

MTR Corporation Limited

**Shatin to Central Link - Tai Wai to Hung  
Hom Section [SCL(TAW – HUH)] and  
Stabling Sidings at Hung Hom Freight Yard  
[SCL(HHS)]**

Monthly Operational Airborne Rail Noise  
Monitoring Report (Festival City) No.1  
[Period from 14 February to 13 March 2020]

(March 2020)

Verified by: Helen Cochrane 

Position: Independent Environmental Checker

Date: 11 March 2020

MTR Corporation Limited

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Certified by:                     Lisa Poon                     

Position:           Environmental Team Leader          

Date:                                     11 March 2020

MTR Corporation Limited

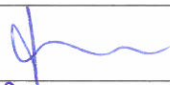
Consultancy Agreement No. C11033

**Shatin to Central Link - Tai Wai to Hung  
Hom Section [SCL(TAW – HUH)] and  
Stabling Sidings at Hung Hom Freight  
Yard [SCL(HHS)]**

**Monthly Operational Airborne Rail Noise  
Monitoring Report (Festival City) No.1**

[Period from 14 February to 13 March 2020]

March 2020

	Name	Signature
Prepared & Checked:	Isaac Chu	
Reviewed & Approved:	Josh Lam	

Version: A Date: 2 March 2020

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## 1 INTRODUCTION

### 1.1 Background

- 1.1.1 The Shatin to Central Link (SCL) is a 17km extension of the existing Ma On Shan Line (MOL) and East Rail Line (EAL) comprising (i) The East-West Corridor which extends the MOL from Tai Wai to Hung Hom via East Kowloon to connect with the West Rail Line (WRL) at Hung Hom Station (HUH) and Stabling Sidings at Hung Hom Freight Yard (HHS); and (ii) The North-South Corridor which is an extension of the EAL at Hung Hom across the harbour to Admiralty Station (ADM).
- 1.1.2 The SCL Tai Wai to Hung Hom Section [SCL (TAW-HUH)] included a total of 7 stations, including Hin Keng Station (HIK), Diamond Hill Station (DIH), Kai Tak Station (KAT), Sung Wong Toi Station (SUW) (formerly named as To Kwa Wan Station (TKW) in SCL(TAW-HUH) EIA), To Kwa Wan Station (formerly named as Ma Tau Wai Station (MTW) in SCL (TAW-HUH) EIA Report), Ho Man Tin Station (HOM) and Hung Hom Station (HUH).
- 1.1.3 Following the cessation of the operations of various freight facilities at Hung Hom in April 2011, MTR Corporation Limited started a detailed study to investigate the feasibility and environmental acceptability of utilizing the former freight yard to accommodate the train stabling requirements for SCL (TAW-HUH). To allow Stabling Sidings at Hung Hom Freight Yard (HHS) feasible for the use of stabling, in addition to providing siding tracks underneath the existing podium structure covering the freight yard, and launching/retrieval and emergency tracks and shunt neck extending outside the podium, appropriate changes were made to the design of SCL (TAW-HUH) and SCL Mong Kok East to Hung Hom Section [SCL (MKK-HUH)] at HUH, Kai Tak Station (KAT) and Diamond Hill Station (DIH) and its associated alignment and facilities.
- 1.1.4 Environmental Impact Assessment (EIA) Reports for SCL – Tai Wai to Hung Hom Section [SCL (TAW-HUH)] (Register No. AEIAR-167/2012), SCL Stabling Sidings at Hung Hom Freight Yard [SCL (HHS)] (Register No. AEIAR-164/2012) and SCL - Mong Kok East to Hung Hom Section [SCL(MKK – HUH)] (Register No. AEIAR-165/2012) (hereinafter referred to as “the EIA Reports”) were approved on 17 February 2012 under the Environmental Impact Assessment Ordinance (EIAO). The alignment and associated facilities under SCL (TAW-HUH) at HUH, KAT and DIH, and SCL (MKK-HUH) at HUH were superseded by those proposed and assessed in SCL (HHS) EIA Report.
- 1.1.5 Following the approval of the EIA Reports, the Environmental Permit EP-438/2012 covering the construction of both SCL (TAW-HUH) and SCL (HHS) (hereinafter referred to as “the Project”) was granted on 22 March 2012. Variations of Environmental Permit (VEP) were subsequently applied for EP-438/2012 and the latest Environmental Permit (EP No: EP-438/2012/K) was issued by Director of Environmental Protection (DEP) on 4 October 2016.
- 1.1.6 In accordance with Section 8.9 of the approved Environmental Monitoring and Audit (EM&A) Manuals for SCL (TAW-HUH) and SCL (HHS), monitoring of  $L_{eq,30min}$  airborne rail noise levels will be carried out at the proposed monitoring locations during night-time period, i.e. 2300-0700 hours on a monthly basis after SCL (TAW-HUH) and SCL (HHS) is in operation. The noise monitoring will be conducted for the initial start-up of up to 6 months and can be terminated before the end of this 6-month period with full compliance of the noise limit and agreement from IEC.
- 1.1.7 An Operational Rail Noise Monitoring Plan (hereinafter referred to as “the Plan”) (**Appendix A** refers) specifying monitoring locations, monitoring methodology and noise criteria was agreed by EPD on 14 February 2020.
- 1.1.8 The SCL(TAW-HUH) will connect the West Rail Line (WRL) and Ma On Shan Line (MOL) to form Tuen Ma Line (TML). The 1<sup>st</sup> phase opening of TML, covering three new stations at Hin Keng, Diamond Hill and Kai Tak commenced on 14 February 2020. As such the 1<sup>st</sup> phase operational airborne rail noise monitoring has commenced accordingly.

1.1.9 AECOM Asia Co. Ltd (AECOM) was commissioned by MTRC to conduct the operational rail noise monitoring for the phased opening of TML according to the agreed Plan.

**1.2 Purpose of the Report**

1.2.1 The 1<sup>st</sup> phase opening of TML commenced on 14 February 2020. This is the first monthly operational noise monitoring report, summarizing the monitoring result obtained between 14 February and 13 March 2020.

## 2 OPERATIONAL RAIL NOISE MONITORING

### 2.1 Monitoring Equipment

- 2.1.1 In accordance with the Plan, sound level meter in compliance with the prevailing International Electrotechnical Commission Publications 60651 (Type 1) and 60804 (Type 1) specifications was used for carrying out the noise monitoring. Immediately prior to and following each noise measurement, the accuracy of sound level meter was checked using an acoustic calibrator generating 94dB at 1000 Hz. Measurement was considered to be valid with the calibration level from before and after the noise measurement within 1.0 dB. **Table 2.1** summarizes the noise monitoring equipment model used for monitoring.

**Table 2.1 Noise Monitoring Equipment**

Equipment	Model
Integrating Sound Level Meter	• B&K 2250 (Serial No. 3001291)
Calibrator	• B&K 4231 (Serial No. 3006428)

### 2.2 Monitoring Parameter

- 2.2.1 A  $L_{Aeq, 30min}$  was obtained during night-time normal train operation on a monthly basis.

### 2.3 Monitoring Location and Date

- 2.3.1 As discussed in **Section 1.1.8**, the 1<sup>st</sup> phase opening of TML, covering three new stations at Hin Keng, Diamond Hill and Kai Tak commenced on 14 February 2020. The 1<sup>st</sup> operational airborne noise monitoring at Tower 1, Festival City Phase II (TAW-P1-2) was conducted on 17 February 2020, while the noise monitoring at Wing Fung Building (HUH-1-3) will be conducted in a later stage after full opening of TML.
- 2.3.2 The corresponding monitoring location during the reporting period was shown in **Figure C11033/C/SCL/ACM/M52/071**.
- 2.3.3 Summary of the monitoring location and monitoring date during the reporting period are shown in **Table 2.2**.

**Table 2.2 Monitoring Location and Schedule of Noise Monitoring**

Monitoring ID	NSR ID	Description	Type	Measurement Floor <sup>(1)</sup>	ASR	Monitoring Date
NMS-OA-1	TAW-P1-2	Tower 1, Festival City Phase II	Residential	Refuge Floor (19/F)	C <sup>(2)</sup>	17 February 2020

Remarks:

- (1) In accordance with Noise Performance Test Report, the predicted noise level (i.e.  $L_{Aeq, 30min}$  45dB(A) during night-time period) at the measurement floor (19/F) of TAW-P1-2 is same as those predicted at the worst affected floor (10/F). It is therefore considered that the noise level at the proposed measurement floor would be able to represent the worst affected floor.
- (2) Based on latest available information, Annual Traffic Census 2018 (ATC 2018), Tsing Sha Highway located to the immediate south-west of TAW-P1-2, as represented by the annual average daily traffic (AADT) of Eagle's Nest Tunnel, is considered as an Influencing Factor (IF) with the AADT of this road section more than 30,000 (i.e. 60,680 as recorded in ATC 2018). As TAW-P1-2 is located in "Urban Area" and the noise from IF was readily noticeable at the monitoring location during the monitoring, the ASR "C" was assigned to TAW-P1-2.

### 2.4 Monitoring Procedures

- 2.4.1 During the noise monitoring, the following procedures were followed:
- All measurements were made in facade type. The microphone of the sound level meter was

positioned 1m exterior of the sensitive receivers and lowered sufficiently so that the external wall of the building acts as a reflecting surface.

- Parameters such as frequency weighting, the time weighting and the duration of measurement were set as follows:
  - Frequency weighting : A
  - Time weighting : Fast
  - Duration of measurement :  $L_{Aeq\ 30\ min}$  (with data being logged at every one second)
- Prior to and after each noise measurement, the sound level meter was calibrated using the Calibrator for 94 dB at 1000 Hz. If the difference in the calibration level before and after measurement was more than 1 dB (A), the measurement is considered invalid and repeat of noise measurement should be required after repair or re-calibration of the equipment.
- Details were recorded when intrusive noise was observed. Noise sources and duration were also recorded during the measurement process.
- All the monitoring data within the sound level meter system were downloaded through the computer software. All these data were then checked and reviewed properly.
- The weather condition during the monitoring period was recorded by the monitoring staff.
- Noise monitoring was conducted in the absence of fog, rain, and wind with a steady speed lower than 5 m/s, or wind with gusts lower than 10 m/s.

2.4.2 Calibration certificates for the equipment employed for monitoring (**Table 2.1** refers) are presented in **Appendix B**.

## 2.5 Data Analysis

2.5.1 Overall noise level,  $L_{Aeq\ 30\ min\ (overall)}$ , represents the noise level recorded during the 30-minute Sampling Time Period, including the time periods with and without the TML, EAL and intercity trains passed in front of the monitoring station. Background noise levels,  $L_{Aeq\ 30\ min\ (background)}$  was evaluated by discarding logged data for the period when the TML, EAL and intercity trains passed in front of the monitoring station.

2.5.2 The noise level contributed by TML, EAL and intercity trains pass-by,  $L_{Aeq\ 30min\ (event)}$ , was calculated by subtracting the background noise level  $L_{Aeq\ 30min\ (background)}$  from the overall noise level  $L_{Aeq\ 30\ mins\ (overall)}$  in accordance with standard acoustical principles. In the event of  $L_{Aeq\ 30min\ (overall)}$  is lower than  $L_{Aeq\ 30min\ (background)}$ ,  $L_{Aeq\ 30min\ (event)}$  would be evaluated by applying a correction of -12 dB(A) to  $L_{Aeq\ 30min\ (overall)}$ , following same approach as adopted in MOL 8-car train operation noise monitoring conducted in 2017.

2.5.3 The operation rail noise level is considered in compliance with NCO noise criteria if one of following conditions is satisfied:

- Operation rail noise level,  $L_{Aeq\ 30min\ (event)}$ , do not exceed ANL; or
- Overall noise level is comparable to background noise level (i.e.  $L_{Aeq\ 30min\ (overall)} - L_{Aeq\ 30min\ (background)} < 3\ dB$ ).

## 2.6 Result and Observation

2.6.1 Night-time operation rail noise monitoring was carried out at TAW-P1-2 during the reporting period. All monitoring data and graphical presentation of the monitoring results are provided in **Appendix C**. **Tables 2.3** summarises the monitoring result obtained.



**Table 2.3 Summary of Operation Rail Noise Monitoring Result at Tower 1, Festival City Phase II**

Monitoring Date	Time	Noise Level, $L_{Aeq, 30 \text{ min}}$ , dB(A)					
		$L_{Aeq 30min}$ (overall)	$L_{Aeq 30min}$ (background)	Difference	$L_{Aeq 30min}$ (event)	ANL	Compliance
17 February 2020	23:30 – 00:00	60.1	57.8	2.3	56	60	Yes

- 2.6.2 According to site observation, apart from the train noise including TML and EAL trains, the noise source from heavy vehicles (i.e. bus and trucks) travelling along Tsing Sha Highway was readily noticeable.
- 2.6.3 With the satisfaction of either one or both conditions set out in **Section 2.5.3**, the monitoring result indicated the compliance of operation rail noise level with NCO noise criteria.

### **3 CONCLUSION**

- 3.1.1 Monthly night-time noise monitoring was conducted on 17 February 2020 at Tower 1, Festival City Phase II for the 1<sup>st</sup> phase of TML operation. It was observed that noise generated from road traffic along Tsing Sha Highway was readily noticeable during the monitoring period. The monitoring result indicated the operation rail noise level complied with NCO noise criteria.

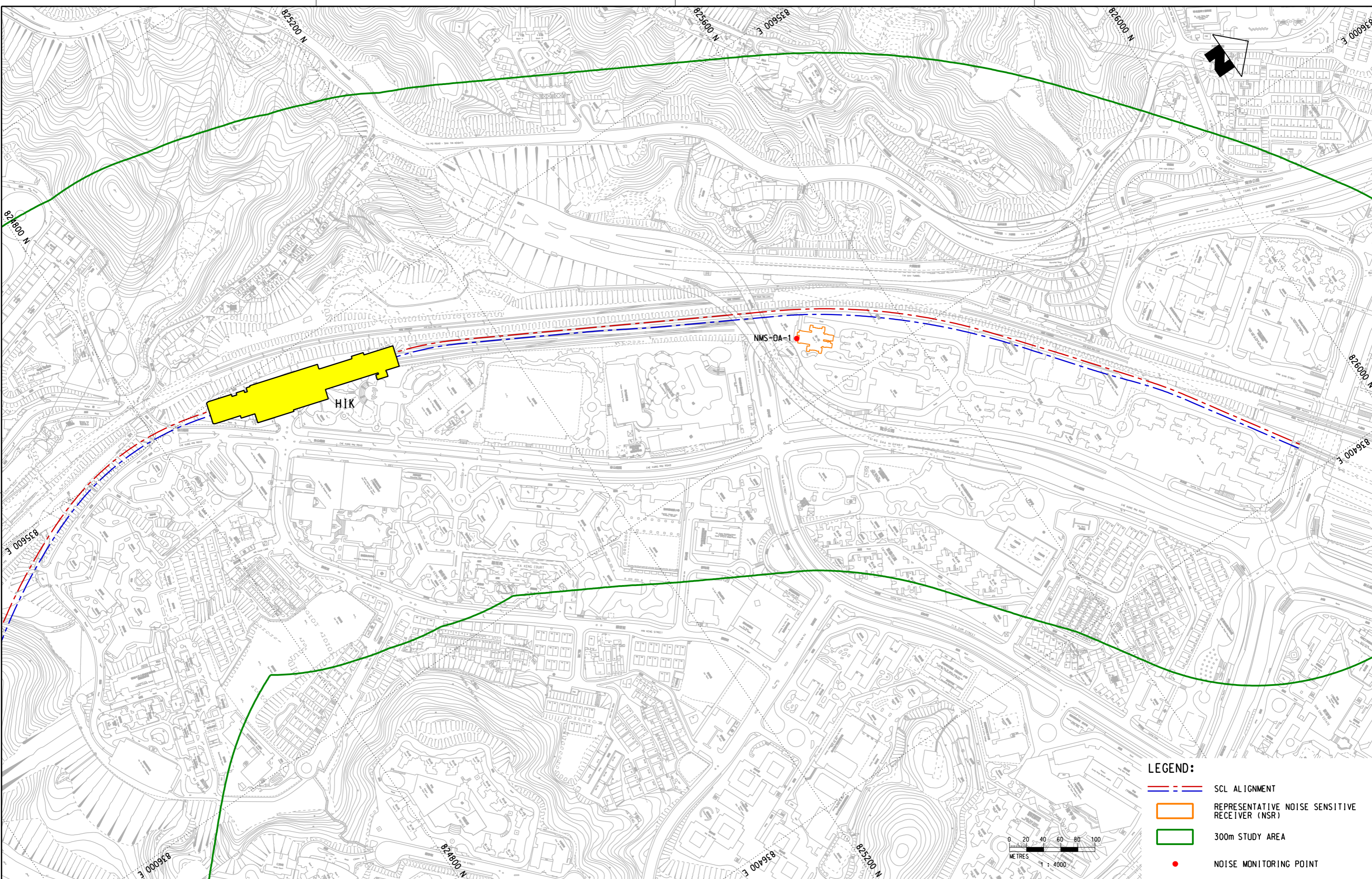
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**Figure**

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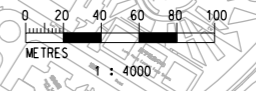
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**LEGEND:**

- — — SCL ALIGNMENT
- REPRESENTATIVE NOISE SENSITIVE RECEIVER (NSR)
- 300m STUDY AREA
- NOISE MONITORING POINT



REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED
A	FIRST ISSUE	GL	13APR17	ST					

DRAWN	ZFX
DESIGNED	GL
CHECKED	ST
APPROVED	ST
DATE	21/FEB/2020

**MTR**

**SHATIN TO CENTRAL LINK**

**AECOM**

ORIGINATOR

CADD REF. C11033\_C\_SCL\_ACM\_M52\_071.dgn

**TITLE**

**C11033**  
**SCL (TAW - HUH)**  
**LOCATION OF OPERATION RAIL NOISE MONITORING POINT**  
**(TOWER 1, FESTIVAL CITY PHASE II)**

SCALE 1 : 4000 (A3)

FIGURE NO. C11033/C/SCL/ACM/M52/071

REV. A



**Appendix A**

**Operational Railway Noise Monitoring Plan (February 2020)**



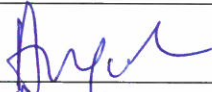


**MTR Corporation Limited**

Consultancy Agreement No. C11033

**Shatin to Central Link - Tai Wai to  
Hung Hom Section [SCL(TAW – HUH)]  
and Stabling Sidings at Hung Hom  
Freight Yard [SCL(HHS)]**

**Operational Airborne Rail Noise  
Monitoring Plan**

February 2020

	Name	Signature
Prepared & Checked:	Angela Tong	
Reviewed & Approved:	 Josh Lam	

Version: **A** Date: **14 February 2020**

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## 1 INTRODUCTION

### 1.1 Background

- 1.1.1 The Shatin to Central Link (SCL) is a 17km extension of the existing Ma On Shan Line (MOL) and East Rail Line (EAL) comprising (i) The East-West Corridor which extends the MOL from Tai Wai to Hung Hom via East Kowloon to connect with the West Rail Line (WRL) at Hung Hom Station (HUH) and Stabling Sidings at Hung Hom Freight Yard (HHS); and (ii) The North-South Corridor which is an extension of the EAL at Hung Hom across the harbour to Admiralty Station (ADM).
- 1.1.2 The SCL Tai Wai to Hung Hom Section [SCL (TAW-HUH)] included a total of 7 stations, including Hin Keng Station (HIK), Diamond Hill Station (DIH), Kai Tak Station (KAT), Sung Wong Toi Station (SUW) (formerly named as To Kwa Wan Station (TKW) in SCL(TAW-HUH) EIA), To Kwa Wan Station (formerly named as Ma Tau Wai Station (MTW) in SCL (TAW-HUH) EIA Report), Ho Man Tin Station (HOM) and Hung Hom Station (HUH).
- 1.1.3 Following the cessation of the operations of various freight facilities at Hung Hom in April 2011, MTR Corporation Limited started a detailed study to investigate the feasibility and environmental acceptability of utilizing the former freight yard to accommodate the train stabling requirements for SCL (TAW-HUH). To allow Stabling Sidings at Hung Hom Freight Yard (HHS) feasible for the use of stabling, in addition to providing siding tracks underneath the existing podium structure covering the freight yard, and launching/retrieval and emergency tracks and shunt neck extending outside the podium, appropriate changes were made to the design of SCL (TAW-HUH) and SCL Mong Kok East to Hung Hom Section [SCL (MKK-HUH)] at HUH, Kai Tak Station (KAT) and Diamond Hill Station (DIH) and its associated alignment and facilities.
- 1.1.4 Environmental Impact Assessment (EIA) Reports for SCL – Tai Wai to Hung Hom Section [SCL (TAW-HUH)] (Register No. AEIAR-167/2012), SCL Stabling Sidings at Hung Hom Freight Yard [SCL (HHS)] (Register No. AEIAR-164/2012) and SCL - Mong Kok East to Hung Hom Section [SCL(MKK – HUH)] (Register No. AEIAR-165/2012) (hereinafter referred to as “the EIA Reports”) were approved on 17 February 2012 under the Environmental Impact Assessment Ordinance (EIAO). The alignment and associated facilities under SCL (TAW-HUH) at HUH, KAT and DIH, and SCL (MKK-HUH) at HUH were superseded by those proposed and assessed in SCL (HHS) EIA Report.
- 1.1.5 Following the approval of the EIA Reports, the Environmental Permit EP-438/2012 covering the construction of both SCL (TAW-HUH) and SCL (HHS) (hereinafter referred to as “the Project”) was granted on 22 March 2012. Variations of Environmental Permit (VEP) were subsequently applied for EP-438/2012 and the latest Environmental Permit (EP No: EP-438/2012/K) was issued by Director of Environmental Protection (DEP) on 4 October 2016.
- 1.1.6 In accordance with Section 8.9 of the approved Environmental Monitoring and Audit (EM&A) Manuals for SCL (TAW-HUH) and SCL (HHS), monitoring of  $L_{eq,30min}$  airborne rail noise levels will be carried out at the proposed monitoring locations during night-time period, i.e. 2300-0700 hours on a monthly basis after SCL (TAW-HUH) and SCL (HHS) is in operation. The noise monitoring will be conducted for the initial start-up of up to 6 months and can be terminated before the end of this 6-month period with full compliance of the noise limit and agreement from IEC.
- 1.1.7 The SCL(TAW-HUH) will connect the West Rail Line (WRL) and Ma On Shan Line (MOL) to form Tuen Ma Line (TML). The MTR Corporation Limited has recommended phased opening of TML, covering three new stations at Hin Keng, Diamond Hill and Kai Tak with a target opening on 14<sup>th</sup> February 2020. As such the operational airborne rail noise monitoring will also be conducted in 2 phases.
- 1.1.8 This Operational Rail Noise Monitoring Plan (hereinafter referred to as “the Plan”) specifies monitoring locations, monitoring methodology and noise criteria for agreement of the DEP prior to commencement of the operational rail noise monitoring.



## **1.2 Purpose of This Plan**

1.2.1 This Plan presents the proposed noise monitoring locations, monitoring methodology and noise criteria for the operational rail noise monitoring.

1.2.2 This Plan comprises the following sections:

- Section 1 presents the background information.
- Section 2 presents the noise criteria and proposed monitoring locations.
- Section 3 presents the measurement methodology.

## 2 NOISE CRITERIA AND MONITORING LOCATIONS

### 2.1 Airborne Railway Noise Criteria

- 2.1.1 The Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM) specifies the applicable acceptable noise levels (ANLs) for airborne railway noise. The ANLs are dependent on the Area Sensitivity Rating (ASR) and the time of the day and are presented in **Table 2.1**.

**Table 2.1 Acceptable Noise Levels (ANLs)**

Time Period	L <sub>Aeq 30min</sub> , dB(A)		
	ASR "A"	ASR "B"	ASR "C"
Day (0700-1900 hours)	60	65	70
Evening (1900-2300 hours)			
Night (2300-0700 hours)	50	55	60

- 2.1.2 According to Table 8.17 and Table 8.15 of SCL (TAW-HUH) and SCL(HHS) EIA Reports respectively, a 10dB(A) was assumed as the noise contribution from existing East Rail Line and Intercity Train. To take into account the cumulative airborne noise impacts from the existing East Rail Line and Intercity Train, an assessment goal of ANL – 10 dB(A) has been adopted in the assessment.
- 2.1.3 Pursuant to EP Condition of 2.31 of EP- EP-438/2012/K, a performance test was conducted and the findings of performance test<sup>1</sup> confirmed that the airborne railway noise levels at all selected ABNSRs complied with both the assessment goal and the stipulated noise criteria in daytime/evening and night-time periods.
- 2.1.4 For this operational airborne rail noise monitoring, the measured noise levels will be checked against with the stipulated noise limit where applicable. Details of data analysis and compliance checking are provided in **Section 3.4**.

### 2.2 Noise Monitoring Locations

- 2.2.1 According to Section 8.11 and Table 8.4 of the approved SCL (TAW-HUH) and SCL (HHS)EM&A Manuals, the potentially worst affected locations have been designated for operational airborne noise monitoring and are presented in **Table 2.2**, with their locations shown in **Figure Nos. C1103/C/SCL/ACM/M52/0018** and **C1103/C/SCL/ACM/M52/019**.

**Table 2.2 Proposed Monitoring Locations for Operational Airborne Rail Noise Monitoring**

Monitoring ID	NSR ID <sup>(1)</sup>	Description	Type	Measurement Floor <sup>(2)</sup>
NMS-OA-1	TAW-P1-2	Tower 1, Festival City Phase II	Residential	Refuge Floor (19/F)
NMS-OA-2	HUH-1-3	Wing Fung Building	Residential	1/F

Notes:

- (1) Based on the Noise Performance Test Report<sup>1</sup> and latest Annual Traffic Census 2018, the ASR assigned at TAW-P1-2 and HUH-1-3 for the performance test remains valid (i.e. ASR "C").
- (2) In accordance with Noise Performance Test Report, the predicted noise level (i.e. L<sub>Aeq, 30min</sub> 45dB(A) during night-time period) at the measurement floor (19/F) of TAW-P1-2 is same as those predicted at the worst affected floor (10/F). It is therefore considered that the noise level at the proposed measurement floor would be able to represent the worst affected floor. For HUH-1-3, the measurement will be conducted at the worst affected floor as identified in the SCL(HHS) EIA Report.

<sup>1</sup> Noise Performance Test Report was submitted under EP Condition 2.31 on 29 March 2019 and was satisfied by DEP on 15 April 2019.

- 2.2.2 The status and location of noise sensitive receivers (NSRs) may change after approval of this Plan. In such case, and if changes to the monitoring locations are considered necessary, the Environmental Team (ET) should propose alternative monitoring station(s) and seek agreement from the Independent Environmental Checker (IEC) and EPD on the proposal. If alternative monitoring stations are proposed, these stations should be chosen based on the following criteria:
- Monitoring at NSRs close to the Project that are likely to arise rail noise impacts;
  - Monitoring as close as possible to the NSRs as defined in the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM); and
  - Assurance of minimal disturbance to the occupants and working under a safe condition during monitoring.
- 2.2.3 The monitoring station should normally be at a point 1m from the exterior of the noise sensitive facade and be at a position 1.2m above ground. If there is a problem with access to the normal monitoring position, an alternative position should be chosen, and a correction to the measurement results should be made. For reference, a correction of +3dB(A) should be made to free-field measurement. The ET should agree with the IEC on the monitoring position and the corrections adopted.

### 3 MEASUREMENT METHODOLOGY

#### 3.1 Instrumentation and Monitoring Procedure

3.1.1 The sound level meters used for the noise monitoring should comply with the prevailing International Electrotechnical Commission Publications 60651 (Type 1) and 60804 (Type 1) and other noise measuring and analysis instrumentation should be of a comparable professional quality.

3.1.2 During the noise monitoring, the following procedures will be followed:

- All measurement should be made in facade type and the microphone of the sound level meter should be positioned 1m exterior of the proposed monitoring locations and lowered sufficiently so that the external wall of the building acts as a reflecting surface.
- Parameter such as frequency weighting, the weighting and noise descriptors should be set as follows:
  - Frequency weighting : A
  - Time weighting : Fast
  - Noise Descriptors :  $L_{Aeq}$  30min (with data being logged at every one second)
  -
- Prior to and after each noise measurement, the sound level meter should be calibrated using the Calibrator for 94 dB at 1000 Hz. If the difference in the calibration level before and after measurement is more than 1.0 dB(A), the measurement is considered invalid and repeat of noise measurement should be required after repair or re-calibration of the equipment.
- Details should be recorded when intrusive noise is observed. Noise sources and duration should also be recorded during the measurement process.
- All the measurement data within the sound level meter system will be downloaded through the computer software. All these data should then be checked and reviewed properly.
- The weather condition during the monitoring period should be recorded by the monitoring staff.
- Noise monitoring should be suspended in the presence of fog, rain, and wind with a steady speed exceeding 5 m/s, or wind with gusts exceeding 10 m/s.

#### 3.2 Impact Monitoring for Operation Rail Noise

3.2.1 A  $L_{Aeq, 30 \text{ min}}$  will be obtained during night-time train operation on a monthly basis. The impact monitoring is proposed to be carried out for 6 months since the initial operation of SCL (TAW-HUH) and SCL (HHS). With full compliance of the noise limit and agreement from IEC, monitoring can be terminated before the end of this 6-month period.

3.2.2 As discussed in **Section 1.1.7**, the operational airborne rail noise monitoring will be conducted in 2 phases. It is anticipated that the 1<sup>st</sup> phase of operational airborne noise monitoring at TAW-P1-2 commence in the 1<sup>st</sup> quarter of 2020, while the noise monitoring at HUH-1-3 will be conducted in a later stage after full opening of TML.

#### 3.3 Data Analysis and Reporting

3.3.1 Background noise levels,  $L_{Aeq 30 \text{ min (background)}}$  will be evaluated by discarding logged data for the period when the TML, EAL and intercity trains passed in front of the monitoring stations.

3.3.2 The noise level contributed by TML, EAL and intercity train pass-by,  $L_{Aeq 30 \text{ min (event)}}$ , would be calculated by subtracting the background noise level  $L_{Aeq 30 \text{ min (background)}}$  from the overall noise level  $L_{Aeq 30 \text{ min (overall)}}$  in accordance with standard acoustical principles. In the event of  $L_{Aeq 30 \text{ min (overall)}}$  is lower than  $L_{Aeq 30 \text{ min (background)}}$ ,  $L_{Aeq 30 \text{ min (event)}}$  would be evaluated by applying a correction of -12 dB(A) to  $L_{Aeq 30 \text{ min (overall)}}$ , following same approach as adopted in MOL 8-car train operation noise monitoring conducted in 2017.

- 3.3.3 The operation rail noise level is considered in compliance with NCO noise criteria if one of following conditions is satisfied:
- Operation rail noise level,  $L_{Aeq\ 30min\ (event)}$ , do not exceed ANL; or
  - Overall noise level is comparable to background noise level (i.e.  $L_{Aeq\ 30min\ (overall)} - L_{Aeq\ 30min\ (background)} < 3\ dB$ ).
- 3.3.4 The monthly monitoring reports presenting the monitoring findings will be verified by the IEC. The verified copies of the report will be submitted to the DEP.

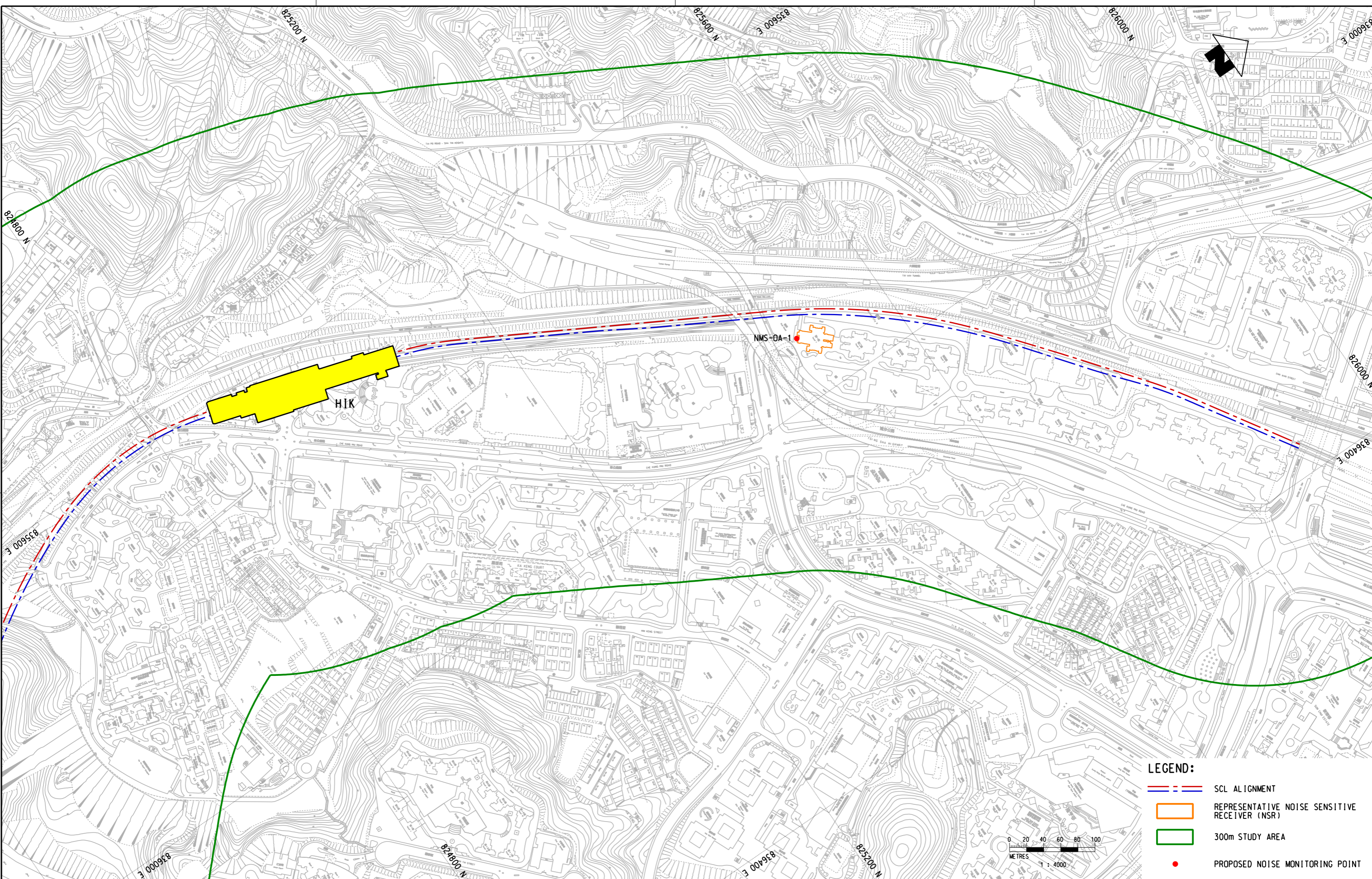
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**Figure**

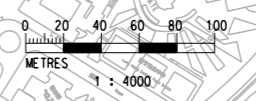
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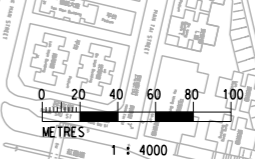
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 File Name: P:\proj\obj\215\6027405\DRAWING\REPORT\C11033\C\_SCL\_ACM\_M52\_018A.dgn  
 Date: 2019/8/21  
 Scale: 1:4000



- LEGEND:**
- --- SCL ALIGNMENT
  - REPRESENTATIVE NOISE SENSITIVE RECEIVER (NSR)
  - 300m STUDY AREA
  - PROPOSED NOISE MONITORING POINT



DRAWN: ZFX				 <b>SHATIN TO CENTRAL LINK</b> 				TITLE: C11033			
DESIGNED: GL								SCL (TAW - HUH)			
CHECKED: ST								LOCATION OF PROPOSED OPERATION RAIL NOISE MONITORING POINT			
APPROVED: ST								(TOWER 1, FESTIVAL CITY PHASE II)			
DATE: 16/AUG/2019				ORIGINATOR:				SCALE: 1 : 4000 (A3)			
<small>DO NOT SCALE DRAWINGS. ALL DIMENSIONS SHALL BE VERIFIED ON SITE.          © MTR CORPORATION LIMITED 2008. COPYRIGHT IN RESPECT OF THIS DRAWING / DOCUMENT IS OWNED BY THE MTR CORPORATION LIMITED OF HONG KONG. NO REPRODUCTION OF THE DRAWING / DOCUMENT OR ANY PART BY WHATEVER MEANS IS PERMITTED WITHOUT THE PRIOR WRITTEN CONSENT OF THE MTR CORPORATION LIMITED.</small>				CADD REF. C11033_C_SCL_ACM_M52_018A.dgn				FIGURE NO. C11033/C/SCL/ACM/M52/018			
A		FIRST ISSUE		GL		13APR17		ST		REV. A	
REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED		



- LEGEND:**
- SCL ALIGNMENT
  - HHS TRACKS
  - REPRESENTATIVE NOISE SENSITIVE RECEIVER (NSR)
  - 300m STUDY AREA
  - HUNG HOM STABILING SIDINGS
  - PROPOSED NOISE MONITORING POINT

REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED
A	FIRST ISSUE	GL	14APR17						

DRAWN	ZFX
DESIGNED	GL
CHECKED	ST
APPROVED	ST
DATE	16/AUG/2019

**MTR**

SHATIN TO CENTRAL LINK

**AECOM**

ORIGINATOR

CADD REF. C11033\_C\_SCL\_ACM\_M52\_019A.dgn

TITLE	C11033 SCL (TAW - HUH) LOCATION OF PROPOSED OPERATION RAIL NOISE MONITORING POINT (WING FUNG BUILDING)
SCALE	1 : 4000 (A3)
FIGURE NO.	C11033/C/SCL/ACM/M52/019
REV.	A



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**Appendix B**

**Calibration Records of Monitoring Equipment**

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## CERTIFICATE OF CALIBRATION

Certificate No.: 19CA1U17 01-01 Page 1 of 2

### Item tested

Description:	Sound Level Meter (Type 1)	Microphone	Preamp
Manufacturer:	B & K	B & K	B & K
Type/Model No.:	2250	4950	ZC0032
Serial/Equipment No.:	3001291	2665582	17190
Adaptors used:	-	-	-

(N 011.05)

### Item submitted by

Customer Name: AECOM ASIA CO LIMITED  
Address of Customer: -  
Request No.: -  
Date of receipt: 17-Oct-2019

Date of test: 18-Oct-2019

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	20-Aug-2019	CIGISMEC
Signal generator	DS 360	61227	26-Dec-2019	CEPREI

### Ambient conditions

Temperature: 22 ± 1 °C  
Relative humidity: 55 ± 10 %  
Air pressure: 1000 ± 5 hPa

### Test specifications

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

### Test results

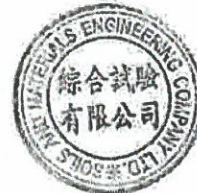
This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:  Date: 21-Oct-2019 Company Chop:

Feng Junqi



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA1017 01-01 Page 2 of 2

### 1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	A	Pass	0.3	
	C	Pass	0.3	
Frequency weightings	Lin	Pass	0.3	
	Time weightings	Single Burst Fast	Pass	0.3
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
	R.M.S. accuracy	Crest factor of 3	Pass	0.3
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
	Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

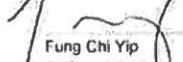
Test:	Subtest	Status	Expanded Uncertainty (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

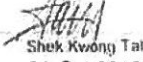
### 3, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by:   
Date: 18-Oct-2019

Checked by:   
Date: 21-Oct-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.



## CERTIFICATE OF CALIBRATION

Certificate No.: 19CA0327 01-02

Page: 1 of 2

### Item tested

Description: Acoustical Calibrator (Class 1)  
Manufacturer: B & K  
Type/Model No.: 4231  
Serial/Equipment No.: 3006428 / N004.03  
Adaptors used: -

### Item submitted by

Customer: AECOM ASIA CO LIMITED  
Address of Customer: -  
Request No.: -  
Date of receipt: 27-Mar-2019

(N.004.03)

Date of test: 27-Mar-2019

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	20-Apr-2019	SCL
Preamplifier	B&K 2673	2743150	27-Apr-2019	CEPREI
Measuring amplifier	B&K 2610	2346941	08-May-2019	CEPREI
Signal generator	DS 360	33873	24-Apr-2019	CEPREI
Digital multi-meter	34401A	US36087050	23-Apr-2019	CEPREI
Audio analyzer	8903B	GB41300350	23-Apr-2019	CEPREI
Universal counter	53132A	MY40003662	24-Apr-2019	CEPREI

### Ambient conditions

Temperature: 22 ± 1 °C  
Relative humidity: 55 ± 10 %  
Air pressure: 1005 ± 5 hPa

### Test specifications

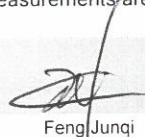
- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

### Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.

Approved Signatory:

  
Feng Junqi

Date: 29-Mar-2019

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA0327 01-02

Page: 2 of 2

**1, Measured Sound Pressure Level**

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.00	94.23	0.10

(Output level in dB re 20 µPa)

**2, Sound Pressure Level Stability - Short Term Fluctuations**

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

**At 1000 Hz** **STF = 0.014 dB**  
 Estimated expanded uncertainty 0.005 dB

**3, Actual Output Frequency**

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

**At 1000 Hz** **Actual Frequency = 1000.0 Hz**  
 Estimated expanded uncertainty 0.1 Hz Coverage factor k = 2.2

**4, Total Noise and Distortion**

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

**At 1000 Hz** **TND = 0.3 %**  
 Estimated expanded uncertainty 0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by:

Date:

Fung Chi Yip  
27-Mar-2019

Checked by:

Date:

Fong Chun Wai  
29-Mar-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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**Appendix C**

**Train Operation Noise Monitoring Results**

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## Appendix C Operation Rail Noise Monitoring Results

Date	Time	L <sub>Aeq</sub> 30min (overall)	L <sub>Aeq</sub> 30min (Background)	Difference	L <sub>Aeq</sub> 30min (event)	ANL	Compliance (Yes/No)
2/17/2020	23:30 - 00:00	60.1	57.8	2.3	56.2	60	Yes

# Operation Rail Noise Monitoring at Tower 1, Festival City Phase II

