1 Airborne Rail Noise Source Term Measurements

1.1 Measurement Methodology

1.1.1.1 Airborne rail noise measurements have been conducted near Ta Pang Po to provide the actual and updated source term for the existing trains running on TCL and AEL. The measurement location is selected at location with suitable background noise level. Detailed procedures are given below:

- The sites were inspected before commencing the field measurements to ascertain that the background noise level does not have any significant influence on the measured airborne rail noise levels;
- Before conducting the measurement, the sound level meters were calibrated by an acoustical calibrator;
- The microphones were set in accordance with **Section 1.2** below;
- The measurement parameter was A-weighted overall sound pressure level. The time weighting was set in fast response and measurements were logged automatically at 1 second intervals over the measurement time period;
- The wind speed was checked during field measurements to ensure the wind speed will not exceed 5m/s;
- Before the measurement, track operating information including the track type, last maintenance date, etc. were logged manually.
- Within the measurement period, train pass by events, including arrival and departure time, and train direction were logged manually. For each train pass by event, average train speed was evaluated with stop watch;
- Any abnormal incidents (aircraft noise, road traffic noise, etc.) that affect the measurement were recorded on the field record sheet;
- After each train pass by event measurement, the equivalent continuous sound pressure level L_{eq} dB(A) and L_{max} dB(A) were recorded;
- At least three measurements were made at each microphone position; and
- The sound level meters were be calibrated after the measurements to confirm that there was no significant drift of reading.

1.2 Measurement Location

1.2.1.1 The measurement location was set at a horizontal separation of approximately 25m and 10m from the existing at-grade ballast track at heights of 3.5m and 10m above track level (for Points 1), 1.2m above track level (for Point 2) near Ta Pang Po respectively, as long as practicable. In the view of the restriction of the fences along the track of TCL, measurements at heights of 3.5m and 10m at Point 2 (horizontal distance 10m from the track) are not feasible due to safety concern. The measurement location is shown in **Annex 4.6.1**.

1.3 Measurement Result

1.3.1.1 The measurement results are shown in **Annex 4.6.1**.

Annex 4.6.1
Source Term Measurement Results

Project: C1202 - EIA for Tung Chung Line Extension
Project no.: 277416

Title: Measured SEL - AEL
Measurement Date: 22 December 2020
Time: 10:00 - 13:00
Weather: Sunny, Light Wind

Project	Direction	Location	Height from track, m	Measured SEL [1,2,3], dB(A)	Measurement Distance from Track, m	No. of Car	Speed, km/h	Car correction, dB(A)	Distance Correction, dB(A)	Speed Correction, dB(A)	Corrected SEL (1 car at 135km/h at 25m, dB(A))
EIA for Tung Chung Line Extension	To Hong Kong Station	1	10	86.3	27	8	133	-9	0.3	0.1	77.7
		1	10	85.4	27	8	132	-9	0.3	0.2	76.8
		1	10	85.8	27	8	127	-9	0.3	0.5	77.6
	To Airport	1	10	85.6	31	8	117	-9	0.9	1.3	78.7
		1	10	85.7	31	8	116	-9	0.9	1.3	78.9
		1	10	85.2	31	8	116	-9	0.9	1.3	78.4
		1	10	85.7	31	8	113	-9	0.9	1.6	79.1
EIA for Tung Chung Line Extension at Location 1 and 10m above track										**Min.**	**76.8**
										Max.	**79.1**
										Average	**78.2**
EIA for Tung Chung Line Extension	To Hong Kong Station	1	3.5	85.2	25	8	133	-9	0.0	133	76.3
		1	3.5	84.7	25	8	132	-9	0.0	132	75.8
		1	3.5	85.1	25	8	127	-9	0.0	127	76.6
	To Airport	1	3.5	84.3	29	8	117	-9	0.7	117	77.2
		1	3.5	84.5	29	8	116	-9	0.7	116	77.4
		1	3.5	83.7	29	8	116	-9	0.7	116	76.6
		1	3.5	83.7	29	8	113	-9	0.7	113	76.9
EIA for Tung Chung Line Extension at Location 1 and 3.5m above track										**Min.**	**75.8**
										Max.	**77.4**
										Average	**76.7**
EIA for Tung Chung Line Extension	To Hong Kong Station	2	1.2	89.0	10	8	133	-9	-3.9	0.1	76.1
		2	1.2	88.5	10	8	132	-9	-3.9	0.2	75.7
		2	1.2	88.9	10	8	127	-9	-3.9	0.5	76.4
	To Airport	2	1.2	86.2	14	8	117	-9	-2.5	1.3	76.0
		2	1.2	86.5	14	8	116	-9	-2.5	1.3	76.2
		2	1.2	85.9	14	8	116	-9	-2.5	1.3	75.7
		2	1.2	85.6	14	8	113	-9	-2.5	1.6	75.7
EIA for Tung Chung Line Extension at Location 2 and 1.2m above track										**Min.**	**75.7**
										Max.	**76.4**
										Average	**76.0**
EIA for Tung Chung Line Extension (All points)										**Min.**	**75.7**
										Max.	**79.1**
										Average	**77.0**
TCNTE (AEIAR-196/2016) [4]										**Min.**	**73.0**
										Max.	**76.5**
										Average	**74.7**
Siu Ho Wan Station and Siu Ho Wan Depot Replanning Works (AEIAR-214/2017) [5]										**Min.**	**71.2**
										Max.	**77.7**
										Average	**74.8**
Source Term in MTRC LAR EIA[6]											**83.9**

Note:
[1] The measurement was taken in free field condition near a straight ballast track section whereas the measurement contained AEL and TCL trains.
[2] There is no screening between tracks and measurement locations.
[3] Current (Dec 2020) AEL and TCL trains are with 8 cars and are approximately 184.2m in length.
[4] The measured source term from the approved EIA report for Tung Chung New Town Extension (TCNTE) (AEIAR-196/2016)
[5] The measured source term from the approved EIA report for Siu Ho Wan Station and Siu Ho Wan Depot Replanning Works (AEIAR-214/2017)
[6] According to Lantau and Airport Railway Environmental Assessment Report EIA-029/BC and Equation 15.21 in Transportation Noise Reference Book, 1987. Equation 15.21 in Transportation Noise Reference Book is listed below

SEL = Lmax + 10log(L/V)+10.5-10log[4D/(4D2 +1)+2tan-11/(2D)]
Where
L = Train length, m
V = Train speed, km/h
d = Distance from track, m
D = d/L

Project: C1202 - EIA for Tung Chung Line Extension
Project no.: 277416

Title: Measured SEL - TCL
Measurement Date: 22 December 2020
Time: 10:00 - 13:00
Weather: Sunny, Light Wind

Project	Direction	Location	Height from track, m	Measured SEL [1,2,3], dB(A)	Measurement Distance from Track, m	No. of Car	Speed, km/h	Car correction, dB(A)	Distance Correction, dB(A)	Speed Correction, dB(A)	Corrected SEL (1 car at 135km/h at 25m, dB(A))
EIA for Tung Chung Line Extension	To Hong Kong Station	1	10	87.2	27	8	132	-9	0.3	0.2	78.6
		1	10	86.6	27	8	135	-9	0.3	0.0	77.9
		1	10	88.9	27	8	131	-9	0.3	0.3	80.5
		1	10	85.9	27	8	129	-9	0.3	0.4	77.6
		1	10	87.2	27	8	129	-9	0.3	0.4	78.8
		1	10	89.0	27	8	129	-9	0.3	0.4	80.7
		1	10	87.1	27	8	130	-9	0.3	0.3	78.7
		1	10	88.9	27	8	130	-9	0.3	0.3	80.5
		1	10	87.1	27	8	130	-9	0.3	0.3	78.7
		1	10	88.6	27	8	127	-9	0.3	0.5	80.4
		1	10	88.6	27	8	131	-9	0.3	0.3	80.2
		1	10	85.7	27	8	130	-9	0.3	0.3	77.3
		1	10	86.8	27	8	130	-9	0.3	0.3	78.4
		1	10	89.0	27	8	135	-9	0.3	0.0	80.3
		1	10	87.4	27	8	126	-9	0.3	0.6	79.2
	To Tung Chung	1	10	89.0	31	8	135	-9	0.9	0.0	80.8
		1	10	88.1	31	8	134	-9	0.9	0.1	80.0
		1	10	88.7	31	8	127	-9	0.9	0.5	81.1
		1	10	88.5	31	8	129	-9	0.9	0.4	80.7
		1	10	89.9	31	8	132	-9	0.9	0.2	81.9
		1	10	87.9	31	8	129	-9	0.9	0.4	80.2
		1	10	87.1	31	8	128	-9	0.9	0.5	79.5
		1	10	89.1	31	8	127	-9	0.9	0.5	81.5
		1	10	87.0	31	8	122	-9	0.9	0.9	79.7
		1	10	89.0	31	8	130	-9	0.9	0.3	81.2
		1	10	88.4	31	8	129	-9	0.9	0.4	80.6
		1	10	87.6	31	8	129	-9	0.9	0.4	79.9
		1	10	87.7	31	8	128	-9	0.9	0.5	80.0
		1	10	89.3	31	8	124	-9	0.9	0.7	81.9
										Min.	**77.3**
										Max.	**81.9**
										Average	**79.9**
EIA for Tung Chung Line Extension	To Hong Kong Station	1	3.5	86.6	25	8	132	-9	0.0	0.2	77.8
		1	3.5	85.8	25	8	135	-9	0.0	0.0	76.8
		1	3.5	88.7	25	8	131	-9	0.0	0.3	80.0
		1	3.5	85.0	25	8	129	-9	0.0	0.4	76.4
		1	3.5	86.3	25	8	129	-9	0.0	0.4	77.7
		1	3.5	88.6	25	8	129	-9	0.0	0.4	80.0
		1	3.5	86.5	25	8	130	-9	0.0	0.3	77.9
		1	3.5	88.1	25	8	130	-9	0.0	0.3	79.5
		1	3.5	86.7	25	8	130	-9	0.0	0.3	78.1
		1	3.5	88.7	25	8	127	-9	0.0	0.5	80.3
		1	3.5	88.6	25	8	131	-9	0.0	0.3	79.9
		1	3.5	84.8	25	8	130	-9	0.0	0.3	76.1
		1	3.5	86.3	25	8	130	-9	0.0	0.3	77.6
		1	3.5	88.3	25	8	135	-9	0.0	0.0	79.3
		1	3.5	86.8	25	8	126	-9	0.0	0.6	78.4
	To Tung Chung	1	3.5	89.1	29	8	135	-9	0.7	0.0	80.7
		1	3.5	87.1	29	8	134	-9	0.7	0.1	78.8
		1	3.5	87.7	29	8	127	-9	0.7	0.5	79.9
		1	3.5	87.4	29	8	129	-9	0.7	0.4	79.5
		1	3.5	89.2	29	8	132	-9	0.7	0.2	81.0
		1	3.5	87.5	29	8	129	-9	0.7	0.4	79.5
		1	3.5	86.3	29	8	128	-9	0.7	0.5	78.5
		1	3.5	89.3	29	8	127	-9	0.7	0.5	81.4
		1	3.5	86.2	29	8	122	-9	0.7	0.9	78.7
		1	3.5	87.9	29	8	130	-9	0.7	0.3	79.9
		1	3.5	87.7	29	8	129	-9	0.7	0.4	79.7
		1	3.5	87.4	29	8	129	-9	0.7	0.4	79.4
		1	3.5	86.5	29	8	128	-9	0.7	0.5	78.6

EIA for Tung Chung Line Extension at Location 1 and 10m above track

Project: C1202 - EIA for Tung Chung Line Extension
Project no.: 277416

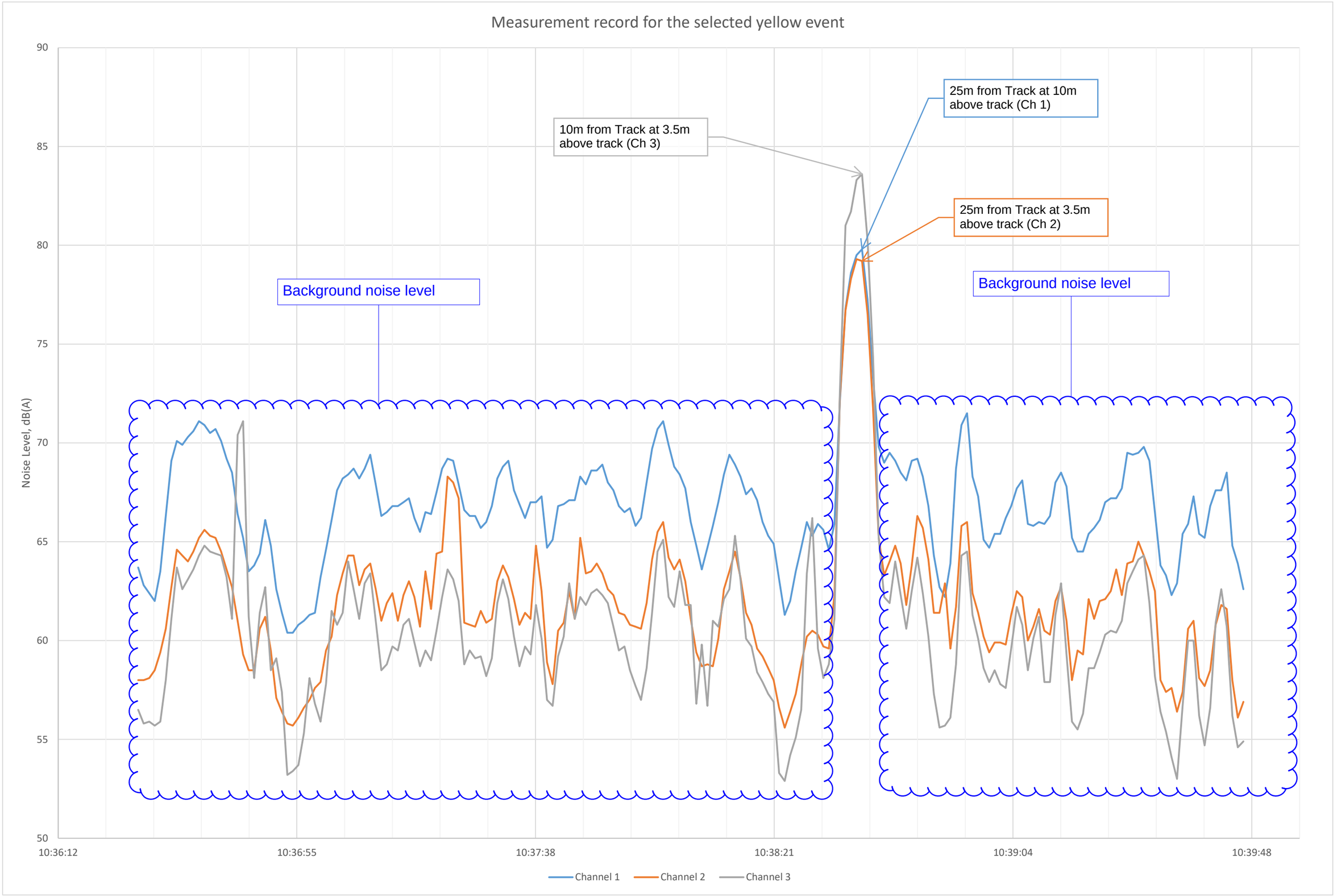
Title: Measured SEL - TCL
Measurement Date: 22 December 2020
Time: 10:00 - 13:00
Weather: Sunny, Light Wind

Project	Direction	Location	Height from track, m	Measured SEL [1,2,3], dB(A)	Measurement Distance from Track, m	No. of Car	Speed, km/h	Car correction, dB(A)	Distance Correction, dB(A)	Speed Correction, dB(A)	Corrected SEL (1 car at 135km/h at 25m, dB(A))
		1	3.5	89.1	29	8	124	-9	0.7	0.7	81.5
EIA for Tung Chung Line Extension at Location 1 and 3.5m above track										**Min.**	**76.1**
										Max.	**81.5**
										Average	**79.1**
EIA for Tung Chung Line Extension	To Hong Kong Station	2	1.2	90.7	10	8	132	-9	-3.9	0.2	77.8
		2	1.2	89.5	10	8	135	-9	-3.9	0.0	76.5
		2	1.2	92.6	10	8	131	-9	-3.9	0.3	79.9
		2	1.2	88.6	10	8	129	-9	-3.9	0.4	76.0
		2	1.2	89.8	10	8	129	-9	-3.9	0.4	77.2
		2	1.2	92.8	10	8	129	-9	-3.9	0.4	80.2
		2	1.2	90.3	10	8	130	-9	-3.9	0.3	77.7
		2	1.2	92.3	10	8	130	-9	-3.9	0.3	79.6
		2	1.2	90.7	10	8	130	-9	-3.9	0.3	78.1
		2	1.2	92.7	10	8	127	-9	-3.9	0.5	80.2
		2	1.2	92.4	10	8	131	-9	-3.9	0.3	79.7
		2	1.2	88.5	10	8	130	-9	-3.9	0.3	75.9
		2	1.2	90.0	10	8	130	-9	-3.9	0.3	77.3
		2	1.2	92.2	10	8	135	-9	-3.9	0.0	79.2
		2	1.2	90.6	10	8	126	-9	-3.9	0.6	78.2
	To Tung Chung	2	1.2	91.2	14	8	135	-9	-2.5	0.0	79.7
		2	1.2	89.0	14	8	134	-9	-2.5	0.1	77.6
		2	1.2	90.3	14	8	127	-9	-2.5	0.5	79.3
		2	1.2	89.8	14	8	129	-9	-2.5	0.4	78.7
		2	1.2	91.6	14	8	132	-9	-2.5	0.2	80.2
		2	1.2	89.5	14	8	129	-9	-2.5	0.4	78.4
		2	1.2	88.4	14	8	128	-9	-2.5	0.5	77.4
		2	1.2	91.2	14	8	127	-9	-2.5	0.5	80.2
		2	1.2	88.2	14	8	122	-9	-2.5	0.9	77.6
		2	1.2	90.2	14	8	130	-9	-2.5	0.3	79.1
		2	1.2	89.8	14	8	129	-9	-2.5	0.4	78.6
		2	1.2	89.7	14	8	129	-9	-2.5	0.4	78.6
		2	1.2	88.4	14	8	128	-9	-2.5	0.5	77.3
		2	1.2	91.4	14	8	124	-9	-2.5	0.7	80.6
EIA for Tung Chung Line Extension at Location 2 and 1.2m above track										**Min.**	**75.9**
										Max.	**80.6**
										Average	**78.5**
EIA for Tung Chung Line Extension (All points)										**Min.**	**75.9**
										Max.	**81.9**
										Average	**79.2**
TCNTE (AEIAR-196/2016) [4]										**Min.**	**74.2**
										Max.	**79.0**
										Average	**76.7**
Siu Ho Wan Station and Siu Ho Wan Depot Replanning Works (AEIAR-214/2017) [5]										**Min.**	**73.1**
										Max.	**77.8**
										Average	**75.8**
Source Term in MTRC LAR EIA[6]											**83.9**

Note:
[1] The measurement was taken in free field condition near a straight ballast track section whereas the measurement contained AEL and TCL trains.
[2] There is no screening between tracks and measurement locations.
[3] Current (Dec 2020) AEL and TCL trains are with 8 cars and are approximately 184.2m in length.
[4] The measured source term from the approved EIA report for Tung Chung New Town Extension (TCNTE) (AEIAR-196/2016)
[5] The measured source term from the approved EIA report for Siu Ho Wan Station and Siu Ho Wan Depot Replanning Works (AEIAR-214/2017)
[6] According to Lantau and Airport Railway Environmental Assessment Report EIA-029/BC and Equation 15.21 in Transportation Noise Reference Book, 1987. Equation 15.21 in Transportation Noise Reference Book is listed below

SEL = Lmax + 10log(L/V)+10.5-10log[4D/(4D2 +1)+2tan-11/(2D)]
Where
L = Train length, m
V = Train speed, km/h
d = Distance from track, m
D = d/L

Project: C1202 - EIA for Tung Chung Line Extension
Project no.: 277416
Title: Raw Data for Selected Yellow Event

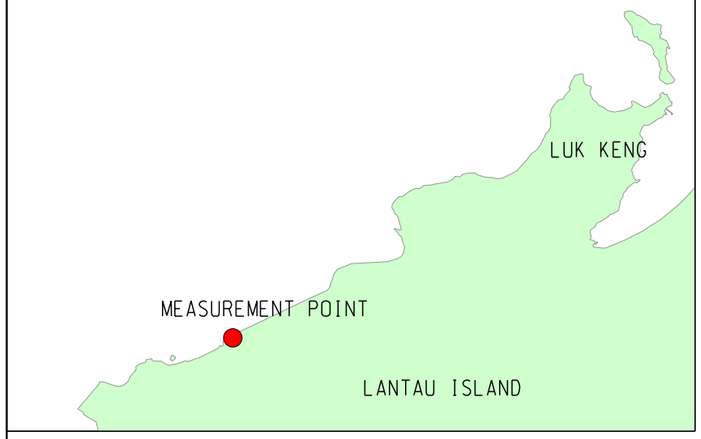


\\Hkgnts27\c1env\env\project\277416\12 Reports Deliverables\029 Noise Impact Assessment Working Paper\01 Draft\Appendix\working\SEL calculation for 2nd measurement.xlsx

Project: C1202 - EIA for Tung Chung Line Extension
Project no.: 277416
Title: Raw Data for Selected Blue Event

MEASUREMENT POINTS FOR RAILWAY NOISE SOURCE TERM: NEAR TA PANG PO

NOTE:
1 MEASUREMENT POINT AT 1.2m, 3.5m AND 10m ABOVE TRACK LEVEL WITHOUT FACADE CORRECTION.
2 EXACT LOCATION SUBJECT TO ON-SITE MEASUREMENT CONDITION.



LEGEND
- BALLAST TRACK
- MEASUREMENT POINT

SECTION DRAWING OF RAIL NOISE SOURCE TERM MEASUREMENT

REV	DESCRIPTION	BY	DATE	APPROVED
A	FIRST ISSUE	GL	100321	FC

DRAWN	GL
DESIGNED	GL
CHECKED	EL
APPROVED	FC
DATE	10/03/2021

MTR
C1202 – EIA for Tung Chung Line Extension

ORIGINATOR
ARUP Ove Arup & Partners Hong Kong Limited

CADD REF.
APPENDIX_RAIL NOISE SOURCE TERM MEASUREMENT POINTS .dgn

TITLE
RAIL NOISE SOURCE TERM MEASUREMENT POINTS NEAR TA PANG PO

SCALE
1 : 1000 (A3)

REV.
A

PLOT DRN: g:\common\microstation standard\plotdrv\hp_arupfk_a3-pdf-c.env.plt
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FILENAME: \\hkgnts27\GENV\env\project\27746\A3 Drawing Deliverables\report\020 Working Paper on Noise Source Term Measurement\APPENDIX_RAIL NOISE SOURCE TERM MEASUREMENT POINTS .dgn