>▪ Establishment and use of vehicle wheel and body washing facilities at the exit points of the site.</li> <li>▪ Imposition of speed controls for vehicles on unpaved site roads. 8km per hour is the recommended limit.</li> <li>▪ Routing of vehicles and positioning of construction plant should be at the maximum possible distance from ASRs.</li> <li>▪ Every stock of more than 20 bags of cement or dry pulverised fuel ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides.</li> <li>▪ Loading, unloading, transfer, handling or storage of large amount of cement or dry PFA should be carried out in a totally enclosed system or facility, and any vent or exhaust should be fitted with an effective fabric filter or equivalent air pollution control system.</li> <li>▪ Covering or enclosing any conveyor belt systems will generally be fully enclosed, depending on the design, materials chosen, and dimension of the conveyor system.</li> </ul>									
<b>Air-borne Noise</b>											
S.7.9.2.6		The following good site practices should be implemented: <ul style="list-style-type: none"> <li>▪ Only well-maintained plant should be operated on-site and plants should be serviced regularly during the construction period;</li> <li>▪ Mobile plant, if any, should be sited as</li> </ul>	To minimise air-borne noise impacts	All works sites	MTR Corporation/ Main Contractor	Noise Control Ordinance		✓			Implemented

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
		far from NSRs as possible; <ul style="list-style-type: none"> <li>▪ Plant known to emit noise strongly in one direction should, wherever possible, be properly orientated so that the noise is directed away from the nearby NSRs;</li> <li>▪ Use of site hoarding as a noise barrier to screen noise at low level NSRs;</li> <li>▪ Machines and plant that may be in intermittent use should be shut down between works periods or should be throttled down to a minimum; and</li> <li>▪ Any material stockpiles and other structures should be effectively utilised, wherever practicable, to screen the noise from on-site construction activities.</li> </ul>									
S.7.9.2.1		The following quiet PME should be used: <ul style="list-style-type: none"> <li>▪ Air compressor</li> <li>▪ Asphalt Paver</li> <li>▪ Breaker</li> <li>▪ Bulldozer</li> <li>▪ Concrete lorry mixer</li> <li>▪ Concrete Pump / Grout Pump</li> <li>▪ Crane</li> <li>▪ Cutter, circular, steel (electric)</li> <li>▪ Dump Truck</li> <li>▪ Backhoe</li> <li>▪ Generator</li> <li>▪ Vibrating Poker, hand-held (electric)</li> <li>▪ Rock Drill</li> <li>▪ Roller, vibratory</li> <li>▪ Scraper</li> <li>▪ Water pump (electric)</li> </ul>	To minimise air-borne noise impacts	All relevant works sites	MTR Corporation/ Main Contractor	Noise Control Ordinance		✓			Implemented

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
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S.7.9.2.4		Movable or fixed noise barrier should be used for the following PME where practicable: <ul style="list-style-type: none"> <li>▪ Wheeled Excavator/Loader</li> <li>▪ Crane</li> <li>▪ Hydraulic Breaker</li> <li>▪ Scraper</li> <li>▪ Breaker, hand-held</li> <li>▪ Compactor, vibratory</li> <li>▪ Drill, percussive, hand-held (electric)</li> <li>▪ Concrete pump</li> <li>▪ Circular Saw, bench mounted</li> <li>▪ Truck</li> <li>▪ Bar bender and cutter (electric)</li> <li>▪ Conveyor belt</li> <li>▪ Generator, Super Silenced</li> <li>▪ Grout Pump</li> <li>▪ Saw, wire</li> <li>▪ Water Pump, Submersible (Electric)</li> <li>▪ Hydraulic Jack with Pump</li> </ul>	To minimise air-borne noise impacts	All relevant works sites	MTR Corporation/ Main Contractor	Noise Control Ordinance		✓			Implemented
S.7.9.2.4		Acoustic fabric should be used for the following PME where practicable: <ul style="list-style-type: none"> <li>▪ Compressor and Pneumatic Drilling Rig</li> <li>▪ Piling, vibrating hammer</li> <li>▪ Rock Drill</li> <li>▪ Silent Piling System</li> </ul>	To minimise air-borne noise impacts	All relevant works sites	MTR Corporation/ Main Contractor	Noise Control Ordinance		✓			Implemented
S.7.9.2.4		Noise enclosure/acoustic shed should be used for the following PME where practicable and will generally be fully enclosed depending on the design, materials chosen, and dimension of the PME: <ul style="list-style-type: none"> <li>▪ Air Compressor</li> <li>▪ Rock Crushing Equipment</li> </ul>	To minimise air-borne noise impacts	All relevant works sites	MTR Corporation/ Main Contractor	Noise Control Ordinance		✓			Implemented
S.7.9.2.4		Silencer should be used for the ventilation fans.	To minimise air-borne noise impacts	All relevant works sites	MTR Corporation/ Main Contractor	Noise Control Ordinance		✓			Implemented
S.7.9.2.6		Use of temporary hoardings along the works boundary.	To minimise air-borne noise impacts	All relevant works sites	MTR Corporation/ Main Contractor	Noise Control Ordinance		✓			Implemented



EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
S.7.9.2.2		Noise enclosures should be installed for the muckout points in WS1 (Gascoigne Road Rest Garden), WS7a1 (WAB at Club de Recreio) and WS26a (Fat Kwong Street Playground)	To comply with the criteria of Noise Control Ordinance.	All muckout points at WS1, WS7a1 and WS26a	MTR Corporation/ Main Contractor	Noise Control Ordinance		✓			Implemented
S.7.9.2.3		Noise enclosures should be installed for all rock crushing equipment.	To comply with the criteria of Noise Control Ordinance.	All rock crushing equipment	MTR Corporation/ Main Contractor	Noise Control Ordinance		✓			To be implemented as per construction programme
S.7.10.1.2		The maximum permissible sound power levels (max SWLs) for the fixed plant should be complied with during the selection of equipment and mitigation measures.	To comply with the criteria of Noise Control Ordinance.	All relevant location of fixed plant	MTR Corporation/ Detailed Design Consultant	Noise Control Ordinance	✓		✓		To be implemented as per construction programme
S.7.10.2.1		The detailed design for all fixed plant should incorporate the following good practice where practicable: <ul style="list-style-type: none"> <li>▪ Louvers should be orientated away from adjacent NSRs whenever practicable;</li> <li>▪ Adequate direct noise mitigation measures including silencers, acoustic louvers or acoustic enclosures should be adopted where necessary; and</li> <li>▪ Quieter plant should be chosen as far as practical.</li> </ul>	To comply with the criteria of Noise Control Ordinance.	At outlets of fixed plant including ventilation building, ventilation shafts, plant room for chiller plant and cooling towers, etc	MTR Corporation/ Detailed Design Consultant	Noise Control Ordinance	✓		✓		To be implemented as per construction programme
<b>Ground-borne Noise</b>											
S.8.7.1.2		MTR will further review the proposed mitigation measures for operational ground-borne noise during the construction stage after the tunnel boring.	To comply with the criteria of Noise Control Ordinance.	At suitable location	MTR Corporation/ Main Contractor	-	✓				To be implemented as per construction programme
S.8.7.1.3		Commissioning test is recommended to ensure compliance of the operational ground-borne noise levels	To comply with the criteria of Noise Control Ordinance.	Designated locations	MTR Corporation/ Main Contractor	Noise Control Ordinance	✓	✓	✓		To be implemented as per construction programme
<b>Water Quality</b>											
S.9.7.6		Construction site run-off and general construction activities: <ul style="list-style-type: none"> <li>▪ The mitigation measures as outlined in the ProPECC PN 1/94 Construction Site Drainage should be adopted where</li> </ul>	To control water quality impact from construction site runoff and general construction activities	All works sites	MTR Corporation/ Main Contractor	EIAO-TM, Water Pollution Control Ordinance, TM-DSS		✓			Implemented

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
		applicable.									
S.9.7.6		In case seepage of uncontaminated groundwater occurs, groundwater should be pumped out from the works areas and discharged into the storm system via silt removal facilities. Uncontaminated groundwater from dewatering process should also be discharged into the storm system via silt traps.	To control water quality impact from groundwater	All works sites	MTR Corporation/ Main Contractor	EIAO-TM, Water Pollution Control Ordinance		✓			To be implemented as per construction programme
S.9.7.6		At the barging point, mitigation measures for control of water quality impact from surface run-off should be applied and the following good site practices should also be adopted: <ul style="list-style-type: none"> <li>▪ All vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash.</li> <li>▪ All hopper barges should be fitted with tight fitting seals to their bottom openings to prevent leakage of material.</li> <li>▪ Construction activities should not cause foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the site.</li> <li>▪ Loading of barges and hoppers should be controlled to prevent splashing of material into the surrounding water. Barges or hoppers should not be filled to a level that will cause the overflow of materials or polluted water during loading or transportation.</li> </ul>	To control water quality impact from barging point	Barging point	MTR Corporation/ Main Contractor	EIAO-TM, Water Pollution Control Ordinance		✓		To be implemented as per construction programme	
S.9.7.6		For effluent discharge, there is a need to apply to EPD for a discharge licence for discharge of effluent from the construction site under the WPCO. The discharge quality should meet the requirements specified in the discharge licence. Minimum distances of 100m should be maintained between the discharge points of construction site effluent and the existing seawater intakes. If	To control water quality impact from effluent discharge from construction site	All works sites	MTR Corporation/ Main Contractor	EIAO-TM, Water Pollution Control Ordinance		✓			Implemented

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
		monitoring of the treated effluent quality from the works areas is required during the construction phase of the Project, the monitoring should be carried out in accordance with the WPCO license which is under the ambit of Regional Office of the EPD.									
S.9.7.6		To prevent the accidental spillage of chemicals, the Contractor should register as a chemical waste producer if chemical wastes would be produced from the construction activities. The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation should be observed and complied with for control of chemical wastes.	To control water quality impact from accidental chemical spillage	All works sites	MTR Corporation/ Main Contractor	EIAO-TM, Water Pollution Control Ordinance, Waste Disposal Ordinance		✓			Implemented
S.9.7.6		Any service shop and maintenance facilities should be located on hard standings within a bunded area, and sumps and oil interceptors should be provided. Maintenance of vehicles and equipment involving activities with potential for leakage and spillage should only be undertaken within the areas appropriately equipped to control these discharges.	To control water quality impact from accidental chemical spillage	All works sites	MTR Corporation/ Main Contractor	EIAO-TM, Water Pollution Control Ordinance, Waste Disposal Ordinance		✓			Implemented
S.9.7.6		Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance. The Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published under the Waste Disposal Ordinance details the requirements to deal with chemical wastes. General requirements are given as follows: <ul style="list-style-type: none"> <li>▪ Suitable containers should be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport.</li> <li>▪ Chemical waste containers should be suitably labelled, to notify and warn the personnel who are handling the wastes, to avoid accidents.</li> <li>▪ Storage area should be selected at a safe</li> </ul>	To control water quality impact from accidental chemical spillage	All works sites	MTR Corporation/ Main Contractor	EIAO-TM, Water Pollution Control Ordinance, Waste Disposal Ordinance		✓		Implemented	

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
		location on site and adequate space should be allocated to the storage area.									
S.9.7.6		<p>Regarding the hydrogeological impacts in the construction of cut-and-cover tunnels and associated excavations for the WAB / ventilation building, the following measures should be in place in order to mitigate any drawdown effects to the groundwater table during the operation of the temporary dewatering works:</p> <ul style="list-style-type: none"> <li>▪ Toe grouting should be applied beneath the toe level of the temporary/permanent cofferdam walls as necessary to lengthen the effective flow path of groundwater from outside and thus control the amount of water inflow to the excavation.</li> <li>▪ Recharge wells should be installed as necessary outside the excavation areas. Water pumped from the excavation areas should be recharged back into the ground.</li> </ul>	To control groundwater hydrogeological impact and groundwater drawdown	All works sites	MTR Corporation/ Main Contractor	EIAO-TM, Water Pollution Control Ordinance		✓			To be implemented as per construction programme
S.9.8.6		<p>Measures for the tunnel run-off and drainage include:</p> <ul style="list-style-type: none"> <li>▪ Track drainage channels discharge should pass through oil/grit interceptors/chambers to remove oil, grease and sediment before being pumped to the foul sewer/holding tank for further disposal.</li> <li>▪ The silt traps and oil interceptors should be cleaned and maintained regularly.</li> <li>▪ Oily contents of the oil interceptors should be transferred to an appropriate disposal facility, or to be collected for reuse, if possible.</li> </ul>	To control runoff from rail track	Tunnels and rail tracks	MTR Corporation/ Detailed Design Consultant	Water Pollution Control Ordinance	✓		✓		To be implemented as per construction programme
S.9.8.6		<p>Measures for the control of sewage effluents include:</p> <ul style="list-style-type: none"> <li>▪ Connection of domestic sewage generated from the KTE project should be diverted to the foul sewer wherever possible. If public sewer system is not</li> </ul>	To control water quality impact from sewage effluent discharge from the ventilation building and Stations	Ventilation building and Stations	MTR Corporation/ Detailed Design Consultant	EIAO-TM, Water Pollution Control Ordinance, TM-DSS, ProPECC PN	✓		✓		To be implemented as per construction programme

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
		available, sewage tankering away services or on-site sewage treatment facilities should be provided to prevent direct discharge of sewage to the nearby storm system and all the discharge should comply with the requirements stipulated in the TM-DSS. <ul style="list-style-type: none"> <li>▪ For handling, treatment and disposal of other operation stage effluent, the practices outlined in ProPECC PN 5/93 should be adopted where applicable.</li> </ul>				5/93					
<b>Waste Management Implications</b>											
S.10.5.6.1		Recommendations for good site practices: <ul style="list-style-type: none"> <li>▪ Prepare a Waste Management Plan approved by the Engineer/Supervising Officer of the Project based on current practices on construction sites.</li> <li>▪ Training of site personnel in, site cleanliness, proper waste management and chemical handling procedures.</li> <li>▪ Provision of sufficient waste disposal points and regular collection of waste.</li> <li>▪ Appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers.</li> <li>▪ Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors.</li> <li>▪ Separation of chemical wastes for special handling and appropriate treatment.</li> </ul>	To implement good site practice for handling, sorting reuse and recycling of C&D materials	All works sites	Main Contractor	Waste Disposal Ordinance, Land (Miscellaneous Provisions) Ordinance, ETWB TC(W) No 31/2004		✓			Implemented
S.10.5.6.1		Recommendations for waste reduction measures: <ul style="list-style-type: none"> <li>▪ Sorting of demolition debris and excavated materials from demolition works to recover reusable/ recyclable portions (i.e. soil, broken concrete, metal etc.).</li> <li>▪ Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or</li> </ul>	To implement on-site sorting facilitating reuse and recycling of materials as well as proper disposal of waste	All works sites	Main Contractor	Waste Disposal Ordinance, Land (Miscellaneous Provisions) Ordinance		✓			Implemented

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
		recycling of materials and their proper disposal. <ul style="list-style-type: none"> <li>▪ Encourage collection of aluminium cans by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the workforce.</li> <li>▪ Proper storage and site practices to minimize the potential for damage or contamination of construction materials.</li> <li>▪ Plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste.</li> <li>▪ Training should be provided to workers about the concepts of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycle.</li> </ul>									
S.10.5.6.1		The Contractor should prepare and implement a Waste Management Plan as a part of the Environmental Management Plan in accordance with ETWB TCW No 19/2005 which describes the arrangements for avoidance, reuse, recovery, recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the construction activities.	To keep trace of the generation, minimization, reuse and disposal of C&D materials in the Project	All works sites	Main Contractor	ETWB TCW No 19/2005		✓			Implemented
S.10.5.6.1		Storage of materials on-site may induce adverse environmental impacts if not properly managed, recommendations to minimise the impacts include: <ul style="list-style-type: none"> <li>▪ Waste, such as soil, should be handled and stored well to ensure secure containment, thus minimising the potential of pollution.</li> <li>▪ Maintain and clean storage areas routinely.</li> <li>▪ Stockpiling area should be provided with covers and water spraying system to prevent materials from wind-blown or being washed away.</li> <li>▪ Different locations should be designated</li> </ul>	To minimise potential impacts of waste storage and enhance reusable volume	All works sites	Main Contractor	-		✓			Implemented

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
		to stockpile each material to enhance reuse.									
S.10.5.6.1		Waste hauliers must hold a valid permit for the collection of waste as stipulated in their permits. Removal of waste should be done in a timely manner.	To collect and remove waste generated	All works sites	Main Contractor	-		✓			Implemented
S.10.5.6.1		Implementation of trip-ticket system to monitor waste disposal and control fly-tipping. <ul style="list-style-type: none"> <li>▪ Set up warning signs at vehicular access points reminding drivers of designated disposal sites and penalties of an offence.</li> <li>▪ Installation of close-circuited television at access points of vehicles to monitor and prevent illegal dumping.</li> </ul>	To monitor disposal of waste and control fly-tipping	All works sites	Main Contractor	ETWB TC(W) No 31/2004		✓			Implemented
S.10.5.6.1		Wheel washing facilities should be provided before the trucks leave the works area.	To minimise dust impact	All works sites	Main Contractor	-		✓			Implemented
S.10.5.6.1		The Contractor should ensure the on-site separation from inert portion. The waste delivered to landfill should not contain any free water or have water content more than 70% by weight. The haulier must ensure suitable amount of waste would be loaded on different types of trucks used. A one-week notice should be given to EPD with information on Contractor's name and respective contact details.	To meet the requirement for disposal at landfill	All works sites	Main Contractor	-		✓			Implemented
S.10.5.6.1		If chemical wastes are produced at the construction site, the Contractor would be required to register with the EPD as a chemical waste producer and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Containers used for storage of chemical waste should : <ul style="list-style-type: none"> <li>▪ Be compatible with the chemical wastes being stored, maintained in good condition and securely sealed.</li> <li>▪ Have a capacity of less than 450 litres unless the specifications have been approved by EPD; and</li> </ul>	To properly store the chemical waste within works sites and works areas	All works sites	Main Contractor	Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes		✓			Implemented

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
		<ul style="list-style-type: none"> <li>Display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the Waste Disposal (Chemical Waste) (General) Regulation.</li> </ul>									
S.10.5.6.1		<p>The chemical storage areas should:</p> <ul style="list-style-type: none"> <li>Be clearly labelled to indicate corresponding chemical characteristics of the chemical waste and used for storage of chemical waste only.</li> <li>Be enclosed on at least 3 sides.</li> <li>Have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest.</li> <li>Have adequate ventilation.</li> <li>Be covered to prevent rainfall from entering.</li> <li>Be properly arranged so that incompatible materials are adequately separated.</li> </ul>	To prepare appropriate storage areas for chemical waste at works areas	All works sites	Main Contractor	Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes		✓			Implemented
S.10.5.6.1		Lubricants, waste oils and other chemical wastes would be generated during the maintenance of vehicles and mechanical equipments. Used lubricants should be collected and stored in individual containers which are fully labelled in English and Chinese and stored in a designated secure place.	To clearly label the chemical waste at works areas	All works sites	Main Contractor	Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes		✓			Implemented
S.10.5.6.1		A trip-ticket system should be operated in accordance with the Waste Disposal (Chemical Waste) (General) Regulation to monitor all movements of chemical waste. The Contractor should employ a licensed collector to transport and dispose of the chemical wastes, to either the approved CWTC at Tsing Yi, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.	To monitor the generation, reuse and disposal of chemical waste	All works sites	Main Contractor	Waste Disposal (Chemical Waste) (General) Regulation		✓			Implemented



EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
S.10.5.6.1		General refuse should be stored in enclosed bins or compaction units separate from C&D materials and chemical waste. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D materials and chemical wastes.	To properly store and separate from other C&D materials for subsequent collection and disposal	All works sites	Main Contractor	-		✓			Implemented
S.10.5.6.1		The recyclable component of general refuse, such as aluminium cans, paper and cleansed plastic containers should be separated from other waste. Provision and collection of recycling bins for different types of recyclable waste should be set up by the Contractor. The Contractor should also be responsible for arranging recycling companies to collect these materials.	To facilitate recycling of recyclable portions of refuse	All works sites	Main Contractor	-		✓			Implemented
S.10.5.6.1		The Contractor should carry out a training programme for workers in avoiding, reducing, reusing and recycling of materials generation. Posters and leaflets advising on the use of the bins should also be provided in the sites as reminders.	To raise workers' awareness on recycling issue	All works sites	Main Contractor	-		✓			Implemented
S.10.6.4		Chemical waste during the operation of the KTE project: <ul style="list-style-type: none"> <li>▪ The requirements stipulated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes should be followed in handling of chemical waste as in construction phase.</li> <li>▪ A trip-ticket system should be operated in accordance with the Waste Disposal (Chemical Waste) (General) Regulation to monitor all movements of chemical wastes which would be collected by a licensed collector to a licensed facility for final treatment and disposal.</li> <li>▪ The recommendations proposed for the mitigation of impacts from chemical waste in construction phase should also be followed.</li> </ul>	To avoid environmental impacts in handling, storage and disposal of chemical waste	Ventilation building and Stations	MTR Corporation	Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes, Waste Disposal (Chemical Waste) (General) Regulation			✓		Implemented
S.10.6.4		General refuse during the operation of the	To separate the general refuse from other waste	Ventilation building and	MTR Corporation	-			✓		Implemented

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
		KTE project: <ul style="list-style-type: none"> <li>Provide recycling bins at designated areas for proper recycling of papers, aluminium cans and plastics bottles.</li> <li>Separation from other waste types and collected by licensed collectors at daily basis to minimize the potential impacts from odour and vermin.</li> </ul>	types and proper disposal of the refuse	Stations							
S.10.6.4		Industrial waste during the operation of the KTE project: <ul style="list-style-type: none"> <li>Separation of reusable components like steel before collection by licensed collector</li> </ul>	To recycle useful materials from industrial waste and proper disposal	Ventilation building and Stations	MTR Corporation	-		✓			Implemented
<b>Hazard to Life</b>											
S.12.12.1, S.12.12.6	Section 12.10.2.1, Section 12.10.2.4	Improved truck design to reduce the amount of combustibles in, front exhaust spark arrester, 1 x 9 kg water based and 1 x 9 kg dry chemical powder fire extinguishers. This should be combined with monthly vehicle inspection.	To meet the ALARP requirement.	Temporary explosives magazine	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.1	Section 12.10.2.1	The explosive truck accident frequency should be minimized by implementing a dedicated training programme for both the driver and his attendants, including regular briefing sessions, implementation of a defensive driving attitude. In addition, drivers should be selected based on good safety record, and medical checks.	To meet the ALARP requirement.	-	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.1	Section 12.10.2.1	The contractor should as far as practicable combine the explosive deliveries for a given work area.	To meet the ALARP requirement.	-	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.1	Section 12.10.2.1	The explosive truck fire involvement frequency should be minimized by implementing a better emergency response and training to make sure the adequate fire extinguishers are used and attempt is made to evacuate the area of the incident or securing the explosive load if possible. All explosive vehicles should also be equipped with bigger	To meet the ALARP requirement.	-	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
		capacity AFFF-type extinguishers.									
S.12.12.1	Section 12.10.2.1	A minimum headway between two consecutive truck conveys of at least 10 min is recommended	To meet the ALARP requirement.	Along explosives transport routes	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.2	Section 12.10.2.2	Blasting activities including storage and transport of explosives should be supervised and audited by competent site staff to ensure strict compliance with the blasting permit conditions.	To ensure that the risks from the proposed explosives storage would not be unacceptable	Works areas at which explosives would be stored and/or used.	MTR Corporation/ Main Contractor	Dangerous Goods Ordinance		✓		-	To be implemented as per construction programme
S.12.12.1 & S.12.12.7.2	Section 12.10.2.1 & Section 12.10.2.5	Only the required quantity of explosives for a particular blast should be transported to avoid the return of unused explosives to the temporary magazine.  The number of return trips to the temporary magazine with the full load of explosives or partial load should be minimised by proper co-ordination between blasting and delivery.  If disposal is required for small quantities, disposal should be made in a controlled and safe manner by a Registered Shotfirer.	To reduce the risk during explosives transport.	Works areas at which explosives would be stored and/ or used.	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.5	Section 12.10.2.4	Use only experienced driver(s) with good safety record for explosive vehicle(s). Training should be provided to ensure it covers all major safety subjects.	To ensure safe transport of explosives.	At suitable location	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.5	Section 12.10.2.4	Develop procedure to ensure that parking space on the site is available for the explosives truck. Confirmation of parking space should be communicated to truck drivers before delivery.	To ensure that the risks from the proposed explosives storage would not be unacceptable	Temporary explosives magazine	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.3	Section 12.10.2.3	Delivery vehicles shall not be permitted to remain unattended within the temporary magazine site (or appropriately wheel-locked).	To reduce the risk of fire within the magazine	Temporary explosives magazine	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.3	Section 12.10.2.3	Good house-keeping within and outside of the temporary magazine to ensure that combustible materials (including vegetation)	To reduce the risk of fire	Temporary explosives	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
		are removed and not allowed to accumulate.	within the magazine	magazine	Main Contractor						programme
S.12.12.5	Section 12.10.2.4	Detonators shall not be transported in the same vehicle with other Class 1 explosives.	To reduce the risk of explosion during the transport of cartridged emulsion	-	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.2	Section 12.10.2.2	Emergency plan (i.e. temporary magazine operational manual) shall be developed to address uncontrolled fire in temporary magazine area. The case of fire near an explosive carrying truck in jammed traffic should also be covered. Drill of the emergency plan should be carried out at regular intervals.	To reduce the risk of fire.	Temporary explosives magazine and along explosives transport routes	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.2	Section 12.10.2.2	Adverse weather working guideline should be developed to clearly define procedure for transport explosives during thunderstorm.	To ensure safe transport of explosives.	Along explosives transport routes	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.2	Section 12.10.2.2	The magazine storage quantities need to be reported on a monthly basis to ensure that the two day storage capacity is not exceeded.	To reduce the risk within the magazine	Temporary explosives magazine	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.5	Section 12.10.2.4	During transport of the explosives within the tunnel, hot work should not be permitted in the vicinity of the explosives offloading or charging activities.	To ensure safe transport of explosives.	Along explosives transport routes	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.5	Section 12.10.2.4	Ensure that UN 1.4B packaging of detonators remains intact until handed over at blasting site.	To reduce the risk of explosion during the transport of detonator.	-	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.6	Section 12.10.2.4	Steel vehicle tray welded to a steel vertical fire screen should be mounted at least 150 mm behind the drivers cab and 100 mm from the steel cargo compartment, the vertical screen shall protrude 150 mm in excess of all three (3) sides of the steel cargo compartment	To reduce the risk during explosives transport.	-	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.10	Section	Ensure cartridged emulsion with high water	To ensure safe explosives	-	MTR Corporation/	-		✓		-	To be

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Objectives of Measures and Main Concern to Address	Location	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agent	Implementation status
							D	C	O		
	12.10.2.5	content should be preferred. Also, the emulsion with perchlorate formulation should be avoided.	to be used.		Main Contractor						implemented as per construction programme
S.12.12.3	Section 12.10.2.3	Traffic Management should be implemented within the temporary magazine site, to ensure that no more than 1 vehicle will be loaded at any time, in order to avoid accidents involving multiple vehicles within the site boundary. Based on the construction programme, considering that 6 trucks could be loaded over a peak 2 hour period, this is considered feasible.	To ensure that the risks from the proposed explosives storage and transport would not be unacceptable	Temporary explosives magazine	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.3	Section 12.10.2.3	The design of the fill slope close to the temporary magazine site should consider potential washout failures and incorporate engineering measures to prevent a washout causing damage to the temporary magazine stores	To ensure that the risks from the proposed explosives storage would not be unacceptable	Temporary explosives magazine	MTR Corporation/ Main Contractor/ Fill Bank Office	-		✓		-	To be implemented as per construction programme
S.12.12.2	Section 12.10.2.2	The security plan should address different alert security level to reduce opportunity for arson / deliberate initiation of explosives. The corresponding security procedure should be implemented with respect to prevailing security alert status announced by the Government.	To ensure that the risks from the proposed explosives storage would not be unacceptable	Temporary explosives magazine	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.3	Section 12.10.2.3	A suitable work control system should be introduced, such as an operational manual including Permit-to-Work system.	To ensure that the risks from the proposed explosives storage would not be unacceptable	Temporary explosives magazine	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme
S.12.12.3	Section 12.10.2.3	The magazine building shall be regularly checked for water seepage through the roof, walls or floor.	To ensure that the risks from the proposed explosives storage would not be unacceptable	Temporary explosives magazine	MTR Corporation/ Main Contractor	-		✓		-	To be implemented as per construction programme

Note: D = Design  
 C = Construction  
 O = Operation

## **Appendix E**

### **Calibration Details**

# ANDERSEN INSTRUMENTS INC.

## GS2310 Series Sampler Calibration

(Dickson Recorder)

Customer -> MTRC

SITE

Location -> Yee Fu Building

Date -> 18-Jan-12

Sampler -> 1294-1109

Tech -> Dennis Yeung

### CONDITIONS

Sea Level Pressure (hpa)	1013.5	Sampler Elevation (feet)	200
Sea Level Pressure (in Hg)	29.93	Corrected Pressure (mm Hg)	755.07
Temperature (deg C)	18	Temperature (deg K)	291.00
Seasonal SL Pressure (in Hg)	29.93	Corrected Seasonal (mm Hg)	755.07
Seasonal Temperature (deg C)	18.00	Seasonal Temperature (deg K)	291.00

### CALIBRATION ORIFICE

Make -> Andersen Instruments Inc.

Qstd Slope -> 2.0075

Model -> G25A

Qstd Intercept -> -0.03814

Serial# -> 1436

Date Certified ->

### CALIBRATION

	Plate or Test #	H <sub>2</sub> O (in)	Qstd (M <sup>3</sup> /min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
	1	18	13	1.831	60	60.520	Slope = 34.5832
	2	13	10	1.608	54	54.468	Intercept = -1.6728
	3	10	8	1.440	48	48.416	Corr. Coeff. = 0.9925
	4	7	5.1	1.154	40	40.347	
	5	5	3.2	0.918	28	28.243	

#### Calculations

$$Qstd = 1/m [\text{Sqrt} (H_2O (Pa/Pstd) (Tstd/Ta)) - b]$$

$$IC = I [\text{Sqrt} (Pa/Pstd) (Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m ((I) [\text{Sqrt} (298/Tav) (Pav/760)] - b)$$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



This is to certify that the above equipment has been calibrated in accordance with manufacturer's procedure.

# ANDERSEN INSTRUMENTS INC.

## GS2310 Series Sampler Calibration

(Dickson Recorder)

Customer -> MTRC

SITE

Location -> Fung Kei MPS

Date -> 18-Jan-12

Sampler -> 1294-1110

Tech -> Dennis Yeung

### CONDITIONS

Sea Level Pressure (hpa)	1012	Sampler Elevation (feet)	100
Sea Level Pressure (in Hg)	29.88	Corrected Pressure (mm Hg)	756.47
Temperature (deg C)	19	Temperature (deg K)	292.00
Seasonal SL Pressur (in Hg)	29.88	Corrected Seasonal (mm Hg)	756.47
Seasonal Temperatu: (deg C)	19.00	Seasonal Temperature(deg K)	292.00

### CALIBRATION ORIFICE

Make -> Andersen Instruments Inc.

Qstd Slope -> 2.0075

Model -> G25A

Qstd Intercept -> -0.03814

Serial# -> 1436

Date Certified ->

### CALIBRATION

	Plate or	H <sub>2</sub> O	Qstd	I	IC	LINEAR
	Test #	(in)	(M <sup>3</sup> /min)	(chart)	(corrected)	REGRESSION
1	18	11.8	1.744	60	60.473	Slope = 34.8147
2	13	9.5	1.566	56	56.441	Intercept = 1.0452
3	10	7.5	1.394	50	50.394	Corr. Coeff. = 0.9970
4	7	4.8	1.119	40	40.315	
5	5	2.8	0.859	30	30.236	

#### Calculations

$$Qstd = 1/m [\text{Sqrt} (H_2O (Pa/Pstd) (Tstd/Ta)) - b]$$

$$IC = I [\text{Sqrt} (Pa/Pstd) (Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m ((I) [\text{Sqrt} (298/Tav) (Pav/760)] - b)$$

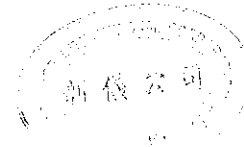
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



This is to certify that the above equipment has been calibrated in accordance with manufacturer's procedure.



# ANDERSEN INSTRUMENTS INC.

## GS2310 Series Sampler Calibration

(Dickson Recorder)

Customer -> MTRC

SITE

Location -> Queen Elizabeth Hospital

Date -> 18-Jan-12

Sampler -> 1294-1112

Tech -> Dennis Yeung

### CONDITIONS

Sea Level Pressure (hpa)	1015	Sampler Elevation (feet)	60
Sea Level Pressure (in Hg)	29.97	Corrected Pressure (mm Hg)	759.73
Temperature (deg C)	17	Temperature (deg K)	290.00
Seasonal SL Pressure (in Hg)	29.97	Corrected Seasonal (mm Hg)	759.73
Seasonal Temperature (deg C)	17.00	Seasonal Temperature (deg K)	290.00

### CALIBRATION ORIFICE

Make -> Andersen Instruments Inc.

Qstd Slope -> 2.0075

Model -> G25A

Qstd Intercept -> -0.03814

Serial# -> 1436

Date Certified ->

### CALIBRATION

	Plate or	H <sub>2</sub> O	Qstd	I	IC	LINEAR
	Test #	(in)	(M <sup>3</sup> /min)	(chart)	(corrected)	REGRESSION
1	18	12.6	1.811	57.5	58.278	Slope = 33.1191
2	13	10.2	1.631	52	52.703	Intercept = -1.7974
3	10	7.8	1.429	44	44.595	Corr. Coeff. = 0.9990
4	7	5	1.148	36	36.487	
5	5	3.1	0.908	28	28.379	

#### Calculations

$$Qstd = 1/m [\text{Sqrt} (H_2O (Pa/Pstd) (Tstd/Ta)) - b]$$

$$IC = I [\text{Sqrt} (Pa/Pstd) (Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m ((I) [\text{Sqrt} (298/Tav) (Pav/760)] - b)$$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



This is to certify that the above equipment has been calibrated in accordance with manufacturer's procedure.

# ANDERSEN INSTRUMENTS INC.

## GS2310 Series Sampler Calibration

(Dickson Recorder)

Customer -> MTRC

SITE

Location -> Finger Pier

Date -> 18-Jan-12

Sampler -> 694-0665

Tech -> Dennis Yeung

### CONDITIONS

Sea Level Pressure (hpa)	1015	Sampler Elevation (feet)	10
Sea Level Pressure (in Hg)	29.97	Corrected Pressure (mm Hg)	761.00
Temperature (deg C)	17	Temperature (deg K)	290.00
Seasonal SL Pressure (in Hg)	29.97	Corrected Seasonal (mm Hg)	761.00
Seasonal Temperature (deg C)	17.00	Seasonal Temperature (deg K)	290.00

### CALIBRATION ORIFICE

Make -> Andersen Instruments Inc.

Qstd Slope -> 2.0075

Model -> G25A

Qstd Intercept -> -0.03814

Serial# -> 1436

Date Certified ->

### CALIBRATION

	Plate or	H <sub>2</sub> O	Qstd	I	IC	LINEAR
	Test #	(in)	(M <sup>3</sup> /min)	(chart)	(corrected)	REGRESSION
1	18	13.2	1.855	58	58.833	Slope = 31.2959
2	13	10.5	1.656	54	54.776	Intercept = 2.3001
3	10	8.1	1.457	48	48.689	Corr. Coeff. = 0.9908
4	7	5.1	1.160	40	40.575	
5	5	3	0.894	28	28.402	

#### Calculations

$$Qstd = 1/m [\text{Sqrt} (H_2O (Pa/Pstd) (Tstd/Ta)) - b]$$

$$IC = I [\text{Sqrt} (Pa/Pstd) (Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m ((I) [\text{Sqrt} (298/Tav) (Pav/760)] - b)$$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



This is to certify that the above equipment has been calibrated in accordance with manufacturer's procedure.

# ANDERSEN INSTRUMENTS INC.

## GS2310 Series Sampler Calibration

(Dickson Recorder)

Customer -> MTRC

SITE

Location -> No. 238 Chatham Road North

Date -> 18-Jan-12

Sampler -> 894-0835

Tech -> Dennis Yeung

### CONDITIONS

Sea Level Pressure (hpa)	1014.5	Sampler Elevation (feet)	60
Sea Level Pressure (in Hg)	29.96	Corrected Pressure (mm Hg)	759.36
Temperature (deg C)	17.5	Temperature (deg K)	290.50
Seasonal SL Pressur (in Hg)	29.96	Corrected Seasonal (mm Hg)	759.36
Seasonal Temperatu: (deg C)	17.50	Seasonal Temperature(deg K)	290.50

### CALIBRATION ORIFICE

Make -> Andersen Instruments Inc.

Qstd Slope -> 2.0075

Model -> G25A

Qstd Intercept -> -0.03814

Serial# -> 1436

Date Certified ->

### CALIBRATION

	Plate or	H <sub>2</sub> O	Qstd	I	IC	LINEAR
	Test #	(in)	(M <sup>3</sup> /min)	(chart)	(corrected)	REGRESSION
1	18	12.2	1.780	56	56.694	Slope = 28.4402
2	13	9.9	1.606	52	52.645	Intercept = 6.2996
3	10	8	1.445	46	46.570	Corr. Coeff. = 0.9976
4	7	4.6	1.101	38	38.471	
5	5	2.8	0.863	30	30.372	

#### Calculations

$$Qstd = 1/m [\text{Sqrt} (H_2O (Pa/Pstd) (Tstd/Ta)) - b]$$

$$IC = I [\text{Sqrt} (Pa/Pstd) (Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m ((I) [\text{Sqrt} (298/Tav) (Pav/760)] - b)$$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



This is to certify that the above equipment has been calibrated in accordance with manufacturer's procedure.

# ANDERSEN INSTRUMENTS INC.

## GS2310 Series Sampler Calibration

(Dickson Recorder)

Customer -> MTRC

SITE

Location -> Ka Fu Building

Date -> 18-Jan-12

Sampler -> 994-0874

Tech -> Dennis Yeung

### CONDITIONS

Sea Level Pressure (hpa)	1013	Sampler Elevation (feet)	100
Sea Level Pressure (in Hg)	29.91	Corrected Pressure (mm Hg)	757.22
Temperature (deg C)	18	Temperature (deg K)	291.00
Seasonal SL Pressure (in Hg)	29.91	Corrected Seasonal (mm Hg)	757.22
Seasonal Temperature (deg C)	18.00	Seasonal Temperature (deg K)	291.00

### CALIBRATION ORIFICE

Make -> Andersen Instruments Inc.

Qstd Slope -> 2.0075

Model -> G25A

Qstd Intercept -> -0.03814

Serial# -> 1436

Date Certified ->

### CALIBRATION

Plate or Test #	H <sub>2</sub> O (in)	Qstd (M <sup>3</sup> /min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
1	18	13.2	1.847	60	60.606	Slope = 31.9321
2	13	10.7	1.665	54	54.546	Intercept = 1.7796
3	10	8.2	1.460	48	48.485	Corr. Coeff. = 0.9957
4	7	5.1	1.155	40	40.404	
5	5	3.3	0.933	30	30.303	

### Calculations

$$Qstd = 1/m [\text{Sqrt} (H_2O (Pa/Pstd) (Tstd/Ta)) - b]$$

$$IC = I [\text{Sqrt} (Pa/Pstd) (Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m ((I) [\text{Sqrt} (298/Tav) (Pav/760)] - b)$$

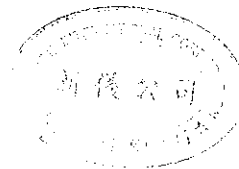
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



This is to certify that the above equipment has been calibrated in accordance with manufacturer's procedure.

**Balance Calibration Report**  
**Tested to MTRC Method WI/707M/01**

Laboratory Equipment Identification Number			BA0011		
Manufacturer	Sartorius	Model	A200S-**DIB	Serial No.	1065989
Capacity	120g	Discrimination	0.1mg	Type	Top Loading
Location	Concrete Testing Area		Temperature	24°C	

Reference Mass Set Used (Equip. ID. No.)		RM001	
Manufacturer	Troemner	OIML Classification	F1
Last Calibration Date	29-04-2002	Calibrated By	South China National Centre of Metrology

**(1) Repeatability of Reading**

Reference Mass (g)	Standard Deviation of Balance Reading (g)	Maximum Difference Between Successive Readings (g)
10	0.000094	0.0002
60	0.000079	0.0002
120	0.000042	0.0001

**Standard Deviation of the Balance = 0.000422 g**

**(2) Departure from Nominal Value**

Reading (g)	Correction (g)	Uncertainty (g)
09.9998	0.00020	±0.000301
19.9980	0.00025	
29.9999	0.00015	
39.9997	0.00043	
49.9998	0.00017	
59.9996	0.00032	
69.9996	0.00037	
79.9996	0.00042	
89.9996	0.00045	
99.9993	0.00050	

**Maximum Correction = 0.00050 g**

(3) **Off-Centre Loading**

A mass of approximately 10000g was moved to various position on the balance pan. The balance readings obtained at different position are given in the table.

Centre	Front	Back	Left	Right
59.9986	59.9984	59.9981	59.9987	59.9988

**Maximum Difference = 0.0007 g**

(4) **Hysteresis**

Load (g)	Hysteresis (g)
50	0.000367

(5) **Limit of Performance of the Balance =  $\pm 0.000783$  g**

Checked by :         Dick Lee              Certified by :         *[Signature]*          
 Date :         14-02-2011              Date :         14/2/2011        

**Notes:**

- 1.The balance has been tested according to the specifications laid down in Chapter 6 of the CSIRO Publication "The Calibration of Balances - by David B. Prowse".
- 2.Uncertainties quoted in this report have been estimated on the basis of there being not more than one chance in one hundred that any value differs from the true value by more than the stated uncertainty.
- 3.The Limit of Performance is the tolerance band within which all readings of the balance will fall.



## CALIBRATION CERTIFICATE

### Certificate Information

Date of Issue 15<sup>th</sup> June, 2011 Certificate Number MLCN110666S

### Customer Information

Company Name MTR Corporation Limited  
Address MTR Tower, Telford Plaza,  
33 Wai Yip St., Kowloon Bay,  
Kowloon,  
Hong Kong

### Unit Under Test (UUT)

Description Handheld Analyzer  
Manufacturer Brüel & Kjær  
Model Number Type 2250  
Serial Number 2731886  
Equipment Number -

### Calibration Result

- \* The exact manufacturer's specification is not available from the customer.
- \* Calibration data are detailed on the attached sheet(s).

### Approved By

*Fu*  
*Ken*

Laboratory Manager

- \* Calibration equipment used for this calibration are traceable to national / international standards.
- \* The results on this Calibration Certificate only relate to the values measured at the time of the calibration and the uncertainties quoted will not include allowance for the UUT long term drift, variation with environmental changes, vibration and shock during transportation, overloading, mishandling, misuse, and the capacity of any other laboratory to repeat the measurement.
- \* MaxLab Calibration Centre Limited shall not be liable for any loss or damage resulting from the use of the UUT.
- \* The copy of this Certificate is owned by MaxLab Calibration Centre Limited. No part of this Certificate may be reproduced without the prior written approval of MaxLab Calibration Centre Limited.



# MAXLAB

## CALIBRATION CERTIFICATE

### Certificate Information

Date of Issue  Certificate Number

### Calibration Status

Date of Calibration   
 Calibration Equipment Used   
 Calibration Procedure   
 Calibration Uncertainty

Calibration Condition	Lab	Temperature	23 °C ± 5 °C
		Relative Humidity	55% ± 25%
	UUT	Stabilizing Time	Over 3 hours
		Warm-up Time	10 minutes
		Supply Voltage	Internal battery

### Calibration Data

UUT Setting				UUT Rdg	Std Rdg	UUT Error
Frequency Weighted	Parameter	Response	Range (dB)			
A (1 kHz Input)	SPL	F	Auto	93.8 dB	94 dB	-0.2 dB
		S		93.8 dB	94 dB	-0.2 dB
		I		93.8 dB	94 dB	-0.2 dB
C (1 kHz Input)		F		93.8 dB	94 dB	-0.2 dB
		S		93.8 dB	94 dB	-0.2 dB
		I		93.8 dB	94 dB	-0.2 dB
A (1 kHz Input)		F		113.8 dB	114 dB	-0.2 dB
		S		113.8 dB	114 dB	-0.2 dB
		I		113.8 dB	114 dB	-0.2 dB
C (1 kHz Input)	F	113.8 dB	114 dB	-0.2 dB		
	S	113.8 dB	114 dB	-0.2 dB		
	I	113.8 dB	114 dB	-0.2 dB		



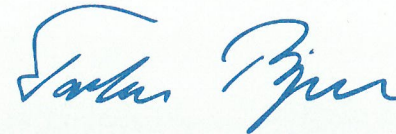
# MANUFACTURER'S CERTIFICATE OF CONFORMANCE

We certify that Brüel & Kjær **-2250-L--** Serial No. **2741136**  
has been tested and passed all production tests, confirming compliance with  
the manufacturer's published specification at the date of the test.

The final test has been performed using calibrated equipment, traceable to  
National or International Standards or by ratio measurements.

Brüel & Kjær is certified under ISO 9001:2008 assuring that all test data is  
retained on file and is available for inspection upon request.

Nærum 21-jan-2011



Torben Bjørn  
Vice President, Operations

Please note that this document is not a calibration certificate.  
For information on our calibration services please contact your nearest Brüel & Kjær office.



# MAXLAB

12 AUG 2011

## CALIBRATION CERTIFICATE

### Certificate Information

**Date of Issue** 15<sup>th</sup> June, 2011 **Certificate Number** MLCN110664S

### Customer Information

**Company Name** MTR Corporation Limited  
**Address** MTR Tower, Telford Plaza,  
 33 Wai Yip St., Kowloon Bay,  
 Kowloon,  
 Hong Kong

### Unit Under Test (UUT)

**Description** Sound Level Calibrator  
**Manufacturer** Brüel & Kjær  
**Model Number** 4231  
**Serial Number** 2309393  
**Equipment Number** -

### Calibration Result

- \* All calibration results within the manufacturer's specification.
- \* Calibration data are detailed on the attached sheet(s).

### Approved By

*Fw*  
*Ken*

Laboratory Manager

- \* Calibration equipment used for this calibration are traceable to national / international standards.
- \* The results on this Calibration Certificate only relate to the values measured at the time of the calibration and the uncertainties quoted will not include allowance for the UUT long term drift, variation with environmental changes, vibration and shock during transportation, overloading, mishandling, misuse, and the capacity of any other laboratory to repeat the measurement.
- \* MaxLab Calibration Centre Limited shall not be liable for any loss or damage resulting from the use of the UUT.
- \* The copy of this Certificate is owned by MaxLab Calibration Centre Limited. No part of this Certificate may be reproduced without the prior written approval of MaxLab Calibration Centre Limited.



# MAXLAB

## CALIBRATION CERTIFICATE

### Certificate Information

**Date of Issue** 15<sup>th</sup> June, 2011 **Certificate Number** MLCN110664S

### Calibration Status

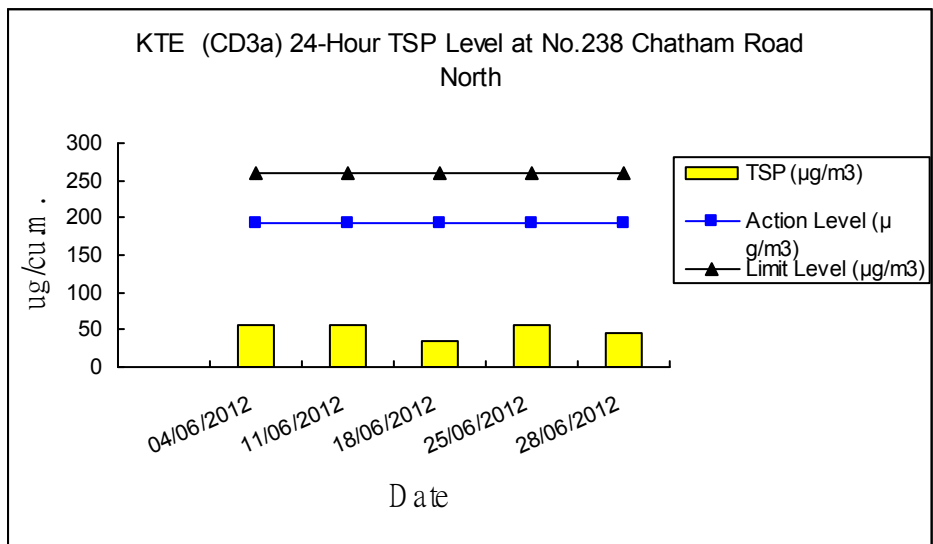
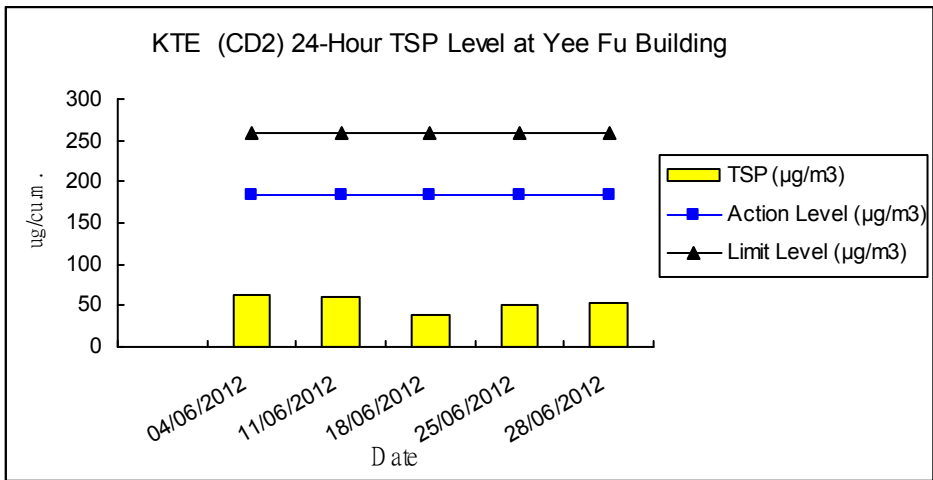
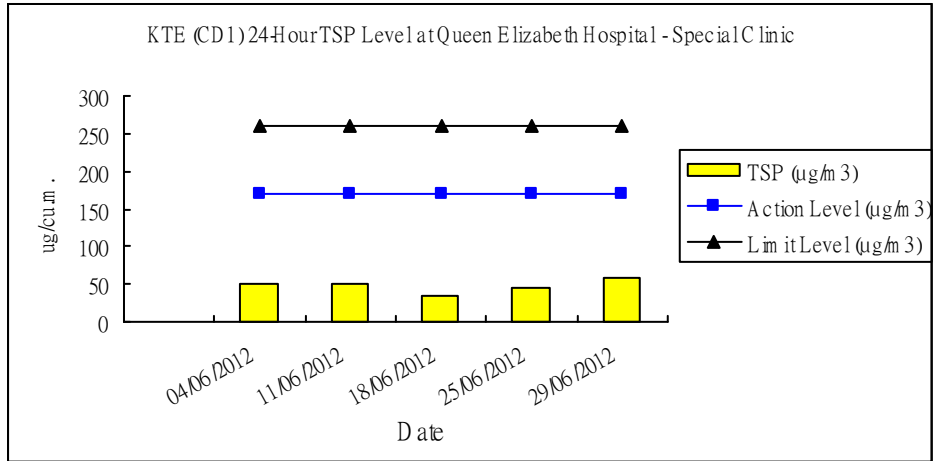
<b>Date of Calibration</b>	15 <sup>th</sup> June, 2011		
<b>Calibration Equipment Used</b>	4231 (MLTE008)/ C1002184/ 8 <sup>th</sup> Mar 2012 1351 (MLTE049)/ MLEC11/06/04/ 15 <sup>th</sup> Jun 2012		
<b>Calibration Procedure</b>	MLCG00 & MLCG15.		
<b>Calibration Uncertainty</b>	± 0.1 dB		
<b>Calibration Condition</b>	<b>Lab</b>	<b>Temperature</b>	23 °C ± 5 °C
		<b>Relative Humidity</b>	55% ± 25%
	<b>UUT</b>	<b>Stabilizing Time</b>	Over 3 hours
		<b>Warm-up Time</b>	Not applicable
		<b>Supply Voltage</b>	Internal battery

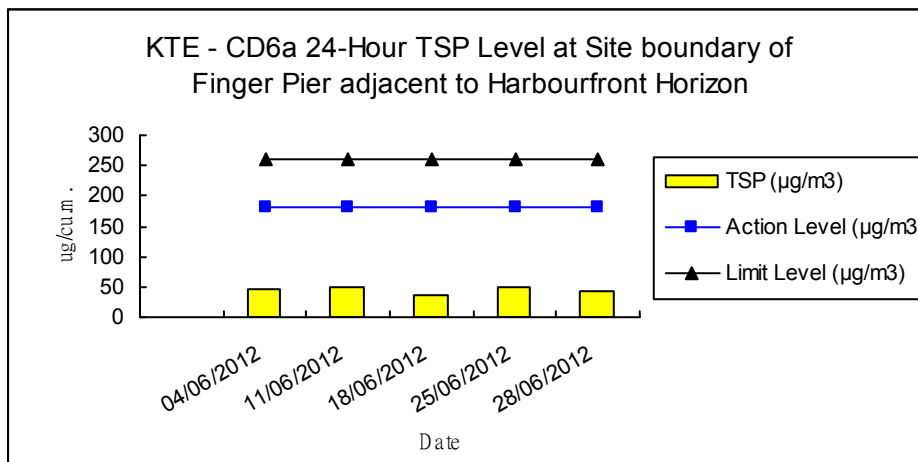
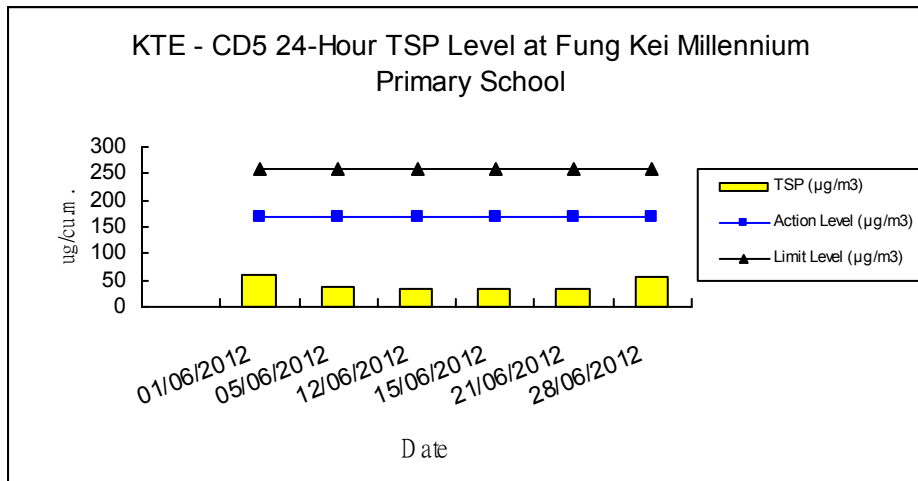
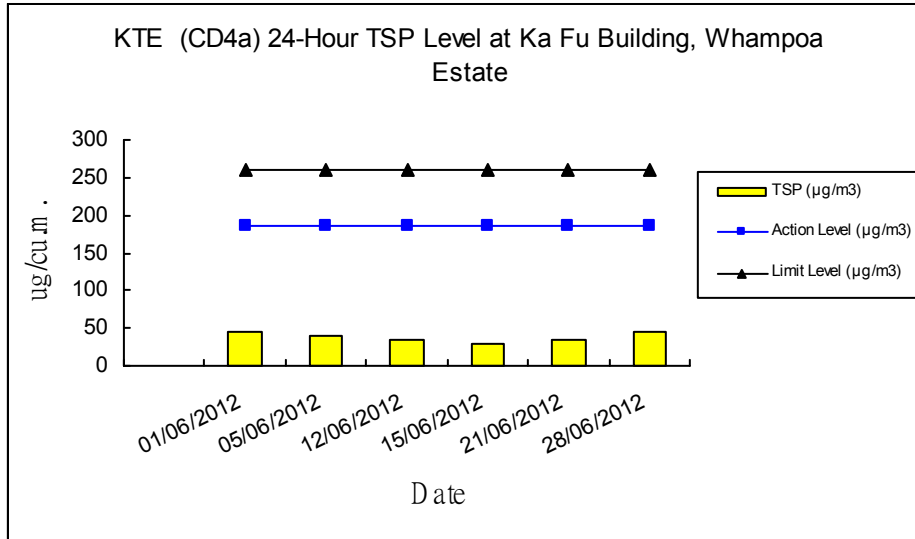
### Calibration Data

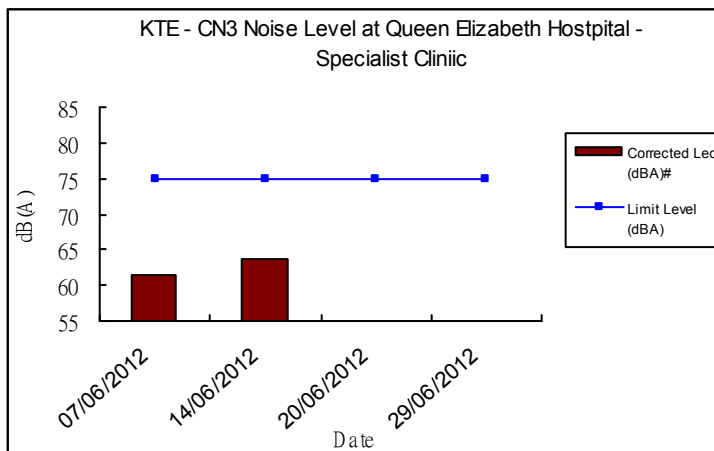
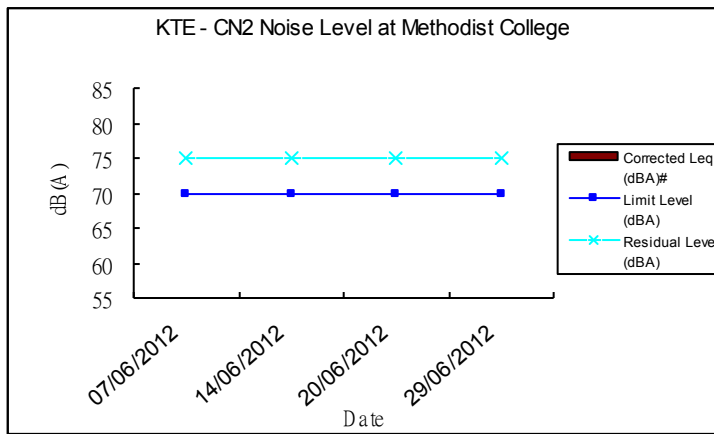
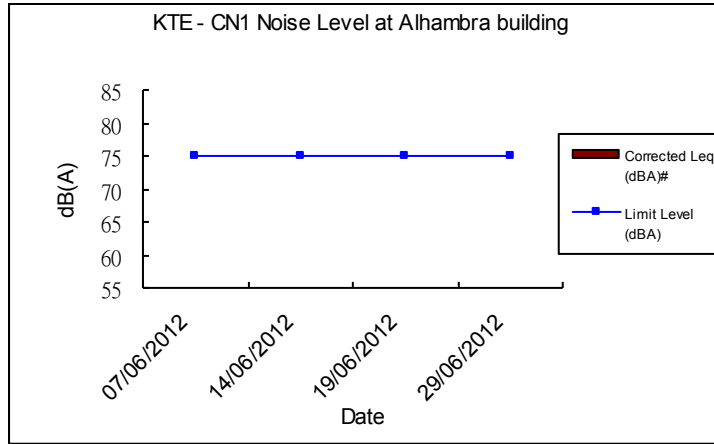
UUT Setting	STD Rdg	UUT Error	UUT Error Limit
94 dB	94.0 dB	0.0 dB	0.2 dB
114 dB	114.0 dB	0.0 dB	0.2 dB

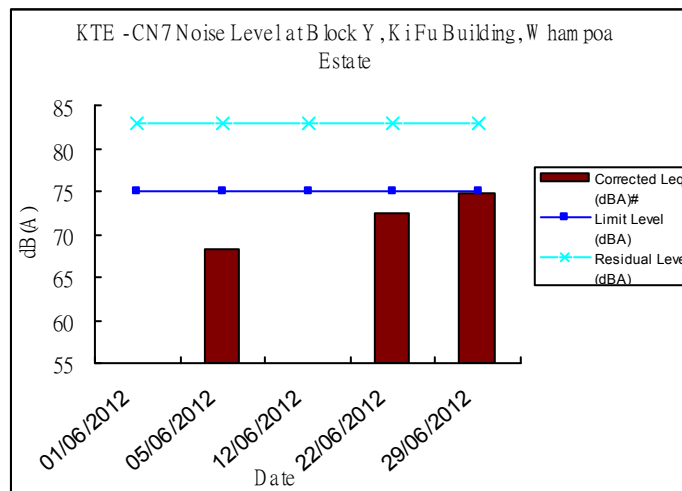
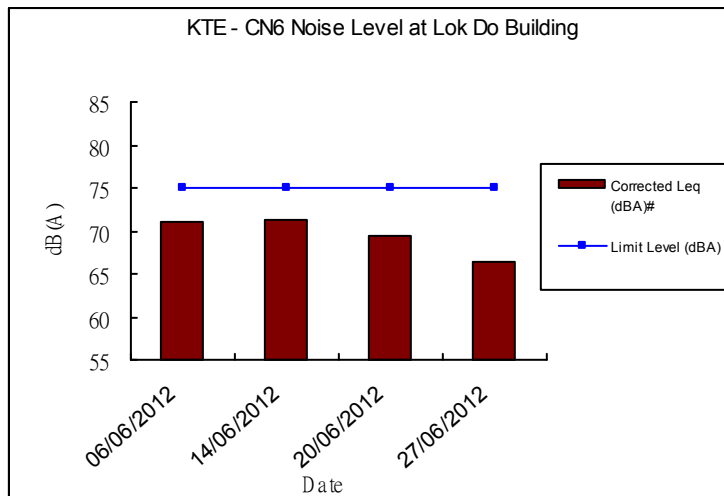
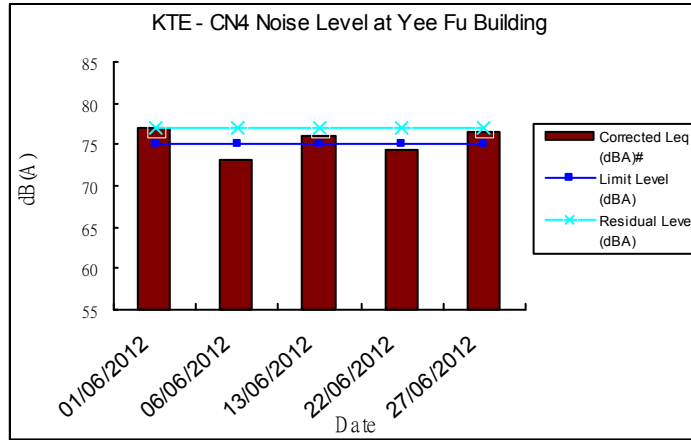
## **Appendix F**

### **Impact Monitoring Graphical Plots**

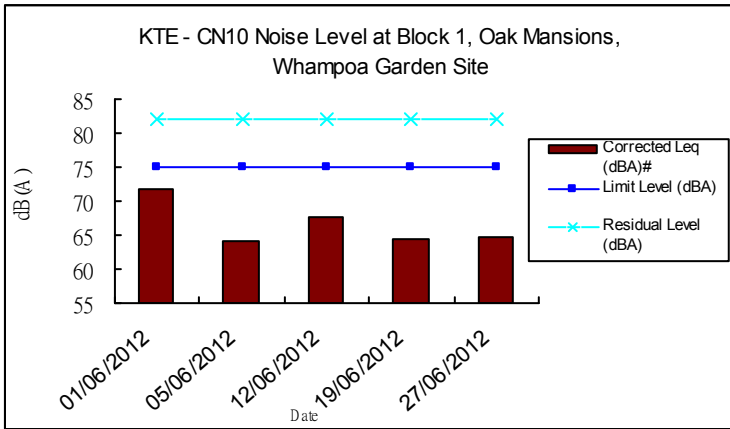
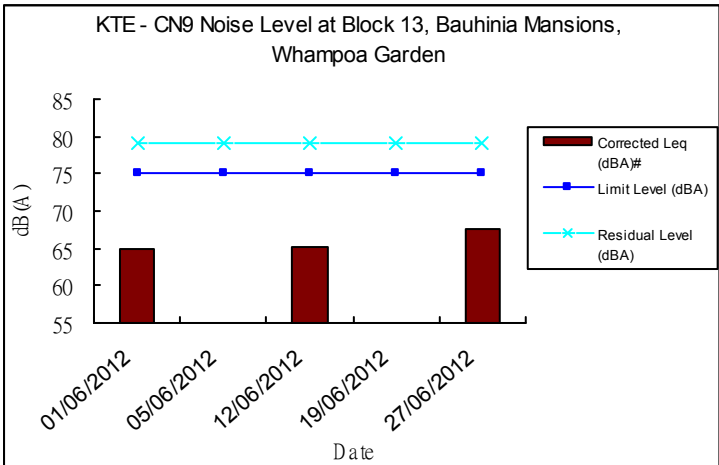
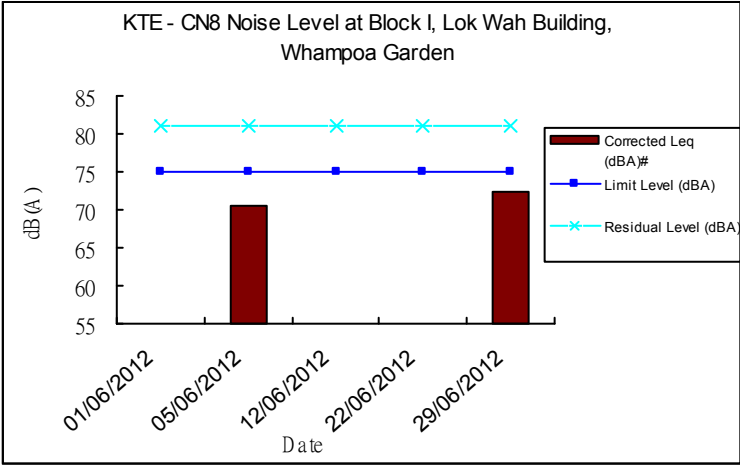


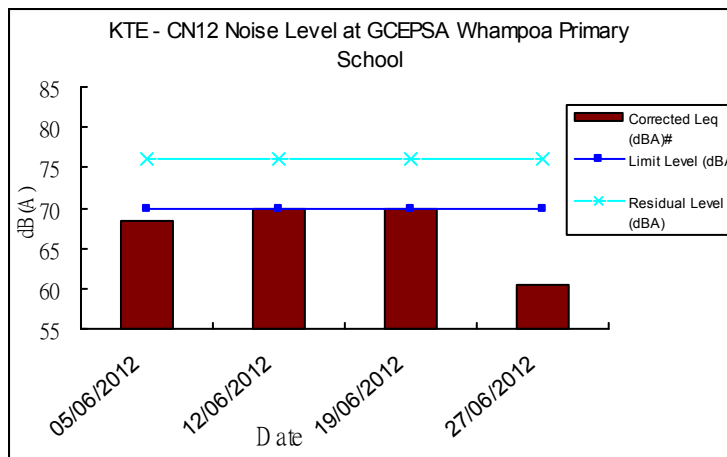
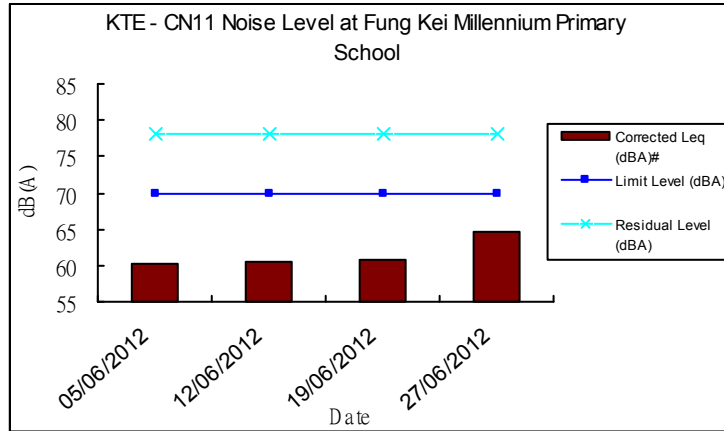












# As some of the measured Leq is lower than the baseline level, correction against baseline level cannot be applied.

## **Appendix G**

### **Monitoring Schedule for the Present and Next Reporting Period**

<b>Dust Monitoring Schedule for June 2012</b>					
CD1	CD2	CD3a	CD4a	CD5	CD6a
4/6/2012	4/6/2012	4/6/2012	1/6/2012	1/6/2012	4/6/2012
11/6/2012	11/6/2012	11/6/2012	5/6/2012	5/6/2012	11/6/2012
18/6/2012	18/6/2012	18/6/2012	12/6/2012	12/6/2012	18/6/2012
25/6/2012	25/6/2012	25/6/2012	15/6/2012	15/6/2012	25/6/2012
28/6/2012	28/6/2012	28/6/2012	21/6/2012	21/6/2012	28/6/2012
NA	NA	NA	28/6/2012	28/6/2012	NA
<b>Tentative Dust Monitoring Schedule for July 2012</b>					
CD1	CD2	CD3a	CD4a	CD5	CD6a
3/7/2012	3/7/2012	3/7/2012	3/7/2012	3/7/2012	3/7/2012
10/7/2012	10/7/2012	10/7/2012	10/7/2012	10/7/2012	10/7/2012
16/7/2012	16/7/2012	16/7/2012	16/7/2012	16/7/2012	16/7/2012
23/7/2012	23/7/2012	23/7/2012	23/7/2012	23/7/2012	23/7/2012
27/7/2012	27/7/2012	27/7/2012	27/7/2012	27/7/2012	27/7/2012

<b>Noise Monitoring Schedule for June 2012</b>										
CN1	CN2	CN3	CN4	CN6	CN7	CN8	CN9	CN10	CN11	CN12
NA	NA	NA	1/6/2012	NA	1/6/2012	1/6/2012	1/6/2012	1/6/2012	NA	NA
7/6/2012	7/6/2012	7/6/2012	6/6/2012	6/6/2012	5/6/2012	5/6/2012	5/6/2012	5/6/2012	5/6/2012	5/6/2012
14/6/2012	14/6/2012	14/6/2012	13/6/2012	14/6/2012	12/6/2012	12/6/2012	12/6/2012	12/6/2012	12/6/2012	12/6/2012
19/6/2012	20/6/2012	20/6/2012	22/6/2012	20/6/2012	22/6/2012	22/6/2012	22/6/2012	19/6/2012	19/6/2012	19/6/2012
29/6/2012	29/6/2012	29/6/2012	27/6/2012	27/6/2012	29/6/2012	29/6/2012	27/6/2012	27/6/2012	27/6/2012	27/6/2012

<b>Tentative Noise Monitoring Schedule for July 2012</b>										
CN1	CN2	CN3	CN4	CN6	CN7	CN8	CN9	CN10	CN11	CN12
4/7/2012	4/7/2012	4/7/2012	4/7/2012	4/7/2012	3/7/2012	3/7/2012	3/7/2012	3/7/2012	3/7/2012	3/7/2012
11/7/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012	11/7/2012
18/7/2012	18/7/2012	18/7/2012	18/7/2012	18/7/2012	18/7/2012	18/7/2012	18/7/2012	18/7/2012	18/7/2012	18/7/2012
25/7/2012	25/7/2012	25/7/2012	25/7/2012	25/7/2012	24/7/2012	24/7/2012	24/7/2012	24/7/2012	24/7/2012	24/7/2012
31/7/2012	31/7/2012	31/7/2012	31/7/2012	31/7/2012	31/7/2012	31/7/2012	31/7/2012	31/7/2012	31/7/2012	31/7/2012

Remarks:

The schedule may be changed due to unforeseen circumstances (adverse weather, etc)

## **Appendix H**

### **Complaint Report**

**MTR Project – Kwun Tong Line Extension**

**Report for Complaint / Concern**

**Ref: KTE/EC/005, KTE/EC/006 and KTE/EC/007**

**RECIPIENT**

Name: Environmental Team

Details: The complaint received from MTRC hotline managed by MTRC Corporate Relations

Received Date: 1, 2 and 4 /6/2012

Received Time: NA

**COMPLAINANT / CONCERN**

Name: Ms Chan (Harbourfront Landmark), Mr Wong (Harbourfront Landmark) and Mr Tsang (Whampoa Garden) respectively

Tel: NA

Address: Harbourfront Landmark and Whampoa Garden

**COMPLAINT**

- Noise**     **Air quality / Dust**     **Water**     **Environment**     **Traffic / Pedestrian**  
 **Safety**     **Others**

**Event Date and Time: NA**

**Location: Harbourfront Landmark and Whampoa Garden**

**INVESTIGATION RESULTS & MITIGATION MEASURES**

**Investigation**

To follow up the complaint cases, jointly investigation was conducted by ET and the contractor. The ET believed the noise impact was predominantly attributed to the rock drilling / coring activities at Wan Hoi Street work areas. The JV was urged to further improve the measures to reduce noise impact.

**Proposed Mitigation Measures**

1. Loose acoustic blanket should be tightly tied on the I-Beam of the gantry.
2. Overlapping arrangement between each pieces of acoustic mat
3. It was proposed to hanging additional layer of acoustic mat at higher position. Such that the transmission path from the drill mast to the NSR can be shielded.
4. Temporary noise enclosure would be setup to cover the whole rock drilling / coring activities to further minimize the noise impact.

**Verification of follow up actions:**

5. Proposed corrective actions have been completed and the noise level at NSR nearby was measured by the Contractor to be 73.2 dB(A) which complied with the residual level.
6. ET has conducted additional noise monitoring at CN12, GCE Whampoa Primary School, with the setup of corrective measures on 12 June 2012. The measured noise level with correction was 70 dB(A) which complied with the limit level.

## **Appendix I**

### **Review Plan for Operational Groundborne Noise for KTE (April 2012)**

Environmental Protection Department  
28th floor, Southorn Centre,  
130 Hennessy Road, Wan Chai,  
Hong Kong

Your ref :

Attention: Mr. Keith Lam

Our ref.: C10009-COR-ENVM-ENV-011609

27 April, 2012

**BY HAND**

Dear Mr. Lam,

**Kwun Tong Line Extension**  
**Environmental Permit No. EP-399/2010/A**  
**Environmental Permit Condition 4.1 – Review Plan for Operational Groundborne Noise for KTE**

I refer to your letter dated 27 March 2012 regarding your comments on the captioned submission.

Please find attached 5 hard copies of the revised Review Plan for Operational Groundborne Noise for KTE (April 2012) with the Response-to-Comment sheet for your perusal. The report has been certified by the ET Leader and verified by the IEC.

Should you have any queries regarding the above, please feel free to contact our William Chan (Tel 3940 3347).

Yours sincerely,



Richard Kwan  
Environment Manager

Encl.

c.c. Arup - Attn: Mr. Jacky Chan (w/encl.) by fax: 2268-3950  
ERM - Attn: Ms. Mandy To (w/encl.) by fax: 2723-5660

b.c.c. CM-Civil - Kenny Kong (w/ encl.)  
DM-KTE - Lawrence Chung (w/ encl.)



**Response to Comments**  
**KWUN TONG LINE EXTENSION (KTE) CONDITION 4.1 – REVIEW PLAN (FEBRUARY 2012) FOR THE REVIEW OF**  
**THE PROPOSED MITIGATION MEASURES FOR OPERATIONAL GROUND BORNE NOISE (INCLUDING THE VERIFICATION OF THE LINE SOURCE RESPONSE**  
**AND GROUND VIBRATION CONDITION) ASSUMED IN THE EIA REPORT**

H:\Team\EM\GMS Projects\0132172 C10010 Env Term Consultancy for WIL, SIL (E) & KTE\04 Deliverables\02 As Issued\03 KTE\Service Order 005\20120424\_Revised Plan to MTR\11049-13 KTE GBN  
Review Plan EPD RTC r6 (MTR).doc

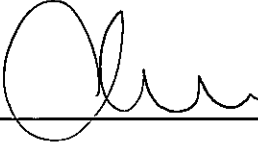
No.	Department	Reference	Comments	Consultants' Response
1.	EPD	C10009-COR-ENVM-ENV-011526 dated 27 Mar 2012	<p>We refer to MTRC's letter dated 29 February 2012, enclosing R-to-C to our comments dated 30.1.12 and the subject Plan.</p> <p>2. According to the information from MTRC, "The proposed test sites in this Review Plan are tentatively only and could be varied as the construction work advance...", and the drill rig vibration measurement before tunnel completion is "to generate needed site-specific information. Additional hammer impact test will be considered based on the measurement results."</p>	Noted.
2.			<p>3. We have advised on 31.1.12 that we have no objection to the proposed testing method and the testing location NSR26. In view of the above said and that further verification of the ground condition and soil mobility data (PSR) after tunnel construction works would be conducted, we therefore also have no objection to the proposed additional test locations (i.e. NSR12 and NSR14) with drill rig vibration measurement during tunnel excavation stage, which is for determining whether additional hammer impact test location(s)/test(s) is (are) required or not.</p>	Noted.
3.			<p>4. Notwithstanding the above, since there could be further information collected by MTRC during/after tunnel excavation works (e.g. site specific information/update on the ground conditions/line source response data, suitability and/or availability of further tests/test locations), we consider that the Review Plan required under EP Condition 4.1 within one month of the completion of KTE tunnel excavation is still required and to re-confirm whether additional hammer impact test location(s)/test(s) is (are) required or not. Please state this EP requirement in the subject Plan and address the EP requirement for Review Plan within one month of the completion of KTE tunnel excavation.</p>	<p>The reason to submit the Review Plan at this stage is to allow adequate time for vibration tests before tunnel completion (i.e. can do the tests earlier when tunnel excavation reaches NSR 12, 14, and 26) and reporting of the results to fulfil EP condition 4.2 in a short time frame. There have been enough geotechnical information obtained as a result of earlier GI and hence expect that no further site-specific information can be obtained during KTE tunnel excavation unless we are agreed to conduct the hammer impact test and drill rig measurements as suggested above in advance.</p> <p>Notwithstanding the above, the EP requirement is stated in the subject Plan and will be addressed accordingly.</p>
4.			<p>5. Our other observations are provided as below:</p>	Section 2 last paragraph was revised accordingly.

No.	Department	Reference	Comments	Consultants' Response
			(i) Section 2 last paragraph - drill rig vibration measurement should also be mentioned.	
5.			(ii) Section 5 Testing procedures - the test procedure of the drill rig measurement should also be mentioned for the sake of completeness. A schematic drawing showing the configuration of the drill rig measurement/test should also be included.	Section 5 was revised accordingly and schematic drawings were included.
6.			(iii) There is no location plan in the subject Plan for NSR12 and NSR14.	Location plans for NSR12 and NSR14 are shown in <i>Figures 4.4</i> and <i>4.5</i> .
7.			(iv) Section 4.3 - The statement " <i>if large soil mobility is observed from the drill rig vibration measurements....</i> " is unclear. The proponent should clearly define the criteria for additional hammer impact test(s) (e.g. by validation of the LSR values and hence the operational ground borne noise level adopted in the KTE EIA etc.) The Review Plan required by EP Condition 4.1 within one month of the completion of KTE tunnel excavation is still required and to re-confirm whether additional hammer impact test location(s)/test(s) is required or not.	As the LSR is indirectly determined from drill rig vibration, it is proposed to reserve a 10dB safety factor. If the updated prediction is less than 10dB below the groundborne noise criteria, further impact test would be considered. Section 4.3 was revised accordingly.
8.			(v) The Review Plan shall be certified by the ET Leader (and verified by the IEC), currently is the person mentioned in MTRC's letter [Ref.: KTE-COR-ENVM-ENV-011167] dated 19.9.11.	Noted.

MTR Corporation Limited

Kwun Tong Line Extension (KTE)

Review Plan for Operational Groundborne Noise for  
KTE (April 2012)

Verified by:  \_\_\_\_\_

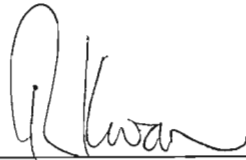
Position: Independent Environmental Checker

Date: 27 Apr 2012

MTR Corporation Limited

Kwun Tong Line Extension (KTE)

Review Plan for Operational Groundborne Noise for  
KTE (April 2012)

Certified by:  \_\_\_\_\_

Position: Environmental Team Leader

Date: 27 APR 2012

MTR Corporation Limited

Consultancy Agreement No.  
C10010 – Environmental Term  
Consultancy for WIL, SIL(E) and  
KTE:

*Review Plan for Operational  
Groundborne Noise for KTE*

April 2012

**Environmental Resources Management**

21/F Lincoln House  
979 King's Road  
Taikoo Place  
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<http://www.erm.com>

MTR Corporation Limited

Consultancy Agreement No.  
C10010 – Environmental Term  
Consultancy for WIL, SIL(E) and  
KTE:

*Review Plan for Operational  
Groundborne Noise for KTE*

April 2012

Reference 0132172

For and on behalf of ERM-Hong Kong, Limited
Approved by: <u>Frank Wan</u>
Signed: <u></u>
Position: <u>Partner</u>
Date: <u>24 April 2012</u>

This report has been prepared by ERM-Hong Kong, Limited with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.

## CONTENTS

1	<b>INTRODUCTION</b>	1
1.1	<b>BACKGROUND</b>	1
1.2	<b>PURPOSE OF THIS REPORT</b>	1
2	<b>EIA PREDICTION METHODOLOGY</b>	3
3	<b>NOISE SENSITIVE RECEIVERS</b>	5
4	<b>TESTING LOCATION</b>	7
4.1	<b>TESTING LOCATION SELECTION CRITERIA</b>	7
4.2	<b>HAMMER IMPACT TEST AT NSR26</b>	7
4.3	<b>DRILL RIG VIBRATION MEASUREMENT AT NSR12 AND NSR14</b>	7
4.4	<b>PREVIOUS GROUND-BORNE NOISE MEASUREMENT AT NSR2</b>	8
5	<b>TESTING PROCEDURES</b>	9
5.1	<b>HAMMER IMPACT TEST PROCEDURES</b>	9
5.2	<b>DRILL RIG VIBRATION MEASUREMENT PROCEDURES</b>	10
6	<b>INSTRUMENTATION</b>	11
7	<b>STAFFING</b>	13
8	<b>PROGRAMME</b>	15
8.1	<b>HAMMER IMPACT TEST PROGRAMME</b>	15
8.2	<b>DRILL RIG VIBRATION MEASUREMENT PROGRAMME</b>	15

## LIST OF FIGURES

FIGURE 4.1	<b>IMPACT TEST LOCATION AT NSR 26 - WING FU BUILDING</b>
FIGURE 4.2	<b>ACCELEROMETER AND IMPACT POSITION AT NSR 26 - WING FU BUILDING</b>
FIGURE 4.3	<b>ACCELEROMETER POSITION AT NSR26 - WING FU BUILDING</b>
FIGURE 4.4	<b>DRILL RIG VIBRATION MEASUREMENT LOCATION AT NSR 12 - PLANNED PRIMARY SCHOOL</b>
FIGURE 4.5	<b>IMPACT TEST LOCATION AT NSR 14 - SHUN MAN HOUSE</b>
FIGURE 5.1	<b>SCHEMATIC SKETCH OF HAMMER IMPACT TEST AT NSR 26</b>
FIGURE 5.2	<b>SCHEMATIC SKETCH OF VIBRATION MEASUREMENT AT NSR 12</b>
FIGURE 5.3	<b>SCHEMATIC SKETCH OF VIBRATION MEASUREMENT AT NSR 14</b>

***LIST OF TABLES***

***TABLE 3.1 KTE OPERATIONAL GROUNDBORNE NOISE SENSITIVE RECEIVERS***

***TABLE 4.1 GROUND CONDITIONS AND TRACKFORM TYPE AT NSR2 AND PROPOSED MEASUREMENT LOCATIONS***

***TABLE 6.1 INSTRUMENTS TO BE USED IN THE IMPACT TEST AND DRILL RIG VIBRATION MEASUREMENT***



# **1 INTRODUCTION**

## **1.1 BACKGROUND**

The Kwun Tong Line Extension (KTE) is a ~2.6km extension of the existing MTR Kwun Tong Line service from Yau Ma Tei (YMT) Station to a new terminus station at Whampoa via Ho Man Tin Station (HOM). The HOM Station will serve as an intermediate station with the proposed Shatin to Central Link (SCL) which is a concurrent project. A crossover is located at east side of HOM Station with a turnback siding immediately beyond the crossover.

The Environmental Impact Assessment (EIA) Report was approved on 19 August 2010, Register No.: AEIAR-154/2010. According to Condition 4.1 of the Environmental Permit (EP-399/2010/A), the Permit Holder shall deposit a Review Plan for the review of the proposed mitigation measure for operational ground-borne noise (including the verification of the Line Source Response and ground vibration condition) assumed in the EIA Report.

ERM was commissioned by MTRCL to prepare the Review Plan. ERM was supported by Wilson Acoustics Limited who acts as the ground-borne noise specialist.

## **1.2 PURPOSE OF THIS REPORT**

This Review Plan presents the proposed methodology for verification of the line source response (LSR) and ground vibration condition during the construction phase of the KTE with a view to review the effectiveness of the operational ground-borne noise mitigation measures proposed in the approved KTE EIA Report.

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According to the approved KTE EIA Report, the methodology for the vibration and ground-borne railway noise impact assessment was based on the procedures outlined in *The Transit Noise and Vibration Impact Assessment* published by US Department of Transportation Federal Transit Administration (FTA Manual) for detailed vibration analysis. The ground-borne noise level at the identified NSRs was calculated based on:

$$L = FDL + TIL + TOC + TCF + LSR + BCF + BVR + CTN + SAF$$

where:

L = ground-borne noise level, in dB re 20 $\mu$ Pa

FDL = Force density level, in dB re 1N/m<sup>0.5</sup>

TIL = trackform attenuation or insertion loss, relative level

TOC = turnout and crossover factor

TCF = vibration coupling between the tunnel and the ground for soil based tunnels, relative level

LSR = line source transfer mobility, in dB re 10<sup>-9</sup> (m/s)/(N/m<sup>0.5</sup>)

BCF = adjustment to account for building coupling loss, in dB

BVR = building vibration amplification within the structure, in dB

CTN = conversion from vibration to noise within the building, in dB

SAF = 10dB safety factor to account for wheel/rail condition and uncertainties in ground conditions, in dB

During the EIA stage, *in situ* LSR was not measured. According to S8.5.2.22-24, Table 8.8 and 8.9 of the EIA Report of KTE, a significant section of the West Island Line (WIL) project is considered similar to KTE in ground conditions. Therefore, the LSR data collected from borehole impact test during the EIA stage of WIL project were adopted.

This Review Plan presents the proposed methodology for the review of the ground-borne noise prediction presented in the approved EIA Report. Drill rig vibration measurement and hammer impact test at the tunnel invert will be conducted to verify the LSR.

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A total of 31 ground-borne noise sensitive receivers (NSRs) were identified in the approved KTE EIA Report. Their predicted ground-borne noise levels are shown in *Table 3.1*.

**Table 3.1** *KTE Operational Ground-borne Noise Sensitive Receivers*

No.	NSR	Predicted Leq,30min, dB(A) <sup>(a)</sup>		Criteria, Leq,30min, dB(A)	
		Day	Night	Day	Night
1	Kam Wah Building	42	38	55	45
2	New King's Hotel	<u>45</u>	<u>42</u>	<u>55</u>	<u>45(c)</u>
3	Tin Hau Temple	28	25	55	45
4	Tang's Mansion	41	38	55	45
5	Alhambra Building	28	25	55	45
6	Methodist College	44	-	55	-(d)
7	Eaton Hotel	30	27	55	45
8	Labour Tribunal	28	-	55	-
9	Diocesan Girl's Junior School	42	-	55	-
10	School of General Nursing	<20	-	50	-
11	Queen Elizabeth Hospital-Special Clinic	<20	<20	50	40
12	Primary School at 10-12 Wylie Road (Planned NSR)	43	-	50	-
13	Parc Palais Block 3	<20	<20	50	40
14	Shun Man House, Oi Man Estate	31	28	55	45
15	SKH Holy Trinity Church Secondary School	<20	-	55	-
18	Yee Fu Building	<20	<20	55	45
20	Caritas Bianchi College of Careers	27	-	55	-
21	Lok Ka House	<20	<20	55	45
24	Top Growth Court	37	36	55	45
25	36 Wuhu Street	38	38	55	45
26	Block R, Wing Fu Building, Whampoa Estate	<u>42</u>	<u>42</u>	<u>55</u>	<u>45(c)</u>
29	Block 9, Bauhinia Mansions, Whampoa Garden Site 11	29	29	55	45
30	Block 1, Cherry Mansions, Whampoa Garden Site 2	35	35	55	45
34	Fung Kei Millennium Primary	25	-	55	-

No.	NSR	Predicted Leq,30min, dB(A) <sup>(a)</sup>		Criteria, Leq,30min, dB(A)	
		Day	Night	Day	Night
	School				
35	GCEPSA Whampoa Primary School	24	-	55	-
36	Harbourfront Landmark	<20	<20	55	45
40	Ho Man Tin Station Development (Planned Future NSR)	39	36	55	45
41	Dormitory for The Hong Kong Polytechnics University (Planned Future NSR)	<20	<20	55	45
44	Yue Sun Mansion 191A Wuhu Street	38	36	55	45
45	271-273 Chatham Road North	24	21	55	45
62	Wing Fung Building	<20	<20	55	45

**Notes:**

- (a) A 10dB(A) safety factor was included in the predicted ground-borne noise level in the EIA. Therefore 15dB safety margin means a difference of 5dB between the noise criteria and EIA predicted noise level.
- (b) The EIA predicted ground-borne noise levels were based on Type 1 trackform with 25kN/mm baseplates, except the existing track near YMT, where stiffer baseplates of 60kN/mm are used.
- (c) NSRs with less than 15dB prediction safety factors are highlighted in bold and underlined.
- (d) Night-time criteria are not applicable to some of the NSRs with no noise sensitive use for the intended purpose at night.

## 4 TESTING LOCATION

### 4.1 TESTING LOCATION SELECTION CRITERIA

The following criteria have been taken into consideration in the selection of appropriate testing locations:

- *Relatively high ground-borne noise levels predicted* - LSR in different ground conditions could have 10-15dB variation. *In situ* hammer impact tests or vibration verification measurement shall be considered for NSRs with less than 15dB safety margin.
- *Ground condition* - The KTE tunnel will pass through mostly granite rock while a small portion of the tunnel will be located in soil.
- *Ambient vibration* - Ambient vibration arises from road traffic, train operation at Tsuen Wan Line (TWL), etc. At some locations the vibration signal produced by the hammer impact may be masked by ambient vibration, making it difficult to verify the LSR. Locations with lower ambient vibration are preferred.
- *Accessibility* - The testing locations shall allow fairly easy access into the tunnel for testing, and there are appropriate positions for fixing the vibration transducers at the receiver's side. Approval of site access by the land owner should also be sought where necessary.

Based on these criteria, a total of one testing location for hammer impact test and two locations for drill rig vibration measurement have been proposed. The proposed test sites in this Review Plan are tentative only and could be varied as the construction works advance. If additional hammer impact test locations are considered justified based on the results of the proposed drill rig vibration measurement, the Permit Holder will submit a revised Review Plan, with details of the need for further tests to EPD, within one month of the completion of the tunnel excavation.

### 4.2 HAMMER IMPACT TEST AT NSR26

Based on the above considerations, it is proposed to carry out the hammer impact test at the up-track tunnel near NSR 26 - Block R, Wing Fu Building, Whampoa Estate as shown in *Figure 4.1*. Hammer impact points and accelerometer locations are shown in *Figures 4.2* and *4.3*.

### 4.3 DRILL RIG VIBRATION MEASUREMENT AT NSR12 AND NSR14

NSR12 and NSR14 are located directly above the tunnel. It is necessary to conduct measurements to verify the EIA predictions. Location plans for NSR12 and NSR14 are shown in *Figures 4.4* and *4.5*. Owing to the large



Figure 4.1

Impact Test Location at NSR 26 – Wing Fu Building

Date 25 Aug 2011

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Figure 4.2

Accelerometer and impact position at NSR 26 – Wing Fu Building



Figure 4.3

Accelerometer Position at NSR 26 – Wing Fu Building

Date 25 Aug 2011

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Resources  
Management





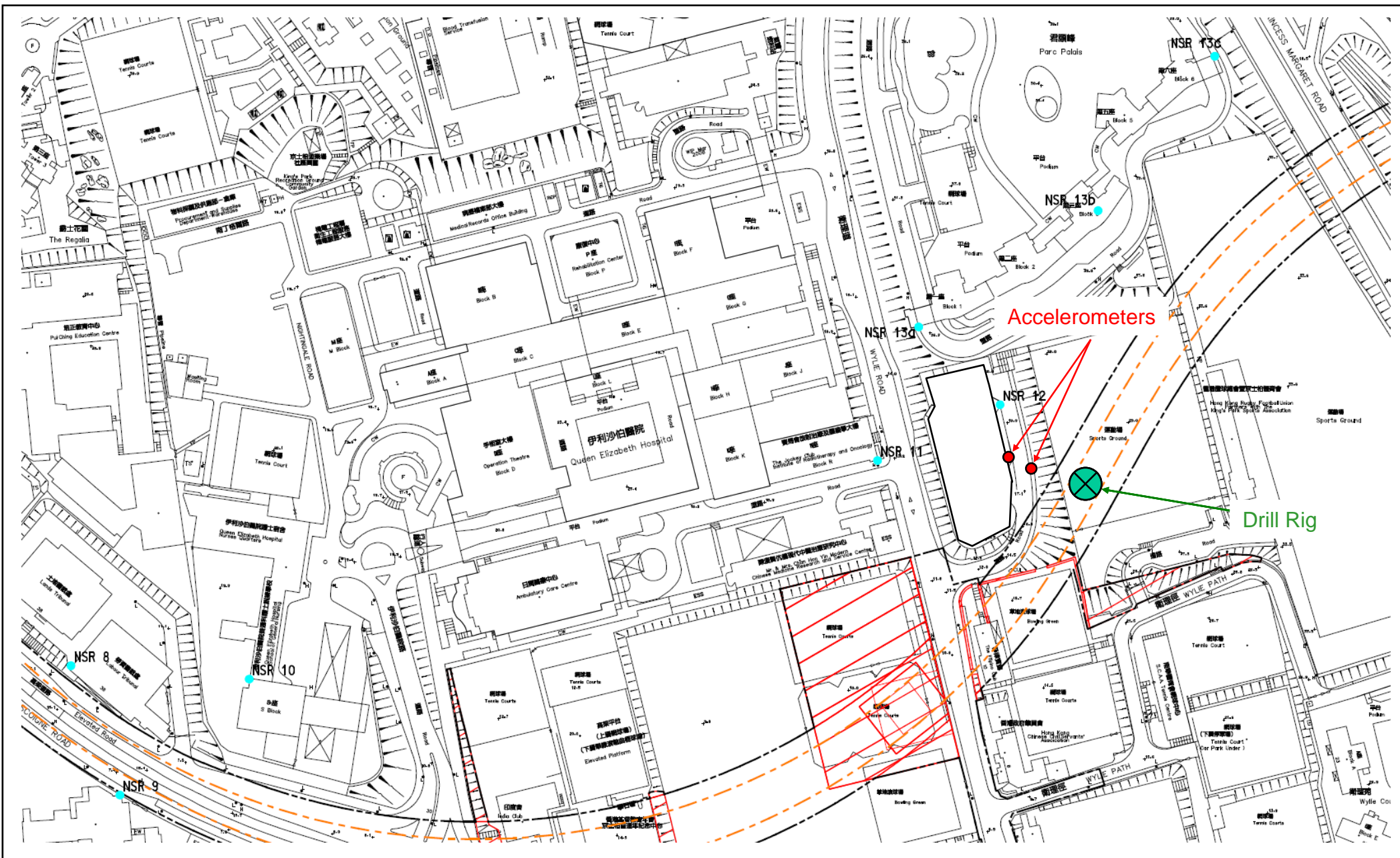


Figure 4.4

Drill Rig Vibration Measurement Location at NSR 12 – Planned Primary School

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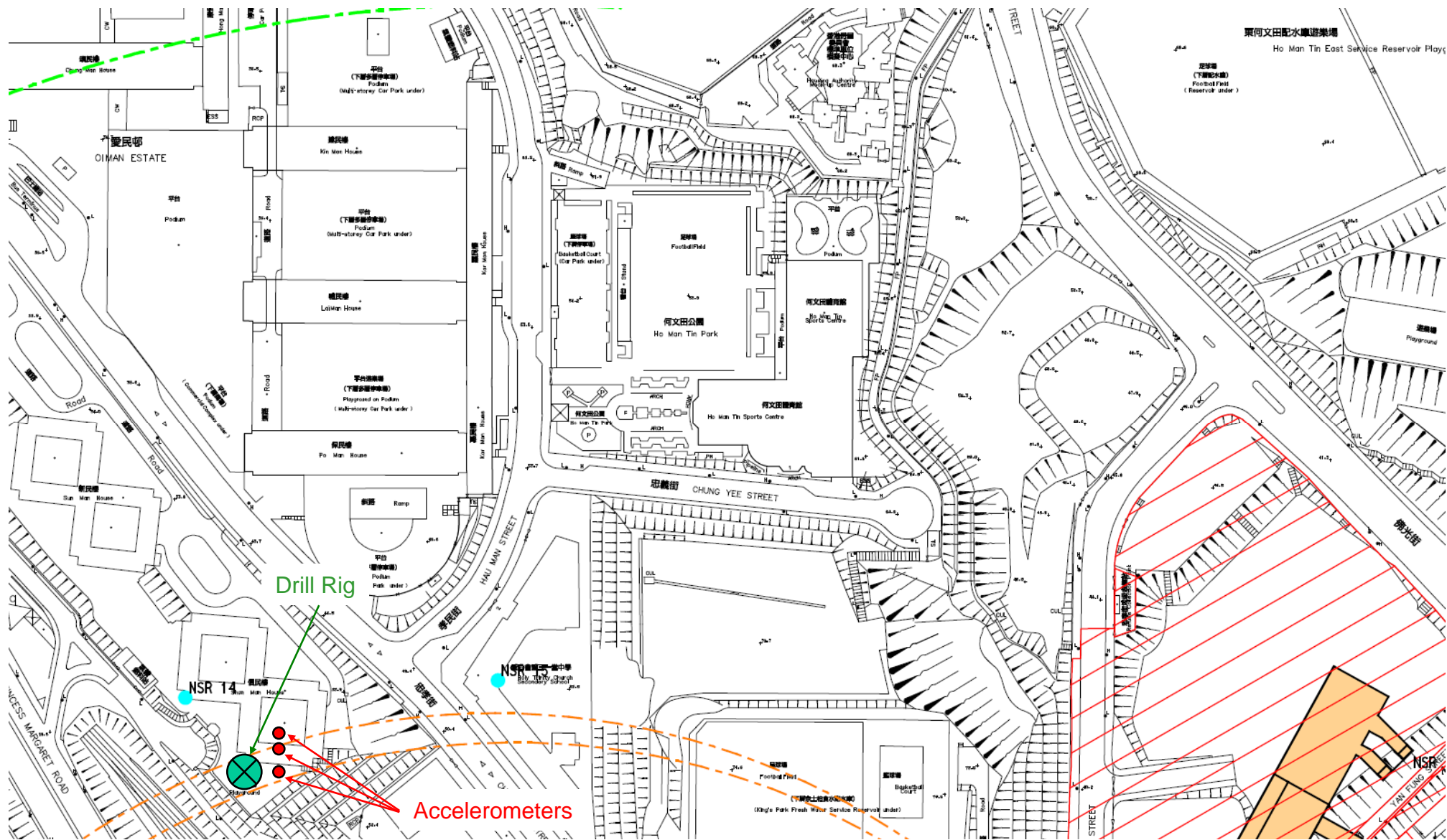


Figure 4.5

Impact Test Location at NSR 14 – Shun Man House

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tunnel depth, unless there is a very effective vibration propagation path, there could be a chance that it may not be practical to obtain meaningful vibration signals on the ground surface using hammer impact test. Alternatively, vibrations can be measured at the ground surface during tunnel excavation by drill rig. The measured vibration level will be compared with previous similar drill rig measurements at WIL with known point source response (PSR). The comparable drill rig excitation force of WIL and KTE can therefore enable estimation of the PSR at KTE NSR12 and NSR14.

The drill rig vibration tests only provide an indirectly rough estimate of the PSR. It is proposed to reserve the 10dB safety factor adopted in KTE EIA. If large soil mobility is observed from the drill rig vibration measurements such that the updated prediction is less than 10dB below the groundborne noise criteria, further impact test would be considered. The Review Plan will be submitted to EPD within one month of the completion of the tunnel excavation in accordance to the EP Condition 4.1 and to re-confirm whether additional hammer test is required or not.

If additional hammer impact test is not required after reviewing the vibration data, the findings will be included in the Review Report, which shall be certified by the ET Leader and verified by the IEC.

#### 4.4 PREVIOUS GROUND-BORNE NOISE MEASUREMENT AT NSR2

Although NSR2 – New King’s Hotel has less than 15dB safety margin, it is not viable to carry out the hammer impact test at NSR2 at Nathan Road due to a high ambient vibration level that could mask the vibration signal produced by hammer impact.

Alternatively, with reference to the approved KTE EIA Report, ground-borne noise from TWL train operation would be insignificant. It is expected that ground-borne noise impact from KTE would likely be less than that from TWL due to the comparatively more favourable conditions. Therefore, it is considered not necessary to conduct further verification measurements at NSR2. Track distance and trackform types for TWL and KTE are compared and are presented in *Table 4.1*.

**Table 4.1 Comparison of Track Distance and Trackform Type at NSR2**

Location	Railway	Vertical Distance	Horizontal Distance	Slant Distance	Trackform Type
NSR2 New King’s Hotel	KTE	23m	8m	24m	60kN/mm baseplate
	TWL	14m	6m	15m	Continuous Plinth Track with rail pad of 75 -90kN/mm

### 5.1 HAMMER IMPACT TEST PROCEDURES

Schematic sketch of the hammer impact test is shown in *Figure 5.1*. Hammer impacts will be conducted inside the tunnel along the alignment. A force transducer is located at the base of the impact hammer to measure the force applied to the tunnel invert. Accelerometers will be placed at various setbacks on the ground to pick up the vibration signals. The hammer impact test will be carried out as follows:

1. Connect the force transducer to the analyzer in the tunnel.
2. Fix accelerometers at various setbacks and connect them to the analyzer on the ground surface.
3. Activate the pneumatic impact hammer. 3-10 impacts will be conducted at each impact point.
4. Record the impact force and the vibration signals.
5. Conduct narrow band frequency analysis of the force and vibration signals.
6. Correct for ambient vibration or electronic noise where necessary.
7. Average the data and calculate the Point Source Response (PSR) at each 1/3 octave band.
8. Move the impact hammer by ~10 meters along the tunnel and repeat the hammer impact. 5-10 impact points will be conducted along the alignment subject to site conditions.
9. Calculate the LSR from PSR. The LSR is calculated from numerical integration of the PSR at each impact point along the alignment according to the equation below:

$$LSR(s, d, f) = 10 \log \left[ \int_{-l/2}^{l/2} 10^{PSR(\sqrt{s^2+d^2+y^2}, f)/10} dy \right]$$

where

s = perpendicular setback

l = train length

d = tunnel depth

f = frequency

10. Verify the LSR assumed in the EIA Report to justify the adequacy of the proposed operation ground-borne noise mitigation measure.
11. Recommend necessary measure(s) if required.



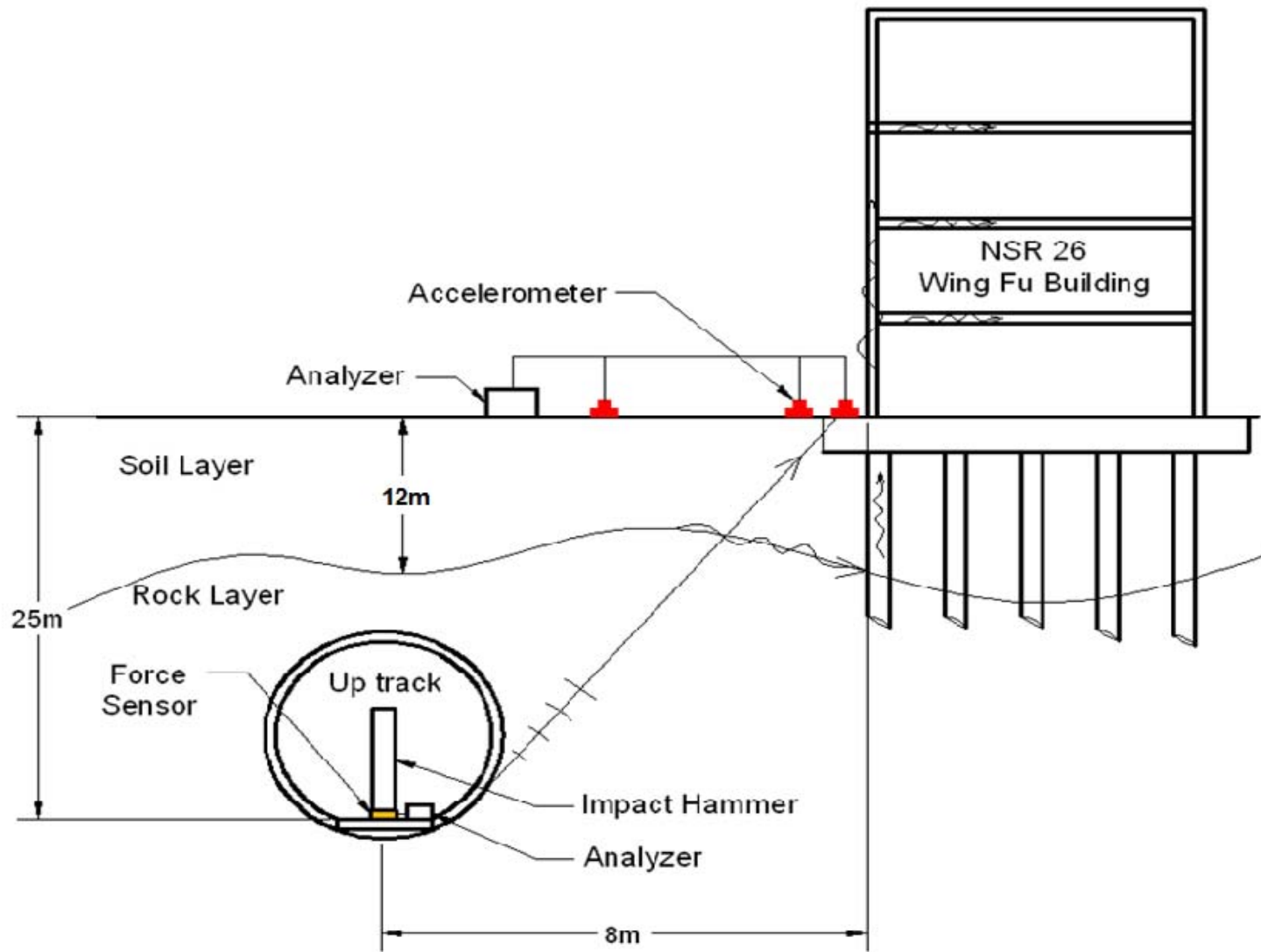


Figure 5.1

Schematic sketch of hammer impact test at NSR 26

Date 25 Aug 2011

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Schematic sketch of the drill rig vibration measurement is shown in *Figure 5.2 and 5.3*. During drill rig operation, accelerometers will be placed at various distances on ground to pick up the vibration signals. Drill rig vibration measurements at NSR12 and NSR14 will be carried out as follows:

1. Fix the accelerometers at ground surface of the measurement location.
2. Log the vibration data during drill rig operation.
3. Log the background vibration data when drill rig is not in operation.
4. Conduct 1/3 octave band spectrum analysis for drill rig vibration and background vibration.
5. Conduct correction for the background vibration as follow:

$$L_v = 10 \log \left[ 10^{L_{measured} / 10} - 10^{L_{background} / 10} \right]$$

where

$L_v$  = background corrected vibration induced by drill rig operation

$L_{measured}$  = measured vibration level without background correction

$L_{background}$  = background vibration

6. Compared the background corrected vibration level with that measured at Island Crest of WIL. Borehole impact test has been conducted at that location (D028) and the PSR is known.
7. Compare the specifications of the drill rig used for WIL and KTE. The excitation force may be assumed to be the same if similar drill rig is used.
8. The PSR of NSR12 and NSR14 of KTE would be estimated from the difference in vibration level.

$$PSR_{KTE} = PSR_{WIL} + \Delta L_v$$

where

$\Delta L_v$  = difference in drill rig vibration spectrum for KTE and WIL

9. Calculate the LSR from PSR. The LSR is calculated from numerical integration of the PSR at each impact point along the alignment.
10. Verify the LSR assumed in the EIA Report to justify the adequacy of the proposed operation ground-borne noise mitigation measure.



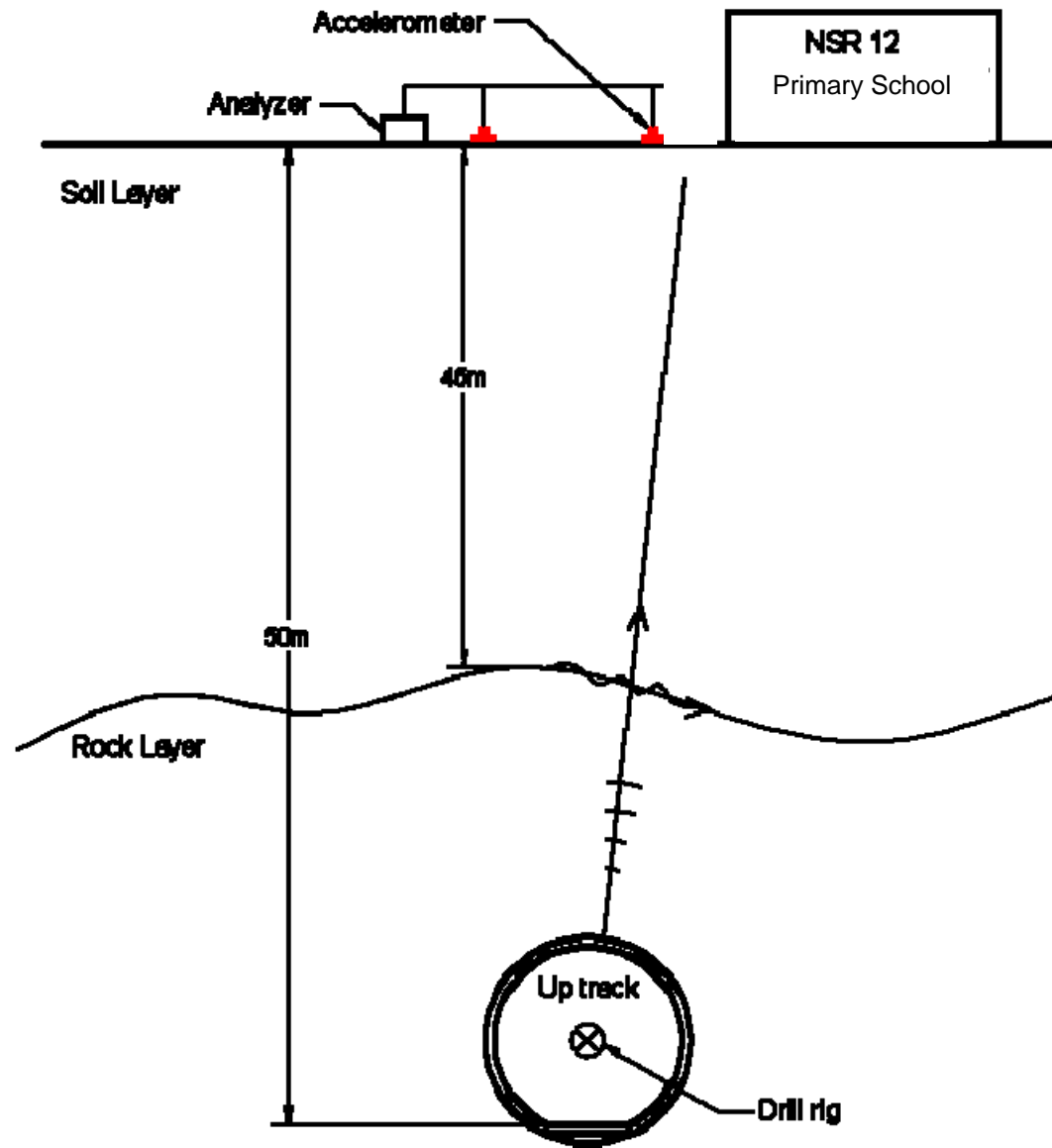


Figure 5.2

Schematic sketch of vibration measurement at NSR 12

Date 25 Aug 2011

Environmental  
Resources  
Management



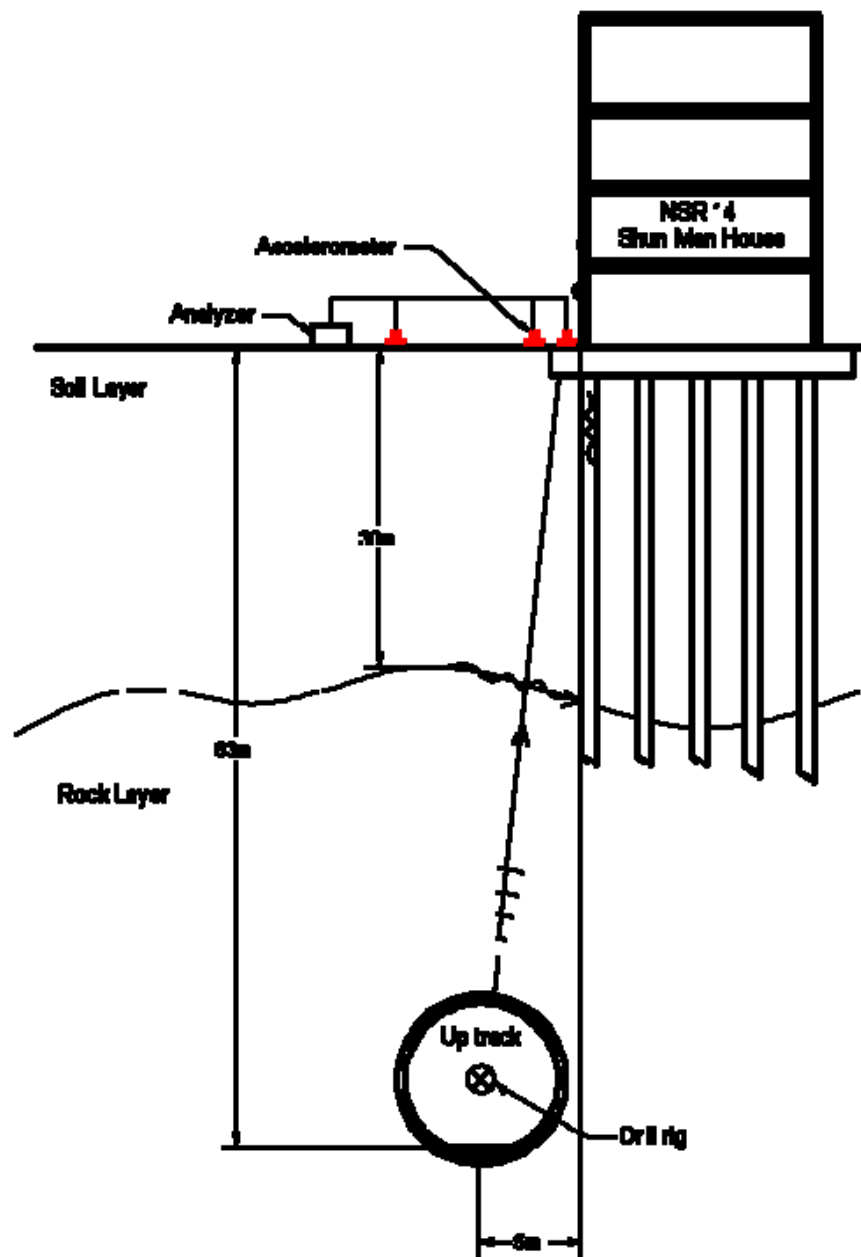


Figure 5.3

Schematic sketch of vibration measurement at NSR 14

Date 25 Aug 2011

The instruments to be used in the impact test and drill rig vibration measurement are listed in *Table 6.1* below.

**Table 6.1** *Instruments to be used in the Impact Test and Drill Rig Measurement*

Instrument	Model No.	Number
7-Channel Spectrum Analyzer	B&K Pulse 3560C	1
4-Channel Sound & Vibration Analyzer	SVAN 958	1
Piezoelectric Accelerometers	Endevco 86	1
Piezoelectric Accelerometers	CTC AC135-1A	4
Vibration Calibrator	IMI 699A02	1
Pneumatic Impact Hammer	WAL-01 (tailor made)	1
Force Transducer for Impact Hammer	FUTEK LCM 550	1



Impact Hammer WAL-01



CTC 135-1A Accelerometer

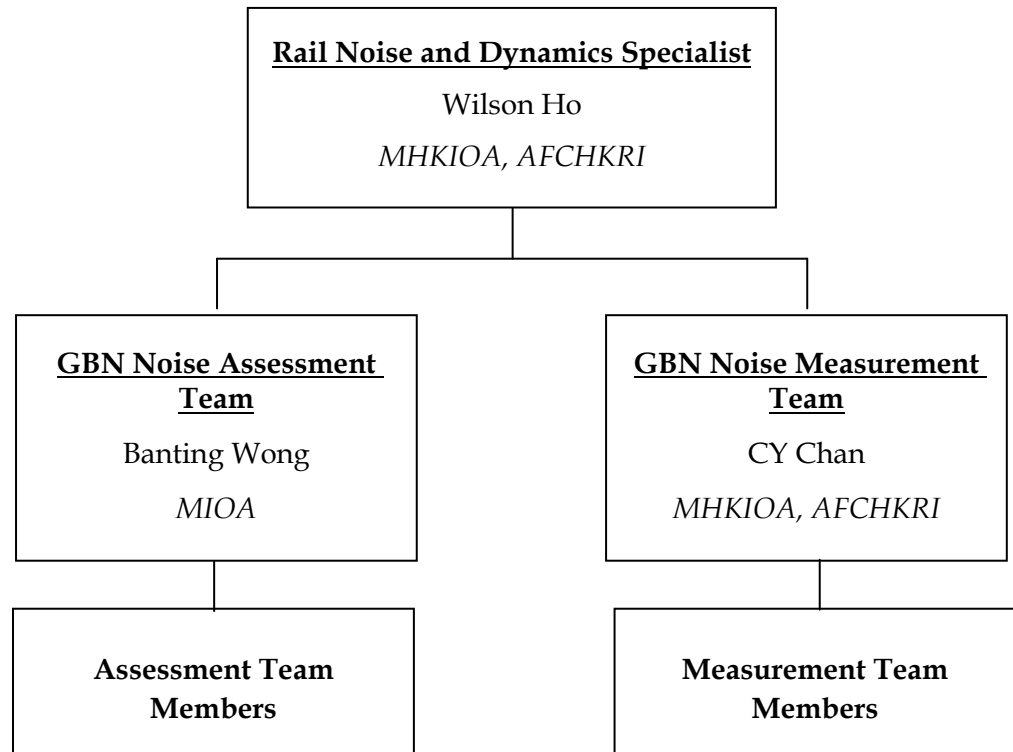


Endevco 86 Accelerometer

WAL-001 was tailor-developed for in railway/TBM ground-borne noise and vibration prognosis. It has been used for impact test in Lo Wu, Hung Hom, West Drainage Tunnel and Taiwan. The impact is produced by a 20kg falling mass driven by pneumatic pump, which can provide adjustable 40-220kN impulsive force for soil mobility determination.

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The organisation chart of the project team is shown below.



The Rail Noise and Dynamics Specialist will be responsible for the overall management and review of the rail noise and vibration impact of the KTE.

The GBN Noise Assessment Team will be responsible for the preparation of the ground-borne noise Review Plan, analysis of the drill rig vibration measurement and hammer impact test LSR data, verification of adequacy of the proposed mitigation measure and recommending necessary measure(s) if required.

The GBN Noise Measurement Team will be responsible for preparation of instruments and conducting the drill rig vibration measurement and hammer impact testing.

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## 8 *PROGRAMME*

### 8.1 *HAMMER IMPACT TEST PROGRAMME*

The schedule of hammer impact test is subjected to the tunnel construction programme. No construction works such as tunnel drilling should be carried out within 300m from the testing locations during the test.

Measurements will be conducted during the night-time period (between 01:00 to 05:00 hours) to minimise the background vibration due to road traffic. Another 1~1.5hr will be required for mobilisation of test equipment in and out of the tunnel.

At least two weeks of advance notice is required for the preparation of measurement equipment.

### 8.2 *DRILL RIG VIBRATION MEASUREMENT PROGRAMME*

The schedule of drill rig vibration measurement is subjected to the tunnel construction programme. Vibration measurements will be conducted during tunnel excavation, when the drill rig is nearest to NSR12 and NSR14 respectively. Measurement is preferred to be conducted when there is no concurrent construction activity in the vicinity.