

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 (Wing Fung Building) No.1
[Period from 27 June to 26 July 2021]

(July 2021)

Verified by: Claudine Lee 

Position: Independent Environmental Checker

Date: 26 July 2021

MTR Corporation Limited

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Certified by: _____ Lisa Poon 

Position: Environmental Team Leader

Date: 26 July 2021

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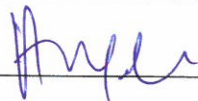
Consultancy Agreement No. C11033

**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 (Wing Fung Building) No. 1**

[Period from 27 June to 26 July 2021]

July 2021

| | Name | Signature |
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Table of Content

| | Page |
|---|----------|
| 1 INTRODUCTION..... | 1 |
| 1.1 Background | 1 |
| 1.2 Purpose of the Report | 2 |
| 2 OPERATIONAL RAIL NOISE MONITORING..... | 3 |
| 2.1 Monitoring Equipment | 3 |
| 2.2 Monitoring Parameter..... | 3 |
| 2.3 Monitoring Location and Date | 3 |
| 2.4 Monitoring Procedures | 3 |
| 2.5 Data Analysis | 4 |
| 2.6 Result and Observation | 4 |
| 3 CONCLUSION | 6 |

List of Tables

| | |
|------------------|--|
| Table 2.1 | Noise Monitoring Equipment |
| Table 2.2 | Monitoring Location and Schedule of Noise Monitoring |
| Table 2.3 | Summary of Operation Rail Noise Monitoring Result at Wing Fung Building |

List of Figures

| | |
|--------------------------|--|
| C11033/C/SCL/ACM/M52/072 | Location of Operation Rail Noise Monitoring Point (Wing Fung Building) |
|--------------------------|--|

List of Appendix

| | |
|------------|---|
| Appendix A | Operational Railway Noise Monitoring Plan (February 2020) |
| Appendix B | Calibration Records of Monitoring Equipment |
| Appendix C | Operation Rail Noise Monitoring Results |

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”), which was provided in Appendix A of the Monthly Operational Airborne Rail Noise Monitoring Report (Wing Fung Building) No. 1 (July 2021), 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 1st phase operation of TML, covering three new stations at Hin Keng, Diamond Hill and Kai Tak, had commenced on 14 February 2020. Six months

operational airborne rail noise monitoring for 1st phase operation at Tower 1, Festival City Phase II (TAW-P1-2) was completed in July 2020. The full operation of TML, i.e. between Wu Kai Sha Station and Tuen Mun Station, had commenced on 27 June 2021. As such the operational airborne rail noise monitoring for full operation has commenced accordingly. Given that the night-time train frequency between Tai Wai and Hin Keng section for the TML full operation and that for TML 1st phase operation remained the same, the monthly rail noise monitoring at Festival City is considered not necessary and therefore the monthly rail noise monitoring for full operation was only carried out at Wing Fung Building (HUH-1-3).

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

1.2 Purpose of the Report

- 1.2.1 The full operation of TML commenced on 27 June 2021. This is the first monthly operational noise monitoring report, summarizing the monitoring result obtained between 27 June and 26 July 2021.

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 in the final monitoring period.

Table 2.1 Noise Monitoring Equipment

| Equipment | Model |
|-------------------------------|------------------------------------|
| Integrating Sound Level Meter | • B&K 2250-L (Serial No. 2681366) |
| Calibrator | • Rion NC-74 (Serial No. 34246490) |

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 The operational airborne noise monitoring for full operation of TML was conducted at Wing Fung Building (HUH-1-3) on 10 July 2021.
- 2.3.2 The corresponding monitoring location during the reporting period was shown in **Figure C11033/C/SCL/ACM/M52/072**.
- 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 ⁽¹⁾ | ASR | Monitoring Date |
|---------------|---------|--------------------|-------------|----------------------------------|------------------|-----------------|
| NMS-OA-2 | HUH-1-3 | Wing Fung Building | Residential | 1/F | C ⁽²⁾ | 10 July 2021 |

Remarks:

- (1) The measurement was conducted at the worst affected floor as identified in the SCL(HHS) EIA Report.
(2) Based on latest available information, Annual Traffic Census 2019 (ATC 2019), Chatham Road North located to the immediate north-west of HUH-1-3, is considered as an Influencing Factor (IF) with the AADT of this road section more than 30,000 (i.e. 116,630 as recorded in ATC 2019). As HUH-1-3 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 HUH-1-3.

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 and EAL passed in front of the monitoring station.
- 2.5.2 The noise level contributed by TML and EAL 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 HUH-1-3 during the reporting period. All monitoring data and graphical presentation of the monitoring results are provided in **Appendix C**. **Table 2.3** summarises the monitoring result obtained.

Table 2.3 Summary of Operation Rail Noise Monitoring Result at Wing Fung Building

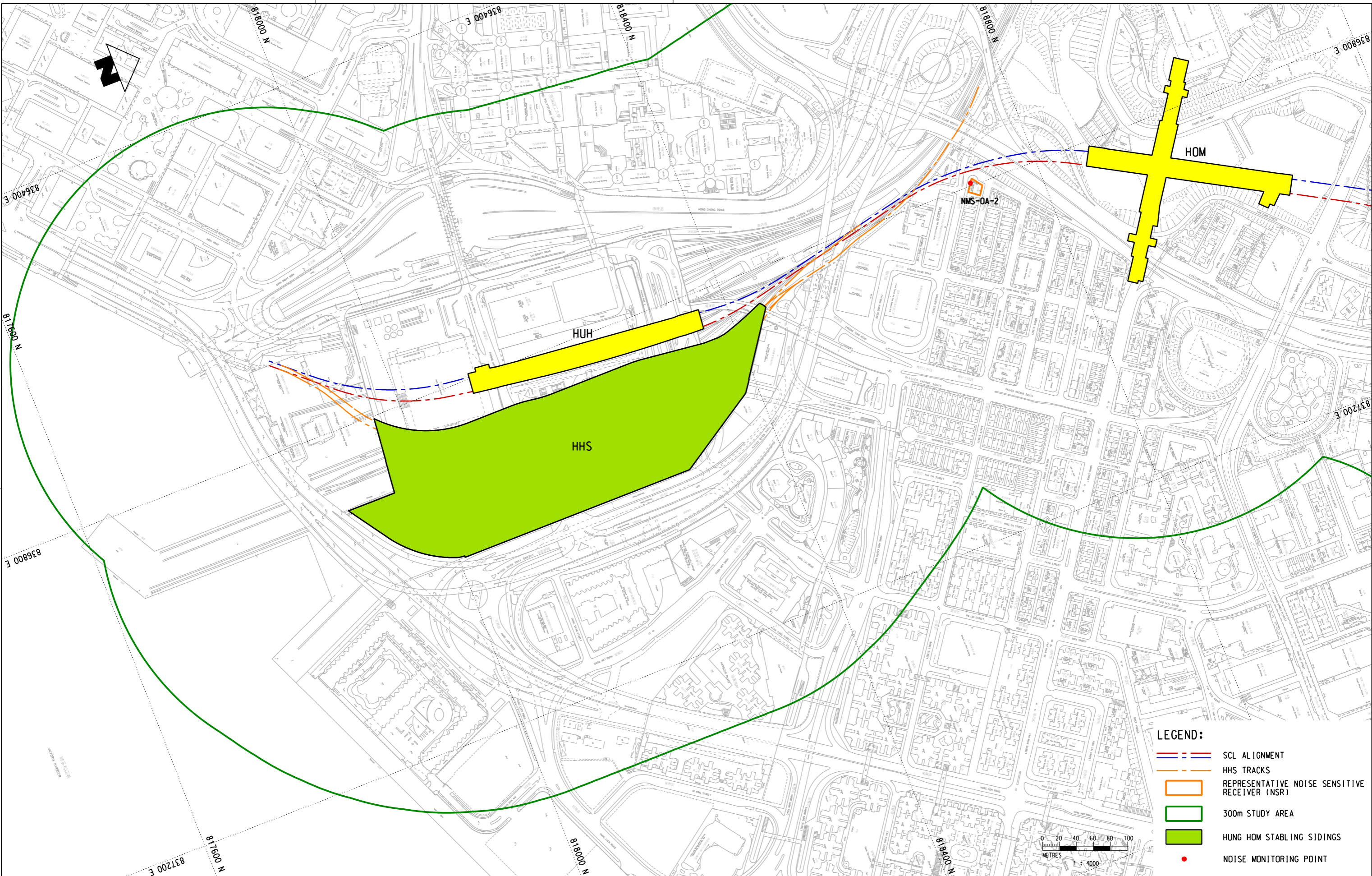
| Monitoring Date | Time | Noise Level, L_{Aeq} , 30 min, dB(A) | | | | | ANL | Compliance |
|-----------------|-------------|--|------------------------------|------------|-------------------------|----|-----|------------|
| | | L_{Aeq} 30min (overall) | L_{Aeq} 30min (background) | Difference | L_{Aeq} 30min (event) | | | |
| 10 July 2021 | 06:30-07:00 | 67.6 | 66.6 | 1.0 | 60.7 | 60 | Yes | |

- 2.6.2 According to site observation, train noise from TML was inaudible at the measurement location. The dominant noise sources included road traffic noise from Chatham Road North and EAL.
- 2.6.3 With the satisfaction of either one of 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 First monthly night-time noise monitoring was conducted on 10 July 2021 at Wing Fung Building for the full operation of TML. According to site observation, train noise from TML was inaudible at the measurement location. The dominant noise sources included road traffic noise from Chatham Road North and EAL.

Figure



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

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

SHATIN TO CENTRAL LINK
 ORIGINATOR

| | |
|--|--|
| TITLE C11033 SCL (TAW - HUH) LOCATION OF OPERATION RAIL NOISE MONITORING POINT (WING FUNG BUILDING) | |
| SCALE 1 : 4000 (A3) | FIGURE NO. C11033/C/SCL/ACM/M52/072 |
| REV. A | |

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

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Appendix A

Operational Railway Noise Monitoring Plan (February 2020)



Table of Content

| | | Page |
|----------|--|----------|
| 1 | INTRODUCTION..... | 1 |
| 1.1 | Background | 1 |
| 1.2 | Purpose of This Plan..... | 2 |
| 2 | NOISE CRITERIA AND MONITORING LOCATIONS | 3 |
| 2.1 | Airborne Railway Noise Criteria | 3 |
| 2.2 | Noise Monitoring Locations..... | 3 |
| 3 | MEASUREMENT METHODOLOGY | 5 |
| 3.1 | Instrumentation and Monitoring Procedure..... | 5 |
| 3.2 | Impact Monitoring for Operation Rail Noise | 5 |
| 3.3 | Data Analysis and Reporting | 5 |

List of Tables

| | |
|-----------|--|
| Table 2.1 | Acceptable Noise Levels (ANLs) |
| Table 2.2 | Proposed Monitoring Locations for Operational Airborne Rail Noise Monitoring |

List of Figures

| | |
|-------------------------|--|
| C1103/C/SCL/ACM/M52/018 | Location of Proposed Operation Rail Noise Monitoring Point (Tower 1, Festival City Phase II) |
| C1103/C/SCL/ACM/M52/019 | Location of Proposed Operation Rail Noise Monitoring Point (Wing Fung Building) |

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 14th 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 _{Aeq 30min} , 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 test¹ 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 ⁽¹⁾ | Description | Type | Measurement Floor ⁽²⁾ |
|---------------|-----------------------|---------------------------------|-------------|----------------------------------|
| 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 Report¹ 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_{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. For HUH-1-3, the measurement will be conducted at the worst affected floor as identified in the SCL(HHS) EIA Report.

¹ 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 1st phase of operational airborne noise monitoring at TAW-P1-2 commence in the 1st 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.

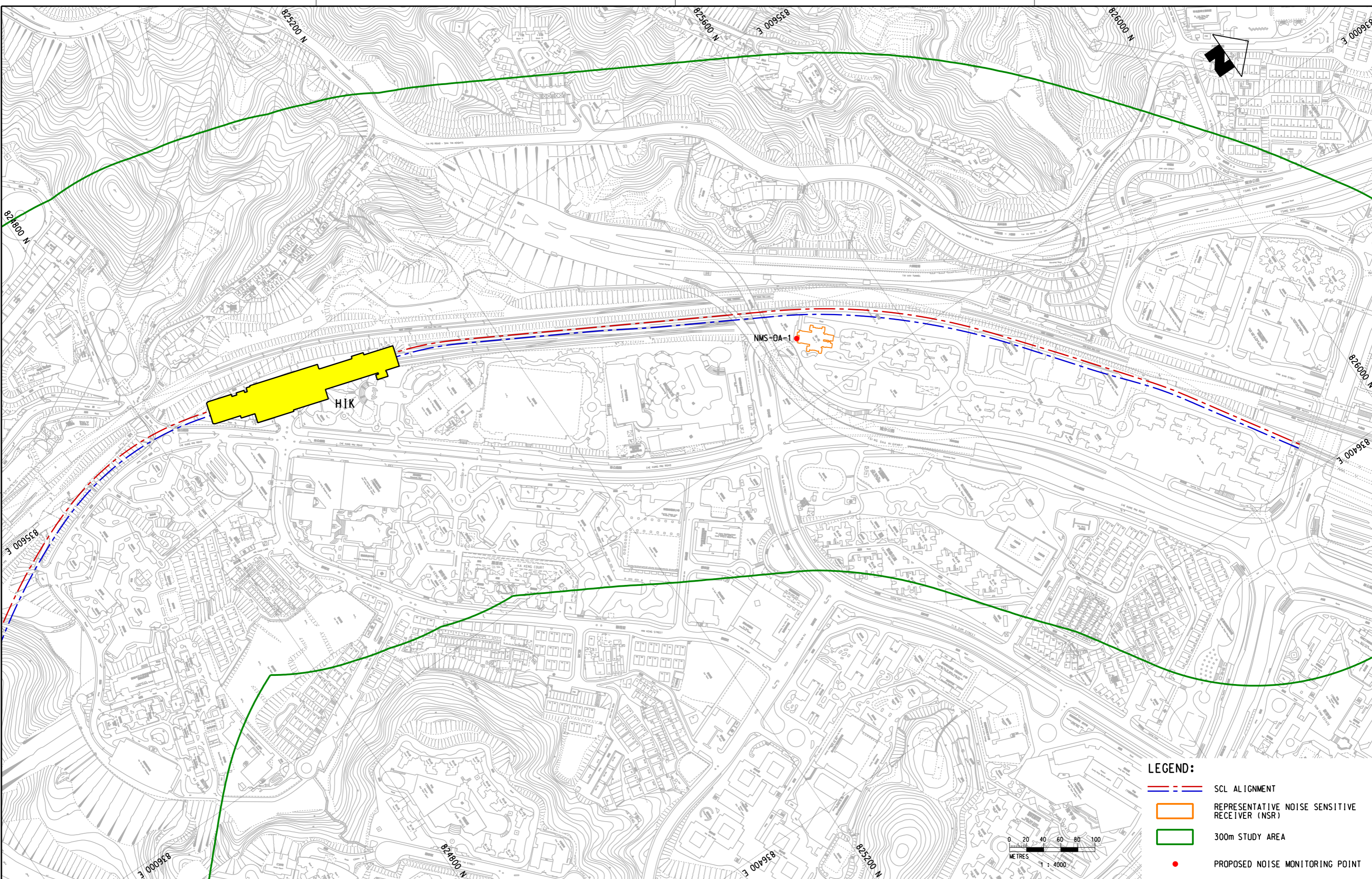
3.3.2 The noise level contributed by TML, EAL and intercity train pass-by, $L_{Aeq 30 \text{ min (event)}}$, would be calculated by subtracting the background noise level $L_{Aeq 30 \text{ min (background)}}$ from the overall noise level $L_{Aeq 30 \text{ min (overall)}}$ in accordance with standard 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.

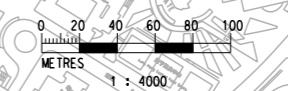
Figure

Maps reproduced with permission of the Director of Lands, © Hong Kong Government

Plot Drive: V:\us\mshet\NTR\PL\DRIVER\WINDOWS\33\COL009.dgn
 Model: C:\ZENPA\2019\8\21_94E52
 File Name: P:\proj\obj\215\6227405\DRAWING\REPORT\C11033\C_SCL_ACM_M52_018A.dgn



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



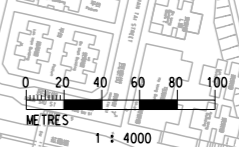
| | | | | | | | | | |
|---------------|-------------|---------------|------|--|-------------|---|------|--|--|
| | | | | DRAWN ZFX | | SHATIN TO CENTRAL LINK | | TITLE C11033 SCL (TAW - HUH) LOCATION OF PROPOSED OPERATION RAIL NOISE MONITORING POINT (TOWER 1, FESTIVAL CITY PHASE II) | |
| | | | | DESIGNED GL | | | | | |
| | | | | CHECKED ST | | | | | |
| | | | | APPROVED ST | | | | | |
| | | | | 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 | DESCRIPTION | BY | DATE | APPROVED | |

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PLOT DRW: V:\us\inset\MTR\PI\DRIVER\WINDOWS_X3_C0C009.dwg
 MODEL: C:\ZENPA\2019\8\21_94758
 FILENAME: P:\proj\obj\18\6027445\DRAWING\REPORT\C11033_C_SCL_ACM_M52_019A.dgn



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



| | | | | | | | | | | | | | | | | | |
|--|-------------|---|----------|--|---------|-----|----------|----|---------|-------------|---------------------------------------|----|------|-------------|---------------------------------------|---|--|
| <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <table border="0" style="width: 100%;"> <tr><td>DRAWN</td><td>ZFX</td></tr> <tr><td>DESIGNED</td><td>GL</td></tr> <tr><td>CHECKED</td><td>ST</td></tr> <tr><td>APPROVED</td><td>ST</td></tr> <tr><td>DATE</td><td>16/AUG/2019</td></tr> </table> </td> <td style="width: 50%; text-align: center; vertical-align: middle;"> SHATIN TO CENTRAL LINK </td> </tr> </table> | | | | <table border="0" style="width: 100%;"> <tr><td>DRAWN</td><td>ZFX</td></tr> <tr><td>DESIGNED</td><td>GL</td></tr> <tr><td>CHECKED</td><td>ST</td></tr> <tr><td>APPROVED</td><td>ST</td></tr> <tr><td>DATE</td><td>16/AUG/2019</td></tr> </table> | DRAWN | ZFX | DESIGNED | GL | CHECKED | ST | APPROVED | ST | DATE | 16/AUG/2019 | SHATIN TO CENTRAL LINK | TITLE C11033 SCL (TAW - HUH) LOCATION OF PROPOSED OPERATION RAIL NOISE MONITORING POINT (WING FUNG BUILDING) | |
| <table border="0" style="width: 100%;"> <tr><td>DRAWN</td><td>ZFX</td></tr> <tr><td>DESIGNED</td><td>GL</td></tr> <tr><td>CHECKED</td><td>ST</td></tr> <tr><td>APPROVED</td><td>ST</td></tr> <tr><td>DATE</td><td>16/AUG/2019</td></tr> </table> | DRAWN | ZFX | DESIGNED | GL | CHECKED | ST | APPROVED | ST | DATE | 16/AUG/2019 | SHATIN TO CENTRAL LINK | | | | | | |
| DRAWN | ZFX | | | | | | | | | | | | | | | | |
| DESIGNED | GL | | | | | | | | | | | | | | | | |
| CHECKED | ST | | | | | | | | | | | | | | | | |
| APPROVED | ST | | | | | | | | | | | | | | | | |
| DATE | 16/AUG/2019 | | | | | | | | | | | | | | | | |
| ORIGINATOR AECOM | | SCALE 1 : 4000 (A3) | | | | | | | | | | | | | | | |
| DATE 14 APR 17 | | FIGURE NO. C11033/C/SCL/ACM/M52/019 | | | | | | | | | | | | | | | |
| REVISION A FIRST ISSUE | | REV. A | | | | | | | | | | | | | | | |

Appendix B

Calibration Records of Monitoring Equipment



CERTIFICATE OF CALIBRATION

Certificate No.: 21CA0319 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-L | 4950 | ZC0032 |
| Serial/Equipment No.: | 2681366 | 2665582 | 17190 |
| Adaptors used: | - | - | - |

Item submitted by

Customer Name: AECOM ASIA CO LTD
Address of Customer: -
Request No.: -
Date of receipt: 19-Mar-2021

Date of test: 23-Mar-2021

Reference equipment used in the calibration

| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
|---------------------------------|----------|------------|--------------|---------------|
| Multi function sound calibrator | B&K 4226 | 2288444 | 23-Aug-2021 | CIGISMEC |
| Signal generator | DS 360 | 33873 | 19-May-2021 | CEPREI |

Ambient conditions

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

Test specifications

- 1, 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.
- 2, 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 $\pm 20\%$.
- 3, 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.

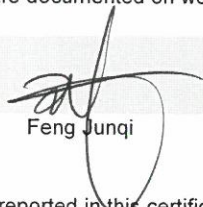
Test results

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.

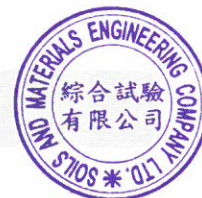
Approved Signatory:



Feng Junqi

Date: 24-Mar-2021

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. The results apply to the item as received.



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 21CA0319 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 | |
| | Frequency weightings | | | |
| Time weightings | A | Pass | 0.3 | |
| | C | Pass | 0.3 | |
| | Lin | Pass | 0.3 | |
| Peak response | Single Burst Fast | Pass | 0.3 | |
| | Single Burst Slow | Pass | 0.3 | |
| R.M.S. accuracy | Single 100µs rectangular pulse | Pass | 0.3 | |
| | 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 ³ at 4kHz | Pass | 0.3 | |
| | 1 ms burst duty factor 1/10 ⁴ at 4kHz | Pass | 0.3 | |
| Pulse range | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| | Sound exposure level | Pass | 0.4 | |
| Overload indication | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| | 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:

Fung Chi Yip
23-Mar-2021

Checked by:

Date:

Chan Yuk Yiu
24-Mar-2021

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.: 20CA1006 03

Page: 1 of 2

Item tested

Description: Acoustical Calibrator (Class 1)
Manufacturer: Rion Co., Ltd.
Type/Model No.: NC-74
Serial/Equipment No.: 34246490 / N.004.10
Adaptors used: -

Item submitted by

Customer: AECOM ASIA CO LIMITED
Address of Customer: -
Request No.: -
Date of receipt: 06-Oct-2020

Date of test: 12-Oct-2020

Reference equipment used in the calibration

| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
|-------------------------|----------|------------|--------------|---------------|
| Lab standard microphone | B&K 4180 | 2412857 | 11-May-2021 | SCL |
| Preamplifier | B&K 2673 | 2743150 | 03-Jun-2021 | CEPREI |
| Measuring amplifier | B&K 2610 | 2346941 | 03-Jun-2021 | CEPREI |
| Signal generator | DS 360 | 33873 | 19-May-2021 | CEPREI |
| Digital multi-meter | 34401A | US36087050 | 19-May-2021 | CEPREI |
| Audio analyzer | 8903B | GB41300350 | 18-May-2021 | CEPREI |
| Universal counter | 53132A | MY40003662 | 18-May-2021 | 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: 12-Oct-2020

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. The results apply to the item as received.



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 20CA1006 03

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 | (Output level in dB re 20 μ Pa) |
|-----------------------|---|--|--------------------------------------|
| | | | Estimated Expanded Uncertainty dB |
| 1000 | 94.00 | 94.10 | 0.10 |

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 = 0.017 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 = 1002.1 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 = 1.6%

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
12-Oct-2020

Checked by:

Date:

Feng Junqi
12-Oct-2020

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.

Appendix C

Train Operation Noise Monitoring Results

Appendix B Operation Rail Noise Monitoring Results

| Date | Time | L _{Aeq} 30min (overall) | L _{Aeq} 30min (Background) | Difference | L _{Aeq} 30min (event) | ANL | Compliance (Yes/No) |
|-----------|---------------|----------------------------------|-------------------------------------|------------|--------------------------------|-----|---------------------|
| 7/10/2021 | 06:30 - 07:00 | 67.6 | 66.6 | 1.0 | 60.7 | 60 | No |

Operation Rail Noise Monitoring at Wing Fung Building

