

MTR Corporation Limited

ROAD WORKS at WEST KOWLOON

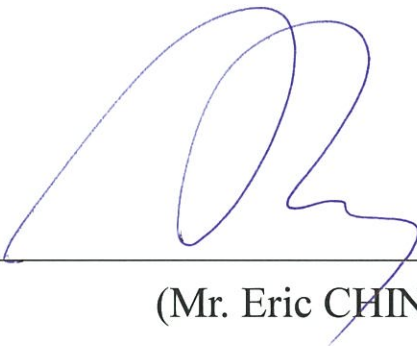
(No. EP-366/2009/A)

Environmental Monitoring and Audit Report No. 83

(May 2018)

Verified by

:



(Mr. Eric CHING)

Position

:

Independent Environmental Checker

Date

:

8 June 2018

MTR Corporation Limited

ROAD WORKS at WEST KOWLOON

(No. EP-366/2009/A)

Environmental Monitoring and Audit Report No. 83
(May 2018)

Certified by

:



(Mr. Raymond WONG)

Position

:

Environmental Team Leader

Date

:

8 June 2018



ROADWORKS AT WEST KOWLOON



Environmental Monitoring and Audit Report No. 83
May 2018

EXECUTIVE SUMMARY

This is the 83rd monthly Environmental Monitoring and Audit (EM&A) Report presenting the EM&A works undertaken during the period from 1 to 31 May 2018 for the Road Works at West Kowloon (hereinafter referred to “the Roadworks” or “the Project”) in accordance with the EM&A Manual and the requirement under EP-366/2009/A.

Air Quality

Air quality monitoring was conducted for 24-hour Total Suspended Particulates (TSP) at three (3) air quality monitoring locations in the vicinity of Works Area in West Kowloon in the reporting month.

Please refer to the section “Environmental Complaints/Exceedance/Non-compliance/Summons and Prosecution” below for the exceedances in air quality in the reporting month.

Air-borne Noise

Air-borne noise was measured in terms of $L_{eq(30min)}$ dB(A) with L_{10} and L_{90} measurements as reference at three (3) noise monitoring locations in the vicinity of Works Area in West Kowloon currently in the interval of once every week since one of the noise monitoring locations has been temporarily suspended since objection has been received from the OC of Sorrento.

Please refer to the section “Environmental Complaints/ Exceedance/ Non-compliance/ Summons and Prosecution” below for the air-borne noise exceedances in the reporting month.

Environmental Audits

In this reporting month, regular site inspections attended by representative from MTRCL and Contractors were carried out at 810A, 810B and 811B at West Kowloon. In addition to the regular site inspections, IEC environmental audits attended by IEC, MTRCL and Contractors were held on monthly basis. Issues observed during these inspections and audits were detailed in Section 6.

Environmental Complaints / Exceedance / Non-compliance / Summons and Prosecution

For the reporting month, one environmental complaint related to the Roadworks was referred from EPD. The complaint was related to construction dust from XRL 811B construction site at Man Wui Street affected the nearby residents on 17 May 2018. Complaint

investigation has been conducted in accordance with the complaint handling procedure in the EM&A Manual and the detail of complaint was contained in Section 7.

No exceedance of both air-borne noise Action and Limits Levels was recorded in the reporting month.

No exceedance of both 24-hour TSP Action and Limit Levels was recorded in the reporting month.

No environmental incident/event related to Roadworks was recorded during the reporting period. Besides, in the reporting period, no summons, no non-compliances and no prosecutions was received related to the Roadworks by MTRCL and/or the Contractors of 810A, 810B and 811B.

Works for Coming Month

The construction works were continued in the reporting month of May 2018 and the major works for the following month were summarized in Table 8-1. Impact monitoring has been continued in the reporting month with reference to the EM&A Manual.

Further Environmental Key Issues

Air quality impact and air-borne noise at the affected sensitive receivers shall continue in the following month. Considering the nature of construction activities, key environmental issues in the coming months include the followings:

- Disposal of C&D waste;
- Dust generation from site activities;
- Noise impact from operating equipment; and
- Site water discharge.

Reporting Changes

In the reporting period, there were no reporting changes.

Table of Contents

Executive Summary	1
1. Introduction.....	4
2. Project Information	5
3. Environmental Status	6
4. Summary of EM&A Requirement.....	8
5. Monitoring Result	12
6. Site Inspection.....	14
7. Non-Compliance and Deficiency.....	16
8. Future Key Issues.....	17
9. Conclusions.....	19

List of Appendices

Appendix A	Works Area
Appendix B	Project Management Organization and Contacts of Key Personnel
Appendix C	Implementation Status
Appendix D	Monitoring Locations
Appendix E	Monitoring Schedule
Appendix F	Graphical Plots of Monitoring Results
Appendix G	Meteorological Data
Appendix H	Calibration Certificate of High Volume Samplers and Orifice Calibrator

1. INTRODUCTION

1.1 Project Background

In April 2008, the Government of Hong Kong Special Administrative Region (HKSAR) requested MTR Corporation Limited (MTRCL) to proceed with further planning and design of the Hong Kong section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link, which runs from the West Kowloon Terminus (WKT) to the boundary at Huanggang.

Upon the opening of the WKT of Express Rail Link (XRL) and the development of the West Kowloon Cultural District (WKCD), additional road traffic capacity and network restructuring would be required through and within the West Kowloon Reclamation Area (WKRA). Roads namely D1A, D1, Lin Cheung Road – Austin Road West Underpass and upgrading of Austin Road West would be used to accommodate the anticipated increase in road traffic.

1.2 Coverage

This is the 83rd monthly Environmental Monitoring and Audit (EM&A) Report presenting the EM&A works undertaken during the period from 1 to 31 May 2018 for the Road Works in accordance with the EM&A Manual and the requirement under Environmental Permit No. EP-366/2009/A which was issued on 18 June 2012.

2. PROJECT INFORMATION

2.1 *Project Management Organisation and Management Structure*

The project management organisation chart and contact of key personnel are shown in Appendix B.

2.2 *Construction Activities*

This report marked the 83rd month of civil construction in Works Area in West Kowloon for May 2018. It is anticipated that the civil construction be completed in the third quarter of year 2018. The updated construction activity is provided in Section 8. Major construction activities undertaken in the reporting month is summarized in the following table.

Contract	Major Construction Activities
810A	Existing utilities diversions and new utilities installation by Utility undertakers; ELS works for subsequent drainage and water mains construction works and ABWF of Footbridges
810B	Remaining works under NMD after Wui Man Road (WMR) closure, including freshwater and saltwater mains
811B	Lin Cheung Road (LCR) S/B & N/B road paving & marking; LCR S/B drawpits/ducts for utilities and street lighting; LCR S/B watermains, drainage and irrigation works; CLP cable laying, joining & backfilling; LCR water main works (remaining); LCR road and drainage works (remaining)

Table 2-1 Major construction activities in the reporting month (May 2018)

3. ENVIRONMENTAL STATUS

3.1 Status of Implementation of mitigation measures

Construction Stage

Environmental mitigation measures recommended in the EIA report were implemented and their implementation status is summarized in Appendix C1.

Operational Stage

Environmental mitigation measures recommended in the EIA report were implemented and their implementation status is summarized in Appendix C2.

3.2 Status of Submissions under EP

A summary of the submissions submitted under the EP for this Project as at 31 May 2018 is presented in Table 3-1 below:

EP-366/2009/A Clause No.	Document Title	Status
3.4	Monthly Environmental Monitoring and Audit Report (April 2018)	Submitted on 10 May 2018

Table 3-1 Summary of the status of submissions submitted under the EP in the reporting month

3.3 Status of Permit/License/Notifications

A summary of the status of permits, licences and notifications on the environmental protection made, applied or approved under this Project during the previous and reporting month is presented in Table 3-2 below. The Environmental Permit No. EP-366/2009/A issued by EPD was used for the Road Works under the XRL project.

Item	Item Description	Application Date	Permit Status
Contract 810A			
1.	Construction Noise Permit (general)	10 Jan 2018	Granted on 26 Jan 2018 Permit No. GW-RE0037-18, valid from 26 Jan 2018 to 25 Jul 2018
2.	Construction Noise Permit (Roadworks at West Kowloon –Phase 3 opening)	23 Apr 2018	Granted on 4 May 2018 Permit No. GW-RE0331-18, valid from 5 May 2018 to 20 May 2018
3.	Construction Noise Permit (night time transportation of construction plants)	2 May 2018	Granted on 29 May 2018 Permit No. GW-RE0386-18, valid from 31 May 2018 to 14 Jun 2018
Contract 810B			
1.	Construction Noise Permit (general)	30 Dec 2017	Granted on 25 Jan 2018 Permit No. GW-RE0043-18, valid from 26 Jan 2018 to 25 Jul 2018
Contract 811B			
1.	Construction Noise Permit (general)	20 Feb 2018	Granted on 9 Mar 2018 Permit No. GW-RE0167-18, valid from 9 Mar 2018 to 6 Sep 2018
2.	Construction Noise Permit (laying of friction course LCR S/B and LCR N/B)	22 Mar 2018	Granted on 4 Apr 2018 Permit No. GW-RE0207-18, valid from 7 Apr 2018 to 4 May 2018
3.	Construction Noise Permit (road works of LCR S/B and N/B)	16 May 2018	Granted on 30 May 2018 Permit No. GW-RE0385-18, valid from 5 Jun 2018 to 1 Sep 2018

Table 3-2 Summary of the status of permits, licences and notifications made, applied and approved under this Project during the reporting month

4. SUMMARY OF EM&A REQUIREMENT

4.1 Air Quality

4.1.1 Air Quality Parameters

In accordance to the EM&A Manual, 24-hour Total Suspended Particulates (TSP) levels were measured at three (3) air monitoring locations in accordance with the EM&A Manual. Monitoring was undertaken at each monitoring location once per every 6 days. Information such as date of monitoring, duration, weather condition, equipment used and monitoring results shall be recorded on the field data sheet developed for the Project. Monitoring results are summarized in Section 5.

4.1.2 Monitoring Methodology and Calibration

Monitoring was undertaken to establish for 24-hour Total Suspended Particulates (TSP) at three (3) monitoring locations in the vicinity of the Works Area in West Kowloon. Monitoring of 24-hour TSP was carried out using a high volume sampler (HVS) according to Part 50 Chapter 1 Appendix B, Title 40 of the Code of Federal Regulations of the USEPA.

The sampling procedure follows to that described Part 50 Chapter 1 Appendix B, Title 40 of the Code of Federal Regulations of the USEPA. 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 shall be collected and returned to HOKLAS accredited laboratory (ALS Technichem (HK) Pty Ltd) for drying in a desiccators followed by accurate 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 flow rate of the high volume sampler with mass flow controller was calibrated using an orifice calibrator. Initial calibration (five points) was conducted upon installation and prior to commissioning. Calibration was carried out every six months. The details of calibration are shown in Table 4-1 and Appendix H. The samplers shall be properly maintained. Prior to dust monitoring commencing, appropriate checks shall be made to ensure that all equipment and necessary power supply are in good working condition.

Monitoring Station ID	Air Quality Monitoring Station	HVS Serial Number	Last Calibration Date ^[1]
<i>High Volume Sampler</i>			
CAM-1	Podium between Sorrento and The Waterfront	515	18 May 2018
CAM-2	Podium next to Tower 3, The Waterfront	1282	18 May 2018
CAM-3	Roof of Lift Building, The Victoria Towers	528	18 May 2018
<i>Orifice Calibrator</i>			
Serial Number		Last Calibration Date ^[1]	
2421		24 January 2018	

Notes: ^[1] Next calibration date to be confirmed.

Table 4-1 Calibration details of HVS and Orifice Calibrator

4.1.3 Monitoring Location

According to the EM&A Manual, air quality monitoring was carried out at the locations as shown in Table 4-1 above. The monitoring locations are illustrated in Appendix D.

4.1.4 Action and Limit Levels

With reference to the baseline monitoring results, the Action and Limit Levels for the 24-hour TSP monitoring derived are shown in Table 4-2. For reference purpose, the Action and Limit Levels for 1-hr TSP monitoring are included, too.

Monitoring Station ID	1-hour TSP Level in $\mu\text{g}/\text{m}^3$		24-hour TSP Level in $\mu\text{g}/\text{m}^3$	
	Action Level	Limit Level	Action Level	Limit Level
CAM-1	298.4	500	168.8	260
CAM-2	295.6	500	155.9	260
CAM-3	319.4	500	179.3	260

Table 4-2 Action and Limit Levels for Air Quality

4.2 Air-borne Noise

4.2.1 Noise Parameters

In accordance to the EM&A Manual, construction air-borne noise monitoring shall be conducted to obtain one set of 30-minute measurement at each monitoring station between 0700 and 1900 hours on normal weekdays at a frequency of once per week when construction activities are underway. The L_{eq} , L_{10} and L_{90} were also recorded at the specified interval.

4.2.2 Monitoring Methodology and Calibration

As referred to the Technical Memorandum (TM) issued under the NCO, sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Sound Level Meters Model B&K 2250, which complies with the above-mentioned specifications, were used for construction noise monitoring.

Before and after each series of measurements, the accuracy of the sound level meter should be checked by using an acoustic calibrator generating a known sound pressure level at a known frequency. If the difference between the calibration levels obtained before and after each series of noise measurements is less than 1.0 dB, then the measurements could be considered as valid.

The sound level meters and calibrator are verified by the certified laboratory or manufacturer at a regular interval to ensure they perform to the same level of accuracy as stated in the manufacturer's specifications. Details of the calibration record are shown in Table 4-3.

Monitoring Station ID	Noise Monitoring Location	Serial Number	Last Calibration Date ^[1]
<i>Sound Level Meters</i>			
CNM-1	Man Cheong Street Refuse Station	2701816	23 January 2017
CNM-2 ^[2]	Tower 6, Sorrento	N/A	N/A
CNM-3	Podium next to Tower 3, The Waterfront	2701823	6 March 2017
CNM-4	Tower 2, The Harbour Side	2718886	12 June 2017

Monitoring Station ID	Noise Monitoring Location	Serial Number	Last Calibration Date ^[1]
<i>Calibrator</i>			
Serial Number		Last Calibration Date	
3014997		22 March 2017	

Notes: [1] Next calibration date to be confirmed.

[2] Due to the objection from the OC of Sorrento was received on 6-Aug-2014, monitoring at Tower 6, Sorrento (CNM-2) has been temporarily suspended. Monitoring would be resumed subject to an alternative location could be determined in the vicinity with consent.

Table 4-3 Calibration details of noise monitoring equipment

4.2.3 Monitoring Location

According to the EM&A Manual, air-borne noise monitoring was carried out at the locations as shown in Table 4-3 above. The monitoring locations are illustrated in Appendix D.

4.2.4 Action and Limit Levels

The Action and Limit Levels for the construction air-borne noise are shown in Table 4-4 below.

Time Period	Action	Limit
0700-1900 hours on normal weekdays	When one documented complaint is received	75 dB(A) for residential premises
		70 dB(A) for school and 65 dB(A) during examination period

Table 4-4 Action and Limit Levels for Air-borne Construction Noise

5. MONITORING RESULT

5.1 Air Quality

The monitoring schedule is shown in Appendix E. Results of 24-hour TSP level and the graphical presentation of monitoring results are shown in Appendix F. The weather condition during the monitoring period is summarized in Appendix G.

In the reporting month, no exceedance was recorded at both 24-hour TSP Action and Limit Levels. Actions stipulated under the Event and Action Plan (Table 3.3 of the EM&A Manual) would be undertaken and the monitoring frequency would be increased if exceedance is recorded.

5.2 Noise

The monitoring schedule is shown in Appendix E. Results of measured air-borne noise level, in terms of $L_{eq(30min)}$ and graphical presentations are presented in Appendix F. The weather condition during the monitoring period is summarized in Appendix G.

In the reporting month, no exceedance was recorded at air-borne noise Limit Levels. Actions stipulated under the Event and Action Plan (Table 2.3 of the EM&A Manual) would be undertaken if exceedance is recorded.

Apart from the above, one air-borne noise exceedance of Action Level was recorded in the reporting month.

5.3 Waste Management

The quantities of waste disposed from the Project in the reporting month with the previous 2 months were summarized in the following table:

Reporting Month	Inert C&D ^[1] Materials (tonnes)	Non-inert C&D ^[2] Materials (tonnes)	Chemical Waste	
			(litre)	(kg)
Contract 810A				
March 2018	0	0	0	0

Reporting Month	Inert C&D ^[1] Materials (tonnes)	Non-inert C&D ^[2] Materials (tonnes)	Chemical Waste	
			(litre)	(kg)
April 2018	0	0	0	0
May 2018	0	0	0	0
Contract 810B				
March 2018	364.8	166.9	0	0
April 2018	843.8	103.3	0	0
May 2018	0	0	0	0
Contract 811B				
March 2018	0	0	0	0
April 2018	0	0	0	0
May 2018	0	0	0	0

Table 5-1 Summary of construction waste generated and disposed

Note:

[1]. Inert C&D materials include bricks, concrete, building debris, rubble and excavated soil.

[2]. Non-inert C&D materials include steel, paper / cardboard packaging waste, plastics and other wastes such as general refuse.

The cumulative quantities are summarized as follows.

Inert C&D Materials (tonnes)	Non-inert C&D Materials (tonnes)	Chemical Waste	
		(Litre)	(Kg)
72,143.8	9,581.5	3,075	315

6. SITE INSPECTION

Regular site inspections on all environmental aspects under the EM&A Manual were attended by representatives from ET and Contractors. The site inspections were carried out at 810A, 810B and 811B in West Kowloon and dates are shown in the following table. In addition to the regular site inspections attended by ET and Contractors, monthly IEC environmental audits attended by IEC, ET and Contractors were held on 15 May 2018 in 810A, 15 May 2018 in 810B and 15 May 2018 in 811B.

Contract	Date of Site Inspections
810A	2/5, 9/5, 15/5, 24/5 and 30/5
810B	15/5 and 30/5
811B	8/5, 15/5 and 29/5

Table 6-1 Date of site inspections in the reporting month

All observations have been recorded in the audit checklist and passed to the Contractor together with the appropriate recommended mitigation measures where necessary. The key observations from these site inspections and Contractor's follow-up action are summarized in Table 6-2 below. No non-compliance was observed.

Item	Description	Contractor's Follow-up Action(s) Undertaken
Contract 810A		
1	The stockpile of fine materials was observed idling on site without proper control when not in use.	The said stockpile of fine materials has been used for backfilling in the following day when the observation has been made.
Contract 810B		
1	No specific observation has been made during the inspections.	Nil.

Item	Description	Contractor's Follow-up Action(s) Undertaken
Contract 811B		
1	The exposed area was observed dry in condition around Footbridge 4 near To Wah Road.	The frontlines have been reminded to wet the exposed surface in a regularly basis.

Table 6-2 Summary of site inspections, recommendations and follow-up actions

7. NON-COMPLIANCE AND DEFICIENCY

7.1 *Summary of Complaint*

For this reporting month, there was one (1) environmental complaint referred from EPD. There were a total of forty three (43) environmental complaints counted since the commencement of the construction. The complaint has been handled in accordance to the EM&A Manual and relevant parties including the Engineer's Representative and IEC. Detail of the complaint was summarized in the following paragraph.

A complaint was received from EPD on 17 May 2018 regarding construction dust from XRL 811B construction site at Man Wui Street affected the nearby residents. Through the case investigation, the complaint was about dust generation from temporary footbridge demolition at Man Wui Street. Control measures such as water spraying during breaking has been implemented and dust screen has been erected along and facing Eight Man Buildings. Besides, the results of air quality monitoring in May 2018 at the nearest monitoring station were below the Action Level. Nevertheless the Contractor has been reminded to maintain the above-mentioned dust control measures on site to minimize the potential nuisance to the nearby residents, and ensure full compliance on related environmental regulations.

Apart from the above, as the Environmental Team (ET) of the Project, we will ensure compliance of the requirements stated in the EM&A Manual and closely liaise with the stakeholders to address any environmental concerns.

7.2 *Summary of Exceedance*

In the reporting month, no exceedance of both air-borne noise Action and Limit Levels was recorded; and no exceedance of both 24-hr TSP Action and Limit Levels was recorded. Actions stipulated under the Event and Action Plan (Tables 2.3 and 3.3 of the EM&A Manual) would be undertaken when exceedance is recorded respectively.

7.3 *Summary of Notification of Summons, Prosecutions, Non-compliance and Corrective Actions*

No notification of environmental warnings from EPD, no summons and no prosecutions was received related to the Roadworks by MTRCL and the Contractors of 810A, 810B and 811B in the reporting period.

8. FUTURE KEY ISSUES

8.1 Construction Works in Coming Months

Works to be undertaken for the following month are summarized below. The works presented below are tentative and subject to change in actual construction programme.

Contract	Major Construction Activities
810A	Existing utilities diversions and new utilities installation by Utility undertakers and ABWF of Footbridges
810B	Interface structure works to WKCD, including street furniture and road signage
811B	Lin Cheung Road (LCR) S/B & N/B road paving & marking; LCR S/B drawpits/ducts for utilities and street lighting; LCR water mains works (remaining), LCR drainage works (rectification works)

Table 8-1 Summary of construction works in the coming month (June 2018)

According to the latest programme, civil construction would be continued in the coming month. Impact monitoring would be continued according to the construction programme.

8.2 Road Opening Programme

According to the current schedule, the road works at West Kowloon (mainly the underpass of Austin Road West / Lin Cheung Road) will be in operation in three Phases. The first and second phases have been opened in September 2017 and December 2017 respectively. The third phase is expected to be opened in the first quarter of 2018.

On 17 September 2017, the first phase has been opened for public use. It includes: first level of the Austin Road West underpass, a temporary roundabout for Austin Road West first level driving vehicle near Kowloon MTR Station, and a round road to the properties / shopping mall parking lot of MTR Kowloon Station.

On 17 December 2017, the second phase has been in place for public use. It includes: the lowest level of Lin Cheung Road underpass, partial section of Jordan Road (first

level of Lin Cheung Road south underpass), and round road at the east of Austin Road underpass.

On 6 May 2018, the third phase has been in place for public use. It includes: the at-grade level and underpass section of Lin Cheung Road and Jordan Road and Austin Road West.

Apart from the above, the realignment of temporary road D1A(S) and Wui Man Road which adjacent to the West Kowloon Terminus are expected to be completed in the second quarter of 2018 and opened to the public use.

8.3 *Monitoring Schedule for Next Month*

The tentative schedule of TSP and air-borne noise monitoring for the next reporting period is presented in Appendix E.

9. CONCLUSIONS

The Report presents the results of EM&A works and the impact monitoring for the construction works of the Roadworks under the XRL project undertaken during the period of 1 to 31 May 2018. The major construction activities in the reporting period included pipe installation for drainage utilities work, noise barrier construction and road finishing works in the West Kowloon Works Areas for the Roadworks.

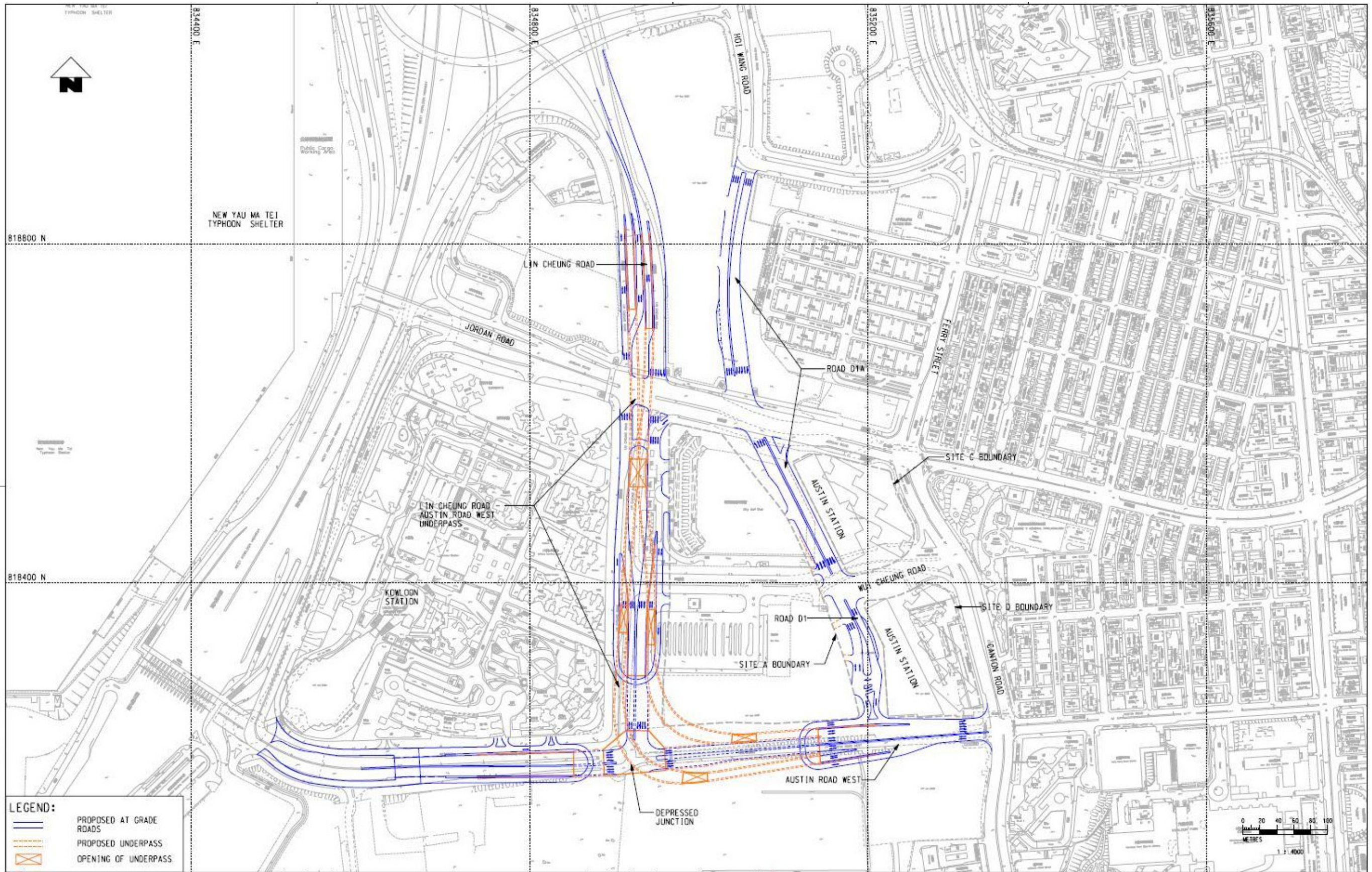
Impact monitoring for air quality and air-borne noise were conducted in accordance with the EM&A Manual in the reporting period. No exceedance of both air-borne noise Action and Limit Levels in the reporting month. Also, no exceedance of both 24-hour TSP Action and Limit Levels was recorded in the reporting month, too.

For the reporting month, one (1) environmental complaint related to the Roadworks was referred from EPD. The complaint has been handled in accordance with the procedures stipulated in the EM&A Manual with investigations at the time of received. Apart from that, no warnings/non-compliances, no summons and no prosecutions were received for Roadworks in the reporting month.

Site inspections were conducted regularly to monitor proper implementation of environmental pollution control and mitigation measures for the Project. The ET would continue the implementation of the environmental monitoring and audit programme in accordance to the EM&A Manual and to a level consistent with MTRCL's Corporate Sustainability Policy.

Appendix A

Works Area



				DRAWN: YJP DESIGNED: TWF CHECKED: KCC APPROVED: PL DATE: 11/MAR./2009				TITLE: ROAD WORKS AT WEST KOWLOON	
				ORIGINATOR: PROJECT DIVISION		TITLE: PROPOSED ROAD WORKS AT WEST KOWLOON			
				CADD REF: NOL_ERL_300_C_WKT_ENS_M62_001A.dgn		SCALE: 1 : 4000 (A3)		FIGURE NO. NOL/ERL/300/C/WKT/ENS/M62/001	
REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED

WORKS AREA for ROAD WORKS

Appendix B

Project Management Organization and Contacts of Key Personnel

Title	Name	Telephone
Engineer's Representative		
Construction Manager (Contracts 810A & 811B)	Mr. Nelson YEUNG	2829 2384
Construction Manager (Contract 810B)	Mr. Edmond SO	2926 9062
Independent Environmental Checker		
Independent Environmental Checker	Mr. Eric CHING	2828 5825
Environmental Team		
Environmental Team Leader	Mr. Raymond WONG	2208 3510
Contractors		
<i>Contract 810A</i>		
Principle Project Director	Mr. Adrian CLAMP	3759 9810
Senior Environmental Officer	Mr. Dominic FUNG	3759 9796
<i>Contract 810B</i>		
Project Director	Mr. Jeremy MATTERSON	2472 8050
Safety/Environmental Officer	Mr. Pranei LIMBU	2472 9519
<i>Contract 811B</i>		
Project Manager	Mr. Brian GOWRAN	3759 9753
Environmental Officer	Ms. Sammie CHAN	2269 1507

Appendix C

Implementation Status

Appendix C1 IMPLEMENTATION SCHEDULE OF THE RECOMMENDED MITIGATION MEASURES FOR CONSTRUCTION PHASE

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
Noise Control					
3.53 – 3.54	<p>The following quiet PME should be used:</p> <ul style="list-style-type: none"> • Pneumatic breaker (SWL=110dB(A)) • Tracked Excavator Fitted with Hydraulic Breaker (SWL=110dB(A)) • Truck Mixer (SWL=100dB(A)) • Tracked Crane (SWL=101dB(A)) • Dump Truck (SWL=103dB(A)) • Tracked Excavator/Loader (SWL=105dB(A)) • Dozer (SWL=111dB(A)) • Road Roller (SWL=101dB(A)) 	To reduce the construction air-borne noise impact.	Contractor	Throughout the whole construction phase	Implement as per the construction programme.
3.55	Use of movable noise barriers, acoustic mats and acoustic sheds for excavator, hand-held pneumatic chipper and etc.	To reduce the construction air-borne noise impact.	Contractor	Throughout the whole construction phase	Movable noise barriers have been made and placed at the excavation zone or the works areas that will generate noise nuisance, if applicable.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
3.57	<p>Good Site Practice:</p> <ul style="list-style-type: none"> • Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction program; • Silencers or mufflers on construction equipment should be utilized and should be properly maintained during the construction programme; • Mobile plant, if any, should be sited as far from noise sensitive receivers (NSRs) as possible; • Machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum; • Plant known to emit noise strongly in one direction should, wherever possible, be orientated so that the noise is directed away from the nearby NSRs; and • Material stockpiles and other structures should be effectively utilized, wherever practicable, in 	To reduce the construction air-borne noise impact.	Contractor	Throughout the whole construction phase	Implemented as per construction programme.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
3.57	screening noise from on-site construction activities	To reduce the construction air-borne noise impact.	Contractor	Throughout the whole construction phase	Implemented as per construction programme.
Air Quality Control					
Table 4.6	The excavation and sandfill areas limited to 30% actively operating and complete watering coverage of these active areas eight times a day as recommended.	To reduce the construction air-borne noise impact.	Contractor	Throughout the whole construction phase	Implemented as per construction programme.
4.77	<p>Implementation of dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation.</p> <ul style="list-style-type: none"> • Skip hoist for material transport should be totally enclosed by impervious sheeting. • Every vehicle should be washed to remove any dusty materials from its body and wheels before leaving the construction site. • The area where vehicle washing takes place and the section of the road between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcore. 	To reduce the construction air-borne noise impact.	Contractor	Throughout the whole construction phase	Implemented.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
4.77	<ul style="list-style-type: none"> • Where a site boundary adjoins a road, streets or other accessible to the public, hoarding of not less than 2.4m high from ground level should be provided along the entire length except for a site entrance or exit. • Every stack of more than 20 bags of cement should be placed in an area sheltered on the top and the 3 sides and be covered entirely by impervious sheeting. • All dusty materials should be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet. • The height from which excavated materials are dropped should be controlled to a minimum practical height to limit fugitive dust generation from falling and landing. • The load of dusty materials carried by vehicle leaving a construction site should be covered entirely by clean impervious sheeting to 	To reduce the construction air-borne noise impact.	Contractor	Throughout the whole construction phase	Implemented.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
4.77	<p>ensure dust materials do not spread from the vehicle.</p> <ul style="list-style-type: none"> Investigation of an environmental monitoring and auditing program to monitor the construction process in order to enforce controls and modify method of work if dusty conditions arise. 	To reduce the construction air-borne noise impact.	Contractor	Throughout the whole construction phase	Implemented.
Water Quality Control					
5.30 -5.42	<p>General Construction Activities and Construction site run-off::</p> <ul style="list-style-type: none"> The mitigation measures as outlined in the ProPECC PN 1/94 Construction Site Drainage should be adopted where applicable. 	To control water quality impact from construction site runoff and general construction activities.	Contractor	Throughout the whole construction phase	Implemented.
5.43	<p>Effluent Discharge</p> <ul style="list-style-type: none"> 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 100 m should be maintained between the discharge points of construction site 	To control water quality impact from construction site runoff and general construction activities.	Contractor	Throughout the whole construction phase	Implemented.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
5.43	effluent and the existing seawater intakes. If 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 relevant WPCO licence which is under the ambit of regional office (RO) of EPD.	To control water quality impact from construction site runoff and general construction activities.	Contractor	Throughout the whole construction phase	Implemented.
5.44	<p>Groundwater</p> <ul style="list-style-type: none"> No contaminated groundwater is anticipated in the works areas. Appropriate measures will be deployed to minimize the intrusion of groundwater into excavation works areas. 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. Ground water from dewatering process should also be discharged into the storm system via silt traps. 	To control water quality impact from construction site runoff and general construction activities.	Contractor	Throughout the whole construction phase	Implemented as per construction programme.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
5.45 -5.47	<p>Accidental Spillage</p> <ul style="list-style-type: none"> • Contractor must 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. • 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. • Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance. 	To control water quality impact from construction site runoff and general construction activities.	Contractor	Throughout the whole construction phase	Implemented.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
5.45 -5.47	<p>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:</p> <ul style="list-style-type: none"> ➤ Suitable containers should be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport. ➤ Chemical waste containers should be suitably labelled, to notify and warn the personnel who are handling the wastes, to avoid accidents. ➤ Storage area should be selected at a safe location on site and adequate space should be allocated to the storage area. 	To control water quality impact from construction site runoff and general construction activities.	Contractor	Throughout the whole construction phase	Implemented.
5.48 -5.49	<p>Sewage Effluent from Construction Workforce</p> <ul style="list-style-type: none"> • Sufficient chemical toilets should be provided in the works areas. A licensed 	To control water quality impact from construction site runoff and general construction activities.	Contractor	Throughout the whole construction phase	Implemented.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
5.48 -5.49	<p>waste collector should be deployed to clean the chemical toilets on a regular basis.</p> <ul style="list-style-type: none"> Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the nearby environment. Regular environmental audit of the construction site will provide an effective control of any malpractices and can encourage continual improvement of environmental performance on site. It is anticipated that sewage generation during the construction phase of the project would not cause water pollution problem after undertaking all required measures. 	To control water quality impact from construction site runoff and general construction activities.	Contractor	Throughout the whole construction phase	Implemented.
Waste Management					
6.47	<p>All waste materials should be segregated into categories covering:</p> <ul style="list-style-type: none"> Excavated materials suitable for reuse; Inert C&D materials for disposal off-site; 	To implement on-site sorting facilitating reuse and recycling of materials as well as proper disposal of waste.	Contractor	Throughout the whole construction phase	Implemented.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
6.47	<ul style="list-style-type: none"> • Non-inert C&D materials for disposal at landfills; • Chemical waste; and • General refuse. 	To implement on-site sorting facilitating reuse and recycling of materials as well as proper disposal of waste.	Contractor	Throughout the whole construction phase	Implemented.
6.50	<p>Recommendations for good site practices during the construction activities include:</p> <ul style="list-style-type: none"> • Training of site personnel in, site cleanliness, proper waste management and chemical handling procedures; • Provision of sufficient waste disposal points and regular collection of waste; • Appropriate measures to minimize windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers; • Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors; and • Separation of chemical wastes for special handling and appropriate treatment. 	To implement on-site sorting facilitating reuse and recycling of materials as well as proper disposal of waste.	Contractor	Throughout the whole construction phase	Implemented.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
6.51	<p>Recommendations for waste reduction measures include:</p> <ul style="list-style-type: none"> • Sorting of demolition debris and excavated materials from demolition works to recover reusable/ recyclable portions (i.e. soil, broken concrete, metal etc.); • Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal; • 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; • Proper storage and site practices to minimize the potential for damage or contamination of construction materials; • Plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary 	To implement on-site sorting facilitating reuse and recycling of materials as well as proper disposal of waste.	Contractor	Throughout the whole construction phase	Implemented as per construction programme.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
6.51	<p>generation of waste; and</p> <ul style="list-style-type: none"> • Training should be provided to workers about the concepts of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycle. 	To implement on-site sorting facilitating reuse and recycling of materials as well as proper disposal of waste.	Contractor	Throughout the whole construction phase	Implemented as per construction programme.
6.52	The Contractor should prepare and implement a Waste Management Plan (WMP) as a part of the Environmental Management Plan (EMP) 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	Contractor	Throughout the whole construction phase	Implemented as per construction programme.
6.58	Wheel wash facilities have to be provided before the trucks leave the works area. This can reduce the introduction of dust to the public road network.	To minimise the dust impact	Contractor	Throughout the whole construction phase	Implemented.
6.60	The waste delivered to landfill should not contain any free water or have water content more than 70% by weight. Concerning the requirement on the truck load of waste to	To meet the requirement for disposal at landfill	Contractor	Throughout the whole construction phase	Implemented.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
6.60	landfill, the haulier must ensure suitable amount of waste would be loaded on different types of trucks used.	To meet the requirement for disposal at landfill	Contractor	Throughout the whole construction phase	Implemented.
6.56	In order to monitor the disposal of C&D materials and to control fly-tipping at PFRFs or landfills, a trip-ticket system should be established in accordance with ETWB TCW No. 31/2004. A recording system for the amount of waste generated, recycled and disposed, including the disposal sites, should also be set up. Warning signs should be put up and close-circuited television should be installed at the vehicular accesses to remind the designated disposal sites and prevent fly-tipping.	To monitor disposal of waste and control fly-tipping	Contractor	Throughout the whole construction phase	Implemented.
6.59	Wet spoil generated from the construction of pipe pile and diaphragm wall should be treated before disposal at PFRFs. With the agreement from Fill Management Department (FMD) of CEDD, wet spoil would be mixed with dry materials to reduce water content to less than 25% dry density before disposal, which reduce the impacts to the reception facilities.	To meet the requirement for disposal at landfill	Contractor	Throughout the whole construction phase	Implemented.
6.61	If chemical wastes are produced at the construction site, the Contractor would be	To properly store the chemical waste within works areas	Contractor	Throughout the whole construction phase	Implemented.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
6.61	required to register with the EPD as a chemical waste producer and to follow the guidelines stated in the <i>Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes</i> .	To properly store the chemical waste within works areas	Contractor	Throughout the whole construction phase	Implemented.
6.64	A trip-ticket system should be operated in accordance with the <i>Waste Disposal (Chemical Waste) (General) Regulation</i> 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 <i>Waste Disposal (Chemical Waste) (General) Regulation</i> .	To monitor the generation, reuse and disposal of chemical waste	Contractor	Throughout the whole construction phase	Implemented.
6.65	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. Preferably, an enclosed and covered area should be provided to reduce the occurrence of wind blown light material.	To properly store and separate from other C&D materials for subsequent collection and disposal	Contractor	Throughout the whole construction phase	Implemented.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
6.66	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. The non-recyclable components should be collected by licensed collectors employed by the Contractor on daily basis to avoid any adverse impacts on storage of refuse, which would be disposed of at designated landfills.	To facilitate recycling of recyclable portions of refuse	Contractor	Throughout the whole construction phase	Implemented.
6.67	The Contractor should carry out an education 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	Contractor	Throughout the whole construction phase	Implemented.
Landscape and Visual Management					
Table 7.4	<ul style="list-style-type: none"> Topsoil, where identified, should be stripped and stored for re-use in the construction of the soft landscape works. 	To minimize landscape and visual impacts during construction phase	Contractor	Throughout the whole construction phase	Implemented.

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
Table 7.4	<ul style="list-style-type: none"> • Existing trees to be retained on site should be carefully protected during construction. • Tree unavoidably to be affected by the works should be considered for transplanting in accordance with ETWB TCW No. 3/2006 - Tree Preservation and maintained until end of the establishment period. Detailed tree transplanting proposal should be submitted to seek relevant government department's approval in detailed design stage. • Compensatory tree planting provided to compensate for felled trees and maintained until end of the establishment period. • Control of night-time lighting glare • Erection of decorative screen hoarding compatible with the surrounding setting. 	To minimize landscape and visual impacts during construction phase	Contractor	Throughout the whole construction phase	Implemented.

Appendix C2 IMPLEMENTATION SCHEDULE OF THE RECOMMENDED MITIGATION MEASURES FOR OPERATIONAL PHASE

EIA / RR Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
Noise Control					
3.13 and Figure C8017/C/XRL/ENS/M52/002	<ul style="list-style-type: none"> Provision of low noise road surfacing for the Western end of existing Austin Road West near The Harbour Side. 	To reduce the traffic noise impact.	MTR until maintenance or management agency is assigned. Maintenance responsibilities will be assigned to HyD	Before commencement of road operation	Implemented.
3.32 and Figure C8017/C/XRL/ENS/M52/013	<ul style="list-style-type: none"> Provision of low noise road surfacing for all new open roads. LNRS would be further extended at least 30m into the underpass at each opening. 	To reduce the traffic noise impact.	MTR until maintenance or management agency is assigned. Maintenance responsibilities will be assigned to HyD	Before commencement of road operation	<ul style="list-style-type: none"> Approx. 80-90% completed. Completed.
3.31, Table 3.2 and Figure C8017/C/XRL/ENS/M52/004	<p>The following noise screening structures are proposed to protect existing NSRs. Absorptive panels will be provided to the lower portion (i.e. 2 to 3 meters) of the proposed noise screening structures in order to reduce the reflection of noise.</p> <ul style="list-style-type: none"> about 55m long of 5.5m high cantilevered noise barrier with 2.5m cantilever inclined at 45° along the southbound carriageway of Road D1A to the north of Jordan Road. 	To reduce the traffic noise impact.	MTR until maintenance or management agency is assigned. Maintenance responsibilities will be assigned to HyD	Before commencement of road operation	<ul style="list-style-type: none"> About 85-90% completed.

EIA / RR Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
3.31, Table 3.2 and Figure C8017/C/XRL/ENS/M52/004	<ul style="list-style-type: none"> • about 90m long of 5.5m high cantilevered noise barrier with 2m cantilever inclined at 45° along the southbound carriageway of Road D1A to the north of Jordan Road. • about 80m long of 5.5m high cantilevered noise barrier with 3m cantilever inclined at 45° along the southbound carriageway of Road D1A to the north of Jordan Road. • about 55m long of 5.5m high cantilevered noise barrier with 2.5m cantilever inclined at 45° along the central divider of Road D1A to the north of Jordan Road. • about 90m long of 5.5m high cantilevered noise barrier with 2m cantilever inclined at 45° along the central divider of Road D1A to the north of Jordan Road. • about 60m long of 5.5m high cantilevered noise barrier with 3m cantilever inclined at 45° along the central divider of Road D1A to the north of Jordan Road. 	To reduce the traffic noise impact.	MTR until maintenance or management agency is assigned. Maintenance responsibilities will be assigned to HyD	Before commencement of road operation	<ul style="list-style-type: none"> • About 85-90% completed.

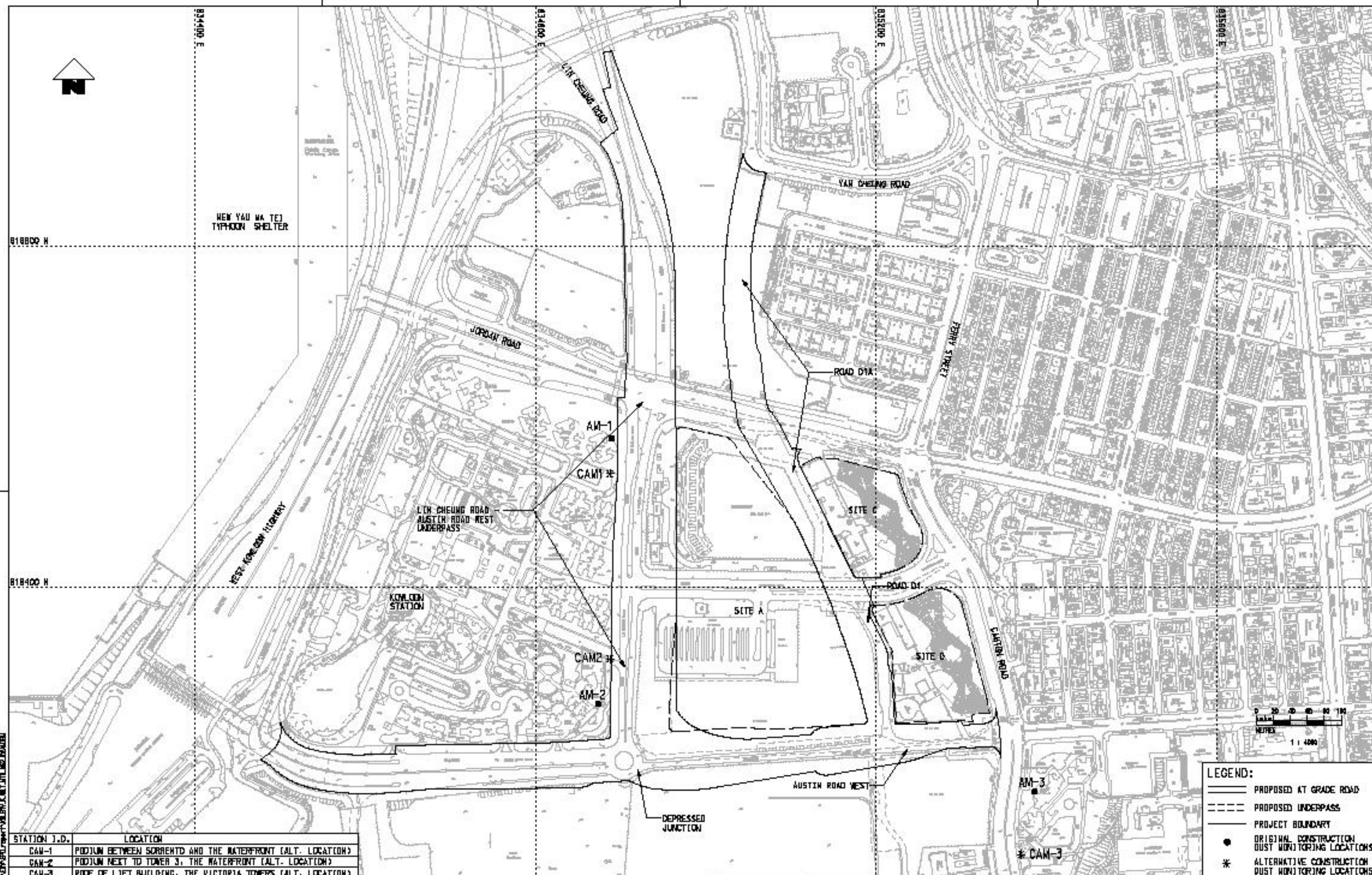
EIA / RR Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
Table 3.2 and Figure C8017/C/XRL/ENS/M52/005	<ul style="list-style-type: none"> • about 60m long of noise screening structure in the form of either landscape deck or semi-enclosure covering the main carriageway (northbound and southbound) of Lin Cheung Road to the south of Jordan Road. • about 95m long of 5.5m high cantilevered noise barrier with 4m cantilever inclined at 45° along the northbound carriageway of Lin Cheung Road to the south of Jordan Road. • about 80m long of 3m high vertical barrier on the top of retaining wall at +7.5 mPD along the northbound carriageway of Lin Cheung Road to the south of Jordan Road. • about 55m long of 5.5m high semi-enclosure with 12m overhang along the southbound carriageway of Lin Cheung Road to the south of Jordan Road. 	To reduce the traffic noise impact.	MTR until maintenance or management agency is assigned. Maintenance responsibilities will be assigned to HyD	Before commencement of road operation	<ul style="list-style-type: none"> • Completed. • Completed. • Completed. • Completed.

EIA / RR Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
Table 3.2 and Figure C8017/C/XRL/ENS/M52/005	<ul style="list-style-type: none"> • about 185m long of 5.5m high cantilevered noise barrier with 2.5m cantilever inclined at 45° along the southbound carriageway of Lin Cheung Road to the south of Jordan Road. • about 160m long of 3.5m high vertical barrier along the southbound carriageway of Lin Cheung Road to the south of Jordan Road. 	To reduce the traffic noise impact.	MTR until maintenance or management agency is assigned. Maintenance responsibilities will be assigned to HyD	Before commencement of road operation	<ul style="list-style-type: none"> • Completed. • Completed.
3.31, Table 3.2 and Figure C8017/C/XRL/ENS/M52/005	<p>The following noise screening structures are proposed to protect planned NSRs. Absorptive panels will be provided to the lower portion (i.e. 2 to 3 meters) of the proposed noise screening structures in order to reduce the reflection of noise.</p> <ul style="list-style-type: none"> • about 65m long of 5.5m high cantilevered noise barrier with 4m cantilever inclined at 45° along the central divider of Road D1A to the south of Jordan Road. • about 57m long of noise screening structure in the form of landscape deck and associated elevated covered walkway at the eastern end of Austin Road West. 	To reduce the traffic noise impact.	MTR until maintenance or management agency is assigned. Maintenance responsibilities will be assigned to HyD	Before commencement of road operation	<ul style="list-style-type: none"> • Completed • Completed.

EIA / RR Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
3.36	<ul style="list-style-type: none"> Installation of sound-absorbing materials on all retaining walls of the underpass. For the inner walls and ceilings of the underpass, the sound-absorbing materials would be extended at least 30m into the underpass at each portal and opening being treated. 	To reduce the traffic noise impact.	MTR until maintenance or management agency is assigned. Maintenance responsibilities will be assigned to HyD	Before commencement of road operation	<ul style="list-style-type: none"> Completed. Completed.
Landscape and Visual Management					
Table 4.2	<ul style="list-style-type: none"> Aesthetically pleasing design as regard to the form, material and finishes should be incorporated to landscape deck, noise barriers/enclosures, engineering structures and associated infrastructure facilities 	To minimize landscape and visual impacts during operational phase	MTR until maintenance or management agency is assigned. Maintenance responsibilities will be assigned to HyD	Before commencement of road operation	<ul style="list-style-type: none"> About 80-90% completed.
Table 4.2	<ul style="list-style-type: none"> Climbers on wire mesh to soften the noise barriers. 	To minimize landscape and visual impacts during operational phase	MTR until maintenance or management agency is assigned. Maintenance responsibilities will be assigned in accordance with ETW TC(W) No. 2/2004 on "Maintenance of Vegetation and Hard Landscape Features" upon completion of the detailed design for the Project	Before commencement of road operation	<ul style="list-style-type: none"> Under preparation

EIA / RR Ref #	Environmental Protection Measures / Mitigation Measures	Objectives of the Recommended Measures & Main Concern to Address	Who to implement the measures?	When to implement the measures?	Implementation Status
Table 4.2	<ul style="list-style-type: none"> • Buffer Tree and Shrub Planting to screen proposed noise barriers and enclosures 	To minimize landscape and visual impacts during operational phase	MTR until maintenance or management agency is assigned. Maintenance responsibilities will be assigned in accordance with ETW TC(W) No. 2/2004 on "Maintenance of Vegetation and Hard Landscape Features" upon completion of the detailed design for the Project	Before commencement of road operation	<ul style="list-style-type: none"> • Under preparation
Table 4.2	<ul style="list-style-type: none"> • Structures and ornamental tree, shrub planting should be provided along roadside amenity areas and central divider to enhance the landscape and visual quality. 	To minimize landscape and visual impacts during operational phase	MTR until maintenance or management agency is assigned. Maintenance responsibilities will be assigned in accordance with ETW TC(W) No. 2/2004 on "Maintenance of Vegetation and Hard Landscape Features" upon completion of the detailed design for the Project	Before commencement of road operation	<ul style="list-style-type: none"> • About 20% completed.

Appendix D
Monitoring Locations



LEGEND:

- PROPOSED AT GRADE ROAD
- - - PROPOSED UNDERPASS
- PROJECT BOUNDARY
- ORIGINAL CONSTRUCTION DUST MONITORING LOCATIONS
- * ALTERNATIVE CONSTRUCTION DUST MONITORING LOCATIONS

STATION I.D.	LOCATION
CAM-1	PODIUM BETWEEN SORRENTO AND THE WATERFRONT (ALT. LOCATION)
CAM-2	PODIUM NEXT TO TOWER 3, THE WATERFRONT (ALT. LOCATION)
CAM-3	ROOF OF LEFT BUILDING, THE VICTORIA TOWERS (ALT. LOCATION)

NO.	DESCRIPTION	BY	DATE	APPROVED BY
A1	FIRST DRAFT			

DRAWN	YCC
DESIGNED	MC
CHECKED	
APPROVED	
DATE	03/APR/2011

MTR

EXPRESS RAIL LINK

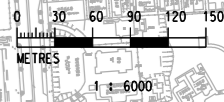
PROJECTS DIVISION | SUSTAINABILITY DEVELOPMENT DEPARTMENT

FILE NO. XRL/ENV/L/WKT/MTR/M62/102

TITLE	ROADWORKS AT WEST KOWLOON LOCATIONS OF CONSTRUCTION DUST MONITORING STATIONS
SCALE	1:4000 @ A1
REVISION NO.	XRL/ENV/L/WKT/MTR/M62/102
REV	A1

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 FILENAME: X:\cadd_library\mtr\cadd\work\kwsa\plot\dwg\BIM_300661_080924.dwg



LEGEND:

ID NO.	NOISE MONITORING STATION
CNM - 1	MAN CHEONG STREET REFUSE STATION (ALTERNATIVE LOCATION)
CNM - 2	TOWER 6, SORRENTO (Temporarily suspended)
CNM - 3	PODIUM NEXT TO TOWER 3, THE WATERFRONT (ALTERNATIVE LOCATION)
CNM - 4	TOWER 2, THE HARBOUR SIDE

LEGEND:

	PROPOSED AT GRADE ROAD
	PROPOSED UNDERPASS
	PROJECT BOUNDARY
	300m STUDY AREA
	ORIGINAL CONSTRUCTION NOISE MONITORING LOCATIONS
	ALTERNATIVE NOISE MONITORING LOCATION

REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED
A1	FIRST DRAFT	YCC	05MAY11						

DRAWN	YCC
DESIGNED	
CHECKED	MC
APPROVED	
DATE	03/MAY/2011

MTR

EXPRESS RAIL LINK

ORIGINATOR

PROJECTS DIVISION | **SUSTAINABILITY DEVELOPMENT DEPARTMENT**

CADD REF. XRLNV_K_WKT_MTR_M52_101A1.DGN

TITLE	ROADWORK AT WEST KOWLOON LOCATION OF CONSTRUCTION NOISE MONITORING STATION	
SCALE	1:6000 @ A3	
DRAWING NO.	XRLNV/K/WKT/MTR/M52/101	
REV.	A1	

Appendix E
Monitoring Schedule

Actual Construction Dust (24-hr TSP) and Air-borne Noise Impact Monitoring Schedule - May 2018

Notes: **TSP** denotes Total Suspended Particulates

* denotes that the noise monitoring at CNM-2 has been temporarily suspended since objection was received from the OC of Sorrento

May-2018						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2 CNM-1, CNM-3, CNM-4 CAM-1, CAM-2, CAM-3	3	4	5
6	7	8 CAM-1, CAM-2, CAM-3	9 CNM-1, CNM-3, CNM-4	10	11	12
13	14 CAM-1, CAM-2, CAM-3	15	16 CNM-1, CNM-3, CNM-4	17	18	19 CAM-1, CAM-2, CAM-3
20	21	22	23 CNM-1, CNM-3, CNM-4	24	25 CAM-1, CAM-2, CAM-3	26
27	28	29	30 CNM-1, CNM-3, CNM-4	31 CAM-1, CAM-2, CAM-3		

Tentative Construction Dust (24-hr TSP) and Air-borne Noise Impact Monitoring Schedule - June 2018

Notes: **TSP** denotes Total Suspended Particulates

* denotes that the noise monitoring at CNM-2 has been temporarily suspended since objection was received from the OC of Sorrento

Jun-2018						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6 CNM-1, CNM-3, CNM-4 CAM-1, CAM-2, CAM-3	7	8	9
10	11	12 CAM-1, CAM-2, CAM-3	13 CNM-1, CNM-3, CNM-4	14	15	16 CAM-1, CAM-2, CAM-3
17	18	19	20 CNM-1, CNM-3, CNM-4	21	22 CAM-1, CAM-2, CAM-3	23
24	25	26	27 CNM-1, CNM-3, CNM-4	28 CAM-1, CAM-2, CAM-3	29	30

Appendix F
Graphical Plots of
Monitoring Results

APPENDIX F: Air Quality Monitoring Results - 24-hour TSP Monitoring

- CAM-1

Date	24-hour TSP Monitoring Results	Action Level	Limit Level
	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)
02-May-18	39.9	168.8	260.0
08-May-18	37.8	168.8	260.0
14-May-18	33.4	168.8	260.0
19-May-18	30.1	168.8	260.0
25-May-18	26.8	168.8	260.0
31-May-18	27.3	168.8	260.0

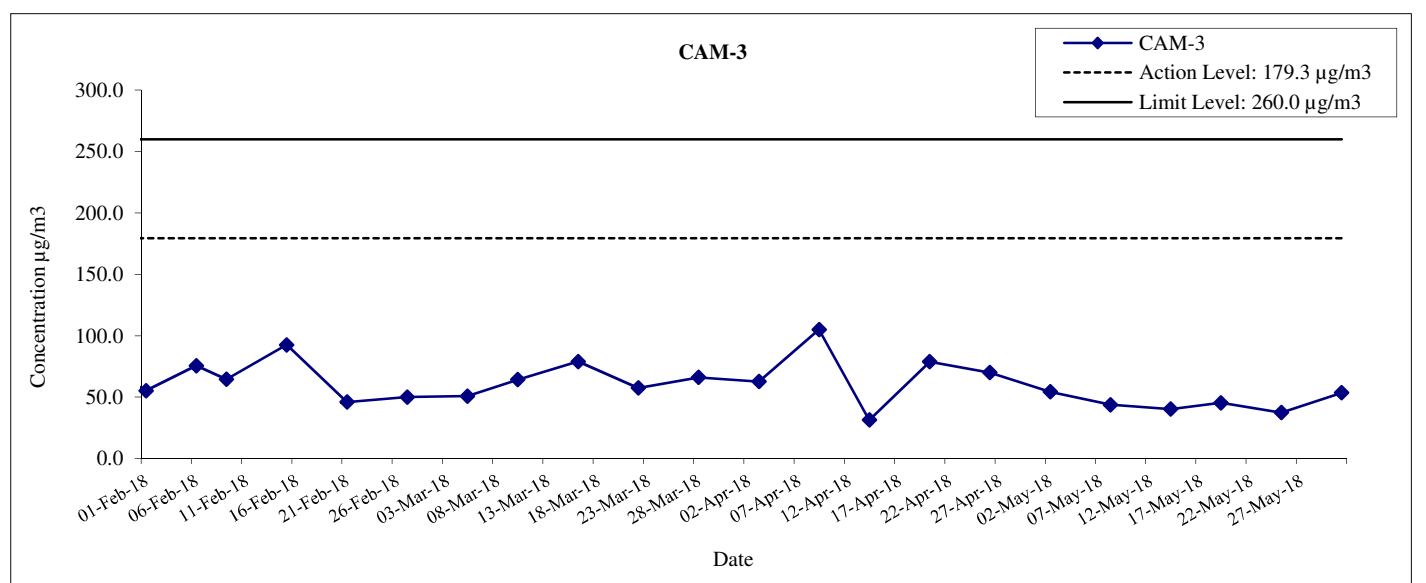
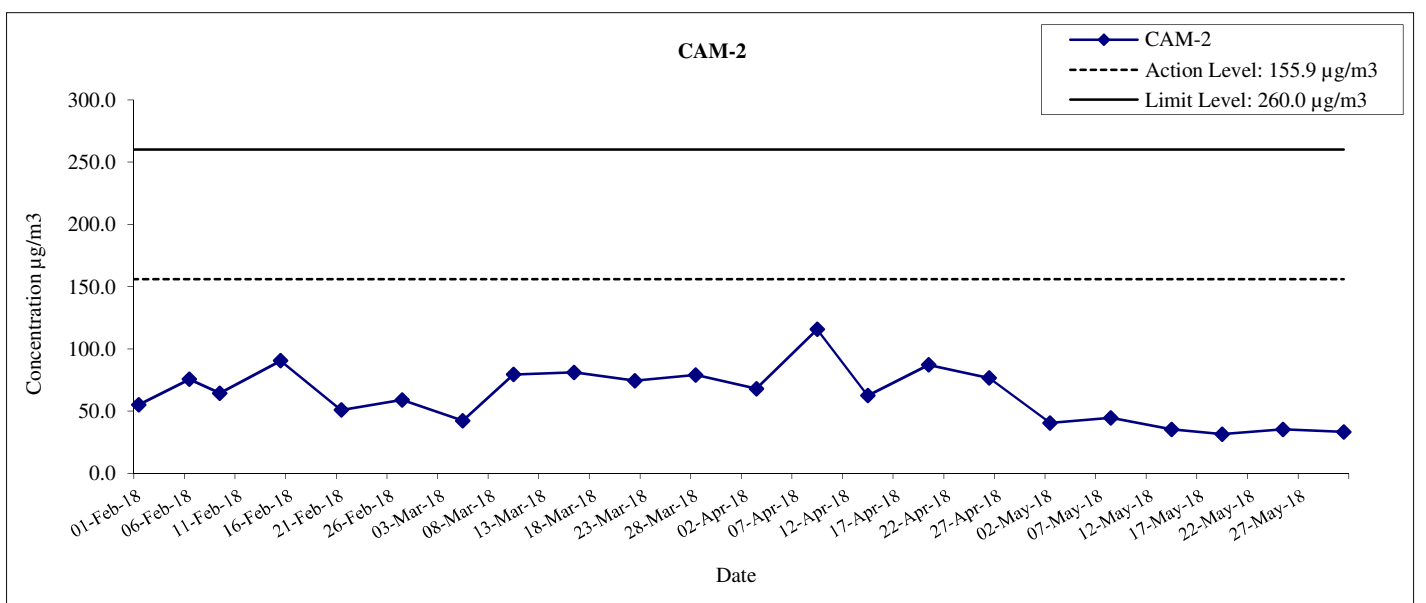
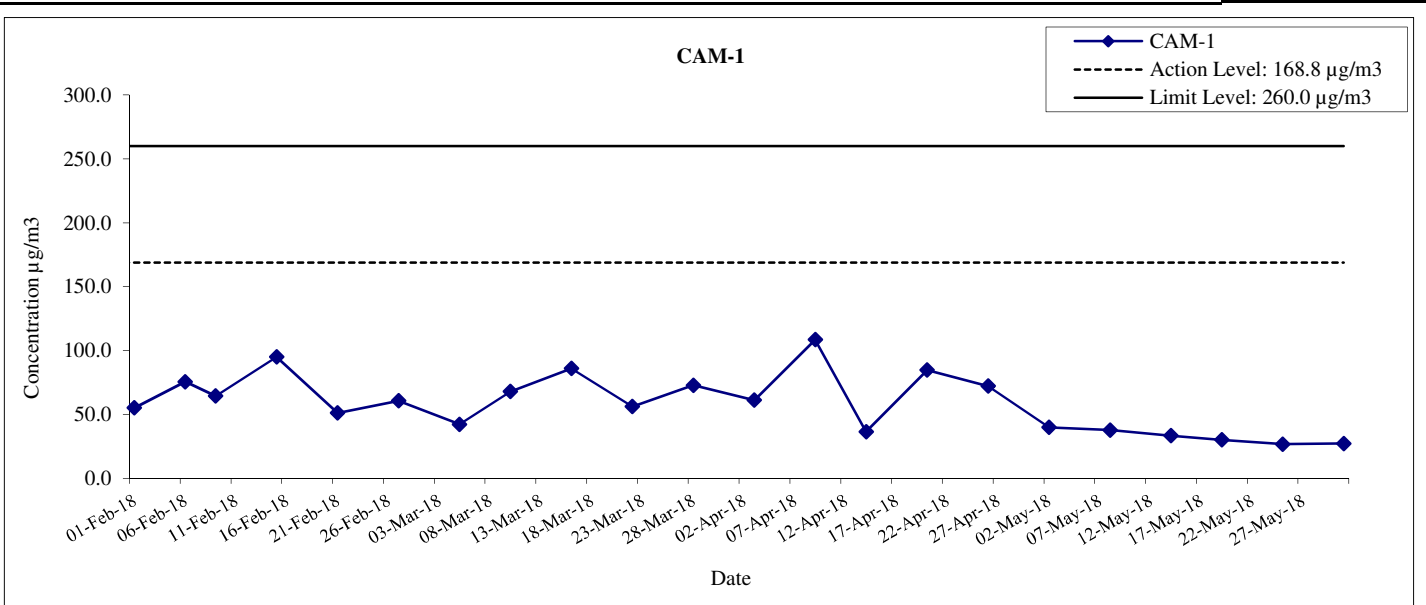
- CAM-2

Date	24-hour TSP Monitoring Results	Action Level	Limit Level
	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)
02-May-18	40.6	155.9	260.0
08-May-18	44.6	155.9	260.0
14-May-18	35.4	155.9	260.0
19-May-18	31.5	155.9	260.0
25-May-18	35.4	155.9	260.0
31-May-18	33.3	155.9	260.0

- CAM-3

Date	24-hour TSP Monitoring Results	Action Level	Limit Level
	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)
02-May-18	54.3	179.3	260.0
08-May-18	43.8	179.3	260.0
14-May-18	40.3	179.3	260.0
19-May-18	45.3	179.3	260.0
25-May-18	37.4	179.3	260.0
31-May-18	53.6	179.3	260.0

Remark: 1. Bold value indicated an Action level exceedance
 2. Bold & Italic value indicated an Limit level exceedance



Hong Kong Section of Guangzhou-Shenzhen-Hong Kong
Express Rail Link

**Graphical Presentation of 24-hour TSP Monitoring
Results for Location CAM-1, CAM-2 and CAM-3**

DATE

May-18

APPENDIX

F

APPENDIX F: Noise Monitoring Results

- CNM-1

Date	Noise Monitoring Results	Limit Level	Exceedance?
	Leq, dB(A)	Leq, dB(A)	
02-May-18	66	75	N
09-May-18	65	75	N
16-May-18	64	75	N
23-May-18	63	75	N
30-May-18	63	75	N

- CNM-2 ^[b]

Date	Noise Monitoring Results	Limit Level	Exceedance?
	Leq, dB(A)	Leq, dB(A)	
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

- CNM-3 ^[a]

Date	Noise Monitoring Results	Limit Level	Exceedance?
	Leq, dB(A)	Leq, dB(A)	
02-May-18	74	75	N
09-May-18	67	75	N
16-May-18	70	75	N
23-May-18	67	75	N
30-May-18	67	75	N

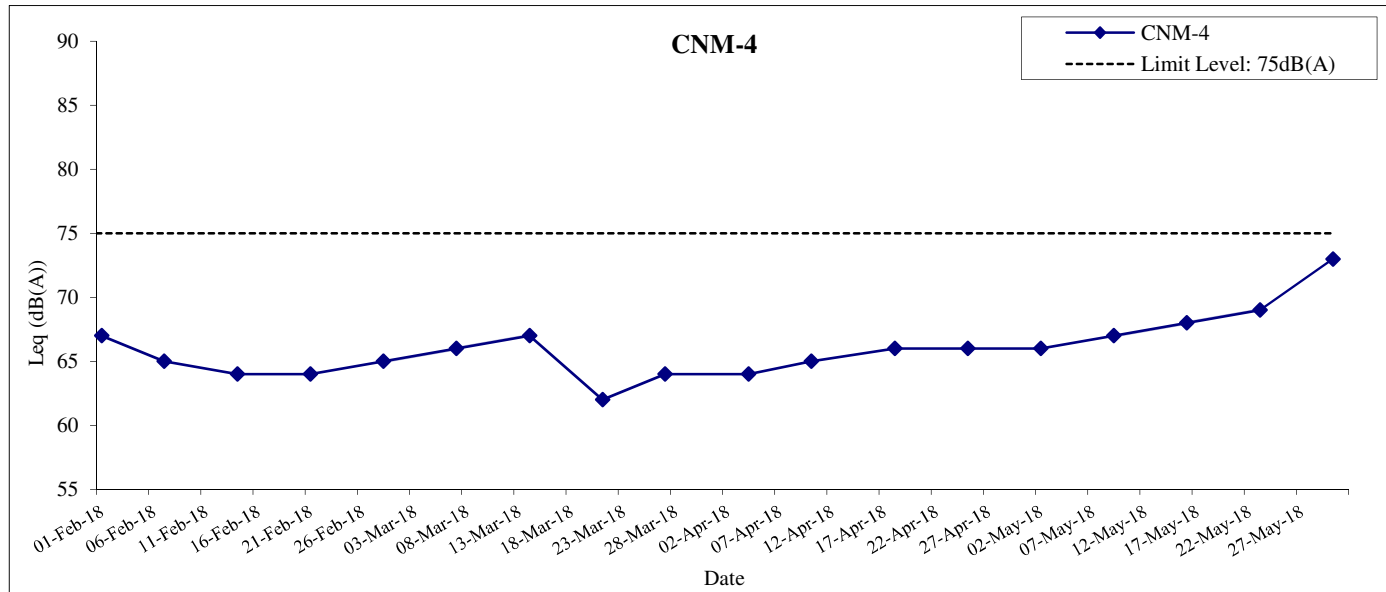
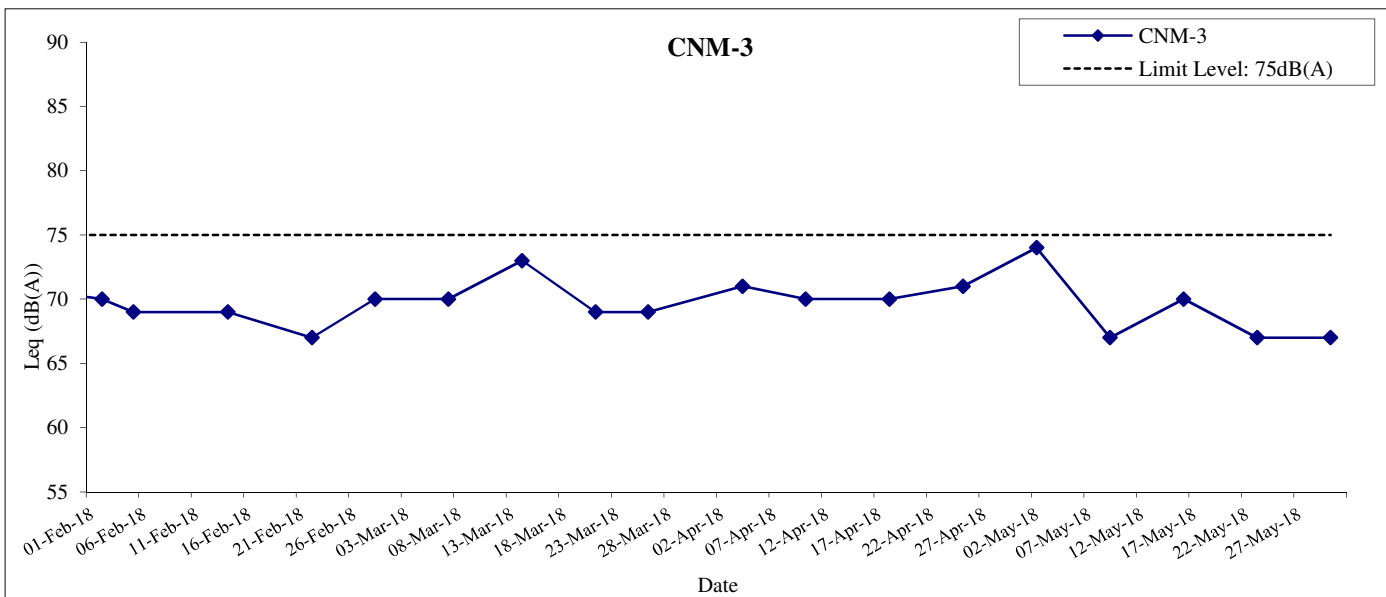
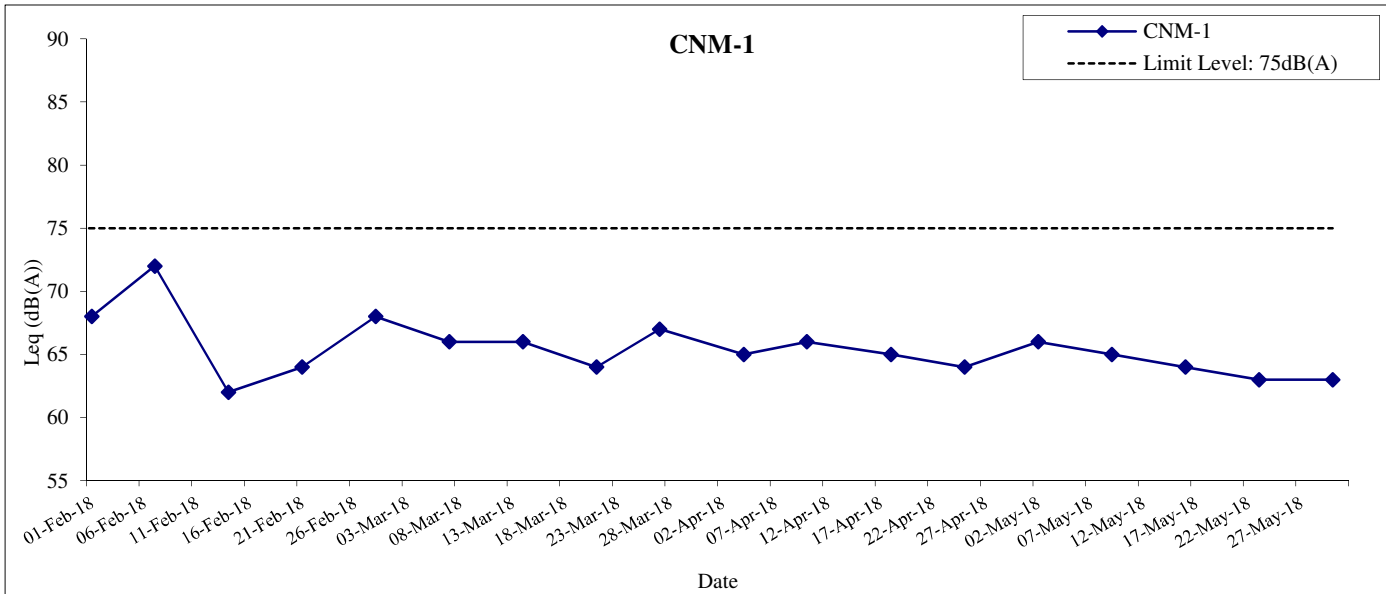
- CNM-4

Date	Noise Monitoring Results	Limit Level	Exceedance?
	Leq, dB(A)	Leq, dB(A)	
02-May-18	66	75	N
09-May-18	67	75	N
16-May-18	68	75	N
23-May-18	69	75	N
30-May-18	73	75	N

Note:

[a]. Facade correction of +3dB(A) would be added to the results taken at CNM-3 due to free-field noise measurements.

[b]. Noise monitoring has been temporarily suspended from 25-Aug-2014 since objection has been received from the OC of Sorrento.



Hong Kong Section of Guangzhou-Shenzhen-Hong Kong
Express Rail Link

**Graphical Presentation of Noise Monitoring Results for
Locations CNM-1, CNM-3 & CNM-4**

DATE

May-18

APPENDIX

F

Appendix G
Meteorological Data

**EXTRACT OF METEOROLOGICAL OBSERVATIONS FOR HONG KONG,
MAY 2018 (Table 1)**

Date MAY	Mean Pressure (hPa)	Air Temperature			Mean Dew Point Temperature (deg. C)	Mean Relative Humidity (%)	Mean Amount of Cloud (%)	Total Rainfall (mm)
		Maximum (deg. C)	Mean (deg. C)	Minimum (deg. C)				
1	1012.5	30.6	27.3	25.4	23.5	80	76	Trace
2	1012.4	31.8	27.9	25.6	23.0	75	64	-
3	1014.1	33.5	27.1	22.9	23.2	80	82	1.9
4	1016.1	25.1	23.8	22.1	20.6	82	89	0.8
5	1015.5	27.7	25.3	23.6	22.0	82	86	Trace
6	1011.3	31.0	27.6	25.4	23.7	80	80	1.0
7	1007.2	29.6	28.0	24.4	24.7	82	88	6.7
8	1008.3	27.1	25.2	23.7	23.5	91	88	28.4
9	1012.9	25.7	24.6	22.8	22.4	88	88	5.4
10	1015.0	23.9	23.0	22.2	21.1	89	90	8.0
11	1014.2	25.3	23.8	22.3	21.3	86	88	1.0
12	1012.3	30.6	26.5	24.2	23.1	82	71	-
13	1011.0	31.5	27.7	25.3	23.7	79	41	-
14	1010.0	31.9	28.6	26.6	24.1	77	43	-
15	1009.3	32.3	28.7	27.1	23.9	76	54	-
16	1008.8	32.2	28.6	26.1	23.5	74	46	-
17	1008.2	33.1	29.4	27.4	24.3	75	64	-
18	1007.7	33.4	29.8	27.7	24.4	74	73	-
19	1007.7	33.4	29.8	27.8	24.6	74	72	-
20	1008.4	34.5	30.1	27.8	24.2	72	41	-
21	1009.5	34.7	30.3	28.1	24.3	71	54	-
22	1010.5	34.8	30.4	27.9	24.0	69	28	-
23	1009.6	35.1	30.5	27.6	24.0	69	18	-

Date MAY	Mean Pressure (hPa)	Air Temperature			Mean Dew Point Temperature (deg. C)	Mean Relative Humidity (%)	Mean Amount of Cloud (%)	Total Rainfall (mm)
		Maximum (deg. C)	Mean (deg. C)	Minimum (deg. C)				
24	1009.3	33.5	30.0	28.4	24.5	73	46	-
25	1008.2	33.1	29.8	27.6	24.0	71	47	Trace
26	1008.3	34.7	30.7	28.8	24.9	72	49	0.9
27	1008.9	33.4	30.0	26.9	25.3	76	63	3.4
28	1009.0	34.5	30.3	27.8	24.3	72	47	-
29	1009.6	35.3	31.1	28.3	24.5	69	24	-
30	1009.7	35.4	31.2	29.0	24.6	69	60	-
31	1009.7	34.8	31.1	28.9	24.7	70	57	-
Mean/Total	1010.5	31.7	28.3	26.1	23.7	77	62	57.5
Normal*	1009.3	28.4	25.9	24.1	22.6	83	76	304.7
Station	Hong Kong Observatory							

**EXTRACT OF METEOROLOGICAL OBSERVATIONS FOR HONG KONG,
MAY 2018 (Table 2)**

Date MAY	Number of hours of Reduced Visibility# (hours)	Total Bright Sunshine (hours)	Daily Global Solar Radiation (MJ/m ²)	Total Evaporation (mm)	Prevailing Wind Direction (degrees)	Mean Wind Speed (km/h)
1	0	6.0	17.40	3.8	080	6.0
2	0	10.4	26.16	5.8	230	15.7
3	5	7.0	17.66	5.2	080	26.5
4	0	0.8	7.94	1.8	070	38.0
5	0	4.2	16.39	3.1	060	24.7
6	0	7.8	23.01	5.7	210	17.3
7	0	2.6	13.09	5.8	200	34.3

Date MAY	Number of hours of Reduced Visibility# (hours)	Total Bright Sunshine (hours)	Daily Global Solar Radiation (MJ/m²)	Total Evaporation (mm)	Prevailing Wind Direction (degrees)	Mean Wind Speed (km/h)
8	0	0.1	6.40	1.4	020	12.5
9	0	0.1	2.28	1.6	080	41.2
10	0	0.4	5.27	1.0	080	51.6
11	0	0.2	11.12	2.0	070	34.0
12	0	8.1	21.06	3.6	050	10.2
13	0	11.1	27.31	5.7	230	15.1
14	0	10.8	27.79	6.3	230	18.6
15	0	7.4	19.81	5.1	150	14.5
16	0	10.6	25.02	4.2	150	12.6
17	0	9.5	25.68	5.8	200	16.5
18	0	10.3	25.56	6.2	220	16.9
19	0	11.3	26.52	6.6	230	16.6
20	0	11.3	27.86	6.7	220	16.0
21	0	9.4	24.37	6.2	190	8.2
22	0	8.3	18.76	5.3	180	11.0
23	0	11.8	25.32	5.4	220	16.2
24	0	5.5	16.62	4.4	150	12.3
25	0	8.4	21.54	5.2	190	15.8
26	0	10.9	26.92	6.2	220	23.5
27	0	9.7	24.08	6.0	230	23.7
28	4	10.4	25.05	6.3	260	16.9
29	0	12.2	27.79	6.8	250	21.5
30	0	8.4	25.28	6.4	230	19.4
31	0	11.9	27.78	4.0	230	20.2
Mean/Total	9	236.9	20.54	149.6	220	20.2

Date MAY	Number of hours of Reduced Visibility# (hours)	Total Bright Sunshine (hours)	Daily Global Solar Radiation (MJ/m²)	Total Evaporation (mm)	Prevailing Wind Direction (degrees)	Mean Wind Speed (km/h)
Normal*	45.4 [§]	140.4	14.19	110.7	080	19.7
Station	Hong Kong International Airport	King's Park			Waglan Island [^]	

The minimum pressure recorded at the Hong Kong Observatory was 1004.2 hectopascals at 1603 HKT on 7 May.

The maximum air temperature recorded at the Hong Kong Observatory was 35.4 degrees C at 1402 HKT on 30 May.

The minimum air temperature recorded at the Hong Kong Observatory was 22.1 degrees C at 0323 HKT on 4 May.

The maximum gust peak speed recorded at Waglan Island was 75 kilometres per hour from 080 degrees at 1640 HKT on 9 May.

The maximum 1-minute mean rainfall rate recorded at the Hong Kong Observatory was 63 millimetres per hour at 2359 HKT on 7 May.

Reduced visibility refers to visibility below 8 kilometres when there is no fog, mist, or precipitation.

- The visibility readings at the Hong Kong International Airport are based on hourly observations by professional meteorological observers in 2004 and before, and average readings over the 10-minute period before the clock hour of the visibility meter near the middle of the south runway from 2005 onwards. The change of the data source in 2005 is an improvement of the visibility assessment using instrumented observations following the international trend.
- Before 10 October 2007, the number of hours of reduced visibility at the Hong Kong International Airport in 2005 and thereafter displayed in this web page was based on hourly visibility observations by professional meteorological observers. Since 10 October 2007, the data have been revised using the average visibility readings over the 10-minute period before the clock hour, as recorded by the visibility meter near the middle of the south runway.

[^] In case the data are not available from Waglan Island, observations of Cheung Chau or other nearby weather stations will be incorporated in computing the Prevailing Wind Direction and Mean Wind Speed.

* 1981 - 2010 Climatological Normal, unless otherwise specified

§ 1997 - 2017 Mean value

Appendix H

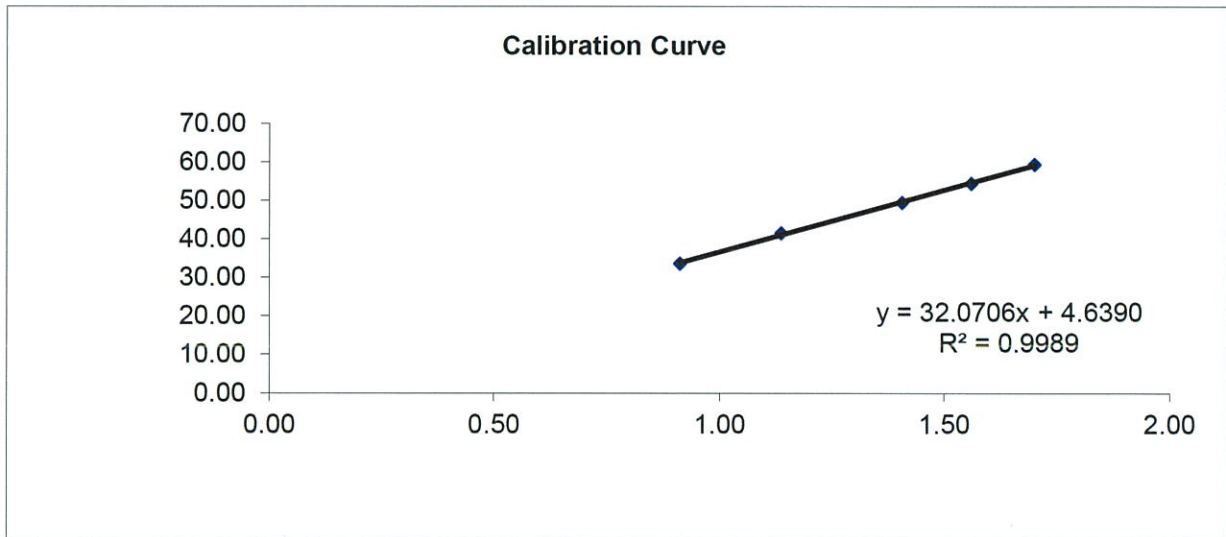
Calibration Certificate of High Volume Samplers and Orifice Calibrator

Ove Arup Partners (Hong Kong) Limited

High Volume Air Sampler Calibration Worksheet

Calibration date	18-May-18	Barometric pressure	756.212 mm Hg
Next Calibration date	14-Nov-18	Temperature (°C)	29.4 °C
Sampler location	AM15 (XRL)/CAM-1(Roadworks at West Kowloon) - Between Sorrento and Waterfront		
Sampler model	TE-5170	Temperature (K)	302.4 K
Sampler serial number	515	P _{std}	760 mm Hg
		T _{std}	298 K
Calibrator model	TE-5021A		
Calibrator serial number	2421		
Slope of the standard curve, m _s	2.088658		
Intercept of the standard curve, b _s	-0.05201		

Resistance Plate No.	Manometer Reading (inch H ₂ O)	Flow Recorder Reading (CFM)	Calculated Q _{std} (m ³ /min)	Continuous Flow Recorder Reading IC (CFM)
5	3.50	34.00	0.91	33.67
7	5.50	42.00	1.14	41.59
10	8.50	50.00	1.41	49.51
13	10.50	55.00	1.56	54.46
18	12.50	60.00	1.70	59.41



Linear Regression

Sampler slope (m) : **32.0706**
 Sampler intercept (b) : **4.6390**
 Correlation coefficient (R²) : **0.9989**

Correlation coefficient is greater than 0.9900 and the calibration result is accepted.

Performed by: 劉特樂

Date: 18 MAY 2018

Checked by: [Signature]

Date: 18 MAY 2018

Approved by: [Signature]

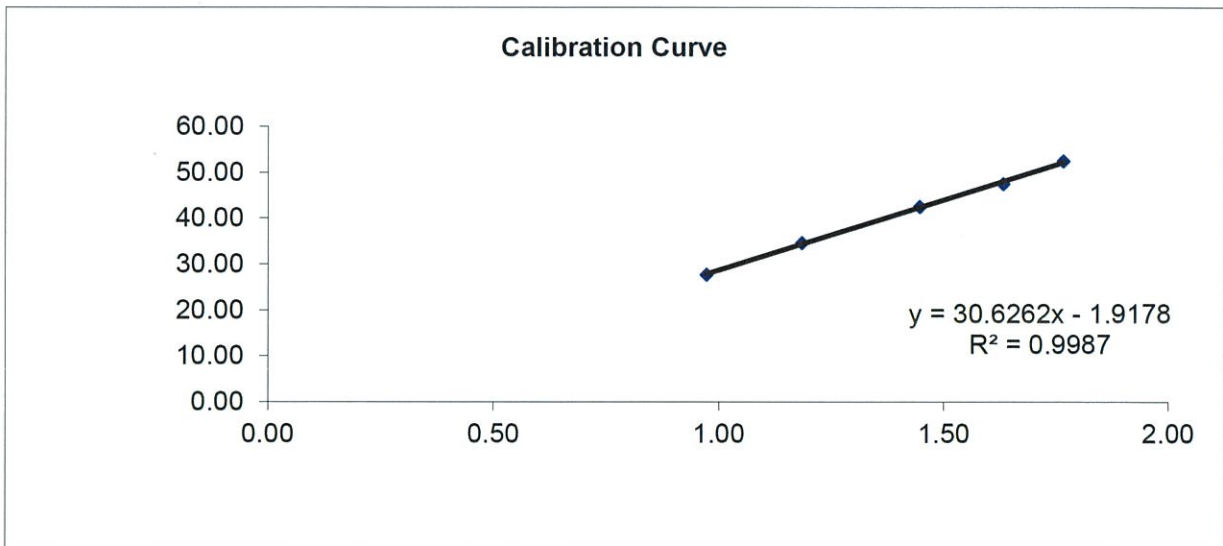
Date: 18 May 2018

Ove Arup Partners (Hong Kong) Limited

High Volume Air Sampler Calibration Worksheet

Calibration date	18-May-18	Barometric pressure	756.212 mm Hg
Next Calibration date	14-Nov-18	Temperature (°C)	29.4 °C
Sampler location	AM16 (XRL)/CAM-2(Roadworks at West Kowloon) - Waterfront	Temperature (K)	302.4 K
Sampler model	TE-5170	P _{std}	760 mm Hg
Sampler serial number	1282	T _{std}	298 K
Calibrator model	TE-5021A		
Calibrator serial number	2421		
Slope of the standard curve, m _s	2.088658		
Intercept of the standard curve, b _s	-0.05201		

Resistance Plate No.	Manometer Reading (inch H ₂ O)	Flow Recorder Reading (CFM)	Calculated Q _{std} (m ³ /min)	Continuous Flow Recorder Reading IC (CFM)
5	4.00	28.00	0.97	27.73
7	6.00	35.00	1.19	34.66
10	9.00	43.00	1.45	42.58
13	11.50	48.00	1.63	47.53
18	13.50	53.00	1.77	52.48



Linear Regression

Sampler slope (m) : **30.6262**
 Sampler intercept (b) : **-1.9178**
 Correlation coefficient (R²) : **0.9987**

Correlation coefficient is greater than 0.9900 and the calibration result is accepted.

Performed by: 劉特樂

Date: 18 MAY 2018

Checked by: [Signature]

Date: 18 MAY 2018

Approved by: [Signature]

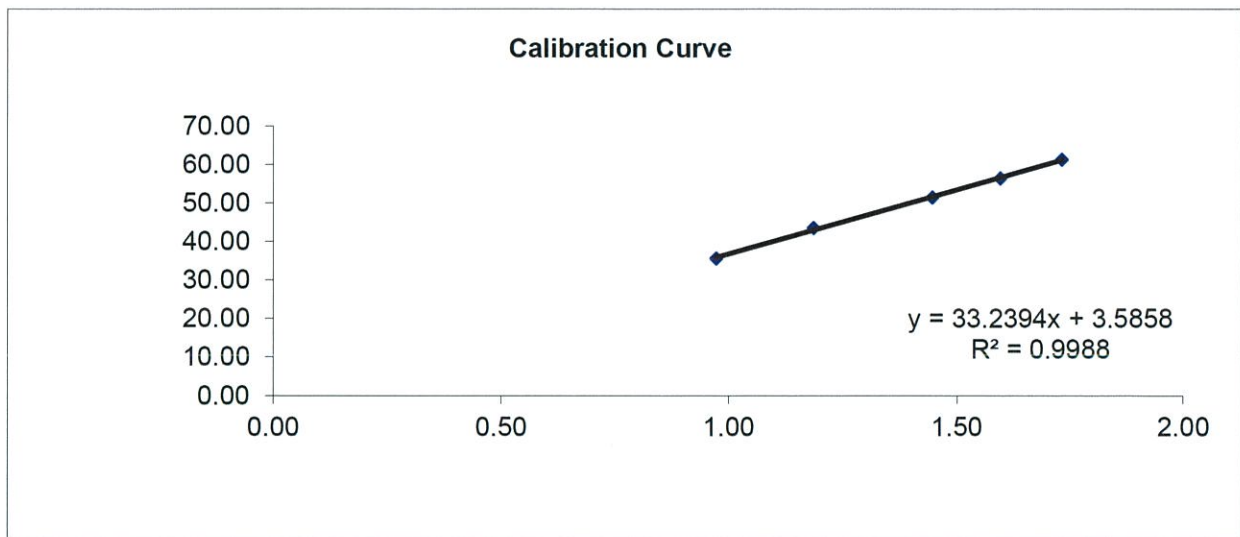
Date: 18 May 2018

Ove Arup Partners (Hong Kong) Limited

High Volume Air Sampler Calibration Worksheet

Calibration date	18-May-18	Barometric pressure	756.212 mm Hg
Next Calibration date	14-Nov-18	Temperature (°C)	29.4 °C
	AM17 (XRL)/CAM-3(Roadworks at West Kowloon) - The Victoria		
Sampler location	Towers	Temperature (K)	302.4 K
Sampler model	TE-5170	P _{std}	760 mm Hg
Sampler serial number	528	T _{std}	298 K
Calibrator model	TE-5021A		
Calibrator serial number	2421		
Slope of the standard curve, m _s	2.088658		
Intercept of the standard curve, b _s	-0.05201		

Resistance Plate No.	Manometer Reading (inch H ₂ O)	Flow Recorder Reading (CFM)	Calculated Q _{std} (m ³ /min)	Continuous Flow Recorder Reading IC (CFM)
5	4.00	36.00	0.97	35.65
7	6.00	44.00	1.19	43.57
10	9.00	52.00	1.45	51.49
13	11.00	57.00	1.60	56.44
18	13.00	62.00	1.73	61.39



Linear Regression

Sampler slope (m) : **33.2394**
 Sampler intercept (b) : **3.5858**
 Correlation coefficient (R²) : **0.9988**

Correlation coefficient is greater than 0.9900 and the calibration result is accepted.

Performed by: 劉特樂

Date: 18 MAY 2018

Checked by: [Signature]

Date: 18 MAY 2018

Approved by: [Signature]

Date: 18 May 2018

Certificate of Calibration

Calibration Certification Information			
Cal. Date: January 24, 2018	Rootsmeter S/N: 438320	Ta: 293	°K
Operator: Jim Tisch		Pa: 756.9	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: 2421		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4300	3.2	2.00
2	3	4	1	1.0130	6.4	4.00
3	5	6	1	0.9080	7.9	5.00
4	7	8	1	0.8650	8.8	5.50
5	9	10	1	0.7180	12.6	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
1.0087	0.7054	1.4233	0.9958	0.6963	0.8799
1.0044	0.9915	2.0129	0.9915	0.9788	1.2443
1.0024	1.1039	2.2505	0.9896	1.0898	1.3912
1.0012	1.1574	2.3603	0.9884	1.1426	1.4591
0.9961	1.3873	2.8467	0.9834	1.3696	1.7598
QSTD	m=	2.08658	QA	m=	1.30658
	b=	-0.05201		b=	-0.03215
	r=	0.99998		r=	0.99998

Calculations	
Vstd= $\Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)$	Va= $\Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$
Qstd= $Vstd / \Delta Time$	Qa= $Va / \Delta Time$
For subsequent flow rate calculations:	
Qstd= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$	Qa= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH: calibrator manometer reading (in H2O)	
ΔP: rootsmeter manometer reading (mm Hg)	
Ta: actual absolute temperature (°K)	
Pa: actual barometric pressure (mm Hg)	
b: intercept	
m: slope	

RECALIBRATION
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30