

Appendix 9.3: Detailed Operational Groundborne Noise Calculations

Project: SCL (HHS)
NSR Ref.: DIH-11-1
Location: Lung Wan House
Assessed Floor Item: 1

Train Speed: 35 kph

	Horizontal Dist, m	Vertical Dist, m	Slant Dist, m
Up Track	80	25	84
Down Track	65	25	70

Selected Borehole Details:

	Borehole Ref.	Rockhead Depth, m	Hole Depth, m	Slant Dist, m
Up Track	D002	24	20	84[1]
Down Track	D002	24	20	70[1]

Description	Unit	Frequency (Hz)														
		20	25	32	40	50	63	80	100	125	160	200	250	315	400	500
Up Track Calculation																
FDL	dB re 1 lb/in ^{0.5}	29.3	33.3	32.3	30.3	29.3	33.3	36.3	37.3	37.3	33.3	32.3	31.3	28.3	29.3	26.3
CCF	dB Y/N N															
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 0															
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	-4.0	-7.2	-12.3	-15.3	-8.1	-21.5	-19.5	-11.7	-25.6	-26.9	-17.4	-14.3	-17.0	-15.4	-18.4
Up Track Vib. Level	dB re 10 ⁻⁶ in/sec	20.3	21.1	15.0	10.0	16.2	6.8	11.8	20.6	6.7	1.4	9.9	12.0	6.3	8.9	2.9
Down Track Calculation																
FDL	dB re 1 lb/in ^{0.5}	29.3	33.3	32.3	30.3	29.3	33.3	36.3	37.3	37.3	33.3	32.3	31.3	28.3	29.3	26.3
CCF	dB Y/N N															
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 0															
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	-2.7	-5.9	-10.8	-14.2	-7.1	-19.0	-17.8	-10.3	-24.4	-25.6	-16.4	-13.2	-15.7	-14.4	-17.4
Down Track Vib. Level	dB re 10 ⁻⁶ in/sec	21.6	22.4	16.5	11.1	17.2	9.3	13.5	22.1	7.9	2.7	10.9	13.1	7.6	9.9	3.9
Total of Up and Down Tracks Calculation																
Total Vibration Level Outside Building		24.0	24.8	18.8	13.6	19.7	11.3	15.7	24.4	10.4	5.1	13.5	15.6	10.0	12.5	6.5
BCF	dB Y/N 0															
BVR-up	dB Floor 1	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
BVR - Resonance	dB	6.0	6.0	6.0	6.0	5.8	5.4	5.2	5.0	4.8	4.0	3.0	2.0	1.0	0.7	0.7
CTN	dB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
SAF	dB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Predicted Noise Level	1/3 Oct, dB	40.0	40.8	34.8	29.6	35.5	26.7	30.9	39.4	25.2	19.1	26.5	27.6	21.0	23.2	17.2
Predicted Noise Level	Oct, dB			42.1			37.2			39.6			30.6			24.1
L_{max}	dB(A)	26.3														
L_{eq,30mins}	dB(A)	<20														
Noise Criteria	dB(A)	45														
Compliance		Yes														

- Notes: [1] Linear interpolation has been applied to slant distance where appropriate.
 [2] FDL based on 60kph data and adjusted by the correction factor of 20xlog(V/Vref), in line with FTA manual.
 [3] LSR based on the same or the next available smaller borehole depth. LSR data are interpolated against slant distance.
 [4] Lmax has incorporated a +0.5dB(A) correction to passby Leq as per measurement at Pat Heung Depot.
 [5] L_{eq,30mins} = L_{eq}(double passbys) + 10*log(Passby duration in sec) + 3dB(A) + 10*log(no. of events in 30mins per direction) - 32.6dB
 (3dB(A) correction is added to L_{eq,30mins} for leading and trailing effect for conservative approaches.)
 [6] L_{eq,30mins} is based on train frequency of 6 trains per 30mins in each direction.
 [7] Track Type 0 = Direct Fixation, 1 = Atl 1 Baseplate; Type 2 = Egg type baseplate; Type 3 = 12.5Hz FST.

Appendix 9.3: Detailed Operational Groundborne Noise Calculations

Project: SCL (HHS)
NSR Ref.: DIH-P3-1
Location: TBA
Assessed Floor Item: 2
 2

Train Speed: 60 kph

	Horizontal Dist, m	Vertical Dist, m	Slant Dist, m
Up Track	30	20	36
Down Track	10	20	22

Selected Borehole Details:

	Borehole Ref.	Rockhead Depth, m	Hole Depth, m	Slant Dist, m
Up Track	D002	24	20	36[1]
Down Track	D002	24	20	22[1]

Description	Unit	Frequency (Hz)															
		20	25	32	40	50	63	80	100	125	160	200	250	315	400	500	
Up Track Calculation																	
FDL	dB re 1 lb/in ^{0.5}	34.0	38.0	37.0	35.0	34.0	38.0	41.0	42.0	42.0	38.0	37.0	36.0	33.0	34.0	31.0	
CCF	dB Y/N N																
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 0																
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	7.6	2.1	2.9	7.7	7.9	-0.4	0.7	-1.4	-12.2	-16.6	-10.2	-8.5	-7.7	-10.6	-12.0	
Up Track Vib. Level	dB re 10 ⁻⁶ in/sec	36.6	35.1	34.9	37.7	36.9	32.6	36.7	35.6	24.8	16.4	21.8	22.5	20.3	18.4	14.0	
Down Track Calculation																	
FDL	dB re 1 lb/in ^{0.5}	34.0	38.0	37.0	35.0	34.0	38.0	41.0	42.0	42.0	38.0	37.0	36.0	33.0	34.0	31.0	
CCF	dB Y/N N																
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 0																
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	12.8	11.5	12.9	12.4	12.5	10.9	11.4	10.9	6.9	1.3	3.8	0.2	-1.4	-1.4	-2.1	
Down Track Vib. Level	dB re 10 ⁻⁶ in/sec	41.8	44.5	44.9	42.4	41.5	43.9	47.4	47.9	43.9	34.3	35.8	31.2	26.7	27.7	24.0	
Total of Up and Down Tracks Calculation																	
Total Vibration Level Outside Building		42.9	44.9	45.3	43.6	42.8	44.2	47.7	48.1	43.9	34.4	36.0	31.7	27.5	28.1	24.4	
BCF	dB Y/N 0																
BVR-up	dB Floor 2	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
BVR - Resonance	dB	6.0	6.0	6.0	6.0	5.8	5.4	5.2	5.0	4.8	4.0	3.0	2.0	1.0	0.7	0.7	
CTN	dB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
SAF	dB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Predicted Noise Level	1/3 Oct, dB	56.9	58.9	59.3	57.6	56.6	57.6	60.9	61.1	56.7	46.4	47.0	41.7	36.5	36.8	33.1
Predicted Noise Level	Oct, dB			63.5			63.5			62.6			48.4			38.4
L_{max}	dB(A)	47.4														
L_{eq,30mins}	dB(A)	36.1														
Noise Criteria	dB(A)	45														
Compliance		Yes														

- Notes: [1] Linear interpolation has been applied to slant distance where appropriate.
 [2] FDL based on 60kph data and adjusted by the correction factor of 20xlog(V/Vref), in line with FTA manual.
 [3] LSR based on the same or the next available smaller borehole depth. LSR data are interpolated against slant distance.
 [4] Lmax has incorporated a +0.5dB(A) correction to passby Leq as per measurement at Pat Heung Depot.
 [5] L_{eq,30mins} = L_{eq}(double passbys) + 10*log(Passby duration in sec) + 3dB(A) + 10*log(no. of events in 30mins per direction) - 32.6dB
 (3dB(A) correction is added to L_{eq,30mins} for leading and trailing effect for conservative approaches.)
 [6] L_{eq,30mins} is based on train frequency of 6 trains per 30mins in each direction.
 [7] Track Type 0 = Direct Fixation, 1 = Atl 1 Baseplate; Type 2 = Egg type baseplate; Type 3 = 12.5Hz FST.

Appendix 9.3: Detailed Operational Groundborne Noise Calculations

Project: SCL (HHS)
NSR Ref.: DIH-P3-2
Location: TBA
Assessed Floor Item: 2
 3

Train Speed: 60 kph

	Horizontal Dist, m	Vertical Dist, m	Slant Dist, m
Up Track	30	20	36
Down Track	10	20	22

Selected Borehole Details:

	Borehole Ref.	Rockhead Depth, m	Hole Depth, m	Slant Dist, m
Up Track	D002	24	20	36[1]
Down Track	D002	24	20	22[1]

Description	Unit	Frequency (Hz)															
		20	25	32	40	50	63	80	100	125	160	200	250	315	400	500	
Up Track Calculation																	
FDL	dB re 1 lb/in ^{0.5}	34.0	38.0	37.0	35.0	34.0	38.0	41.0	42.0	42.0	38.0	37.0	36.0	33.0	34.0	31.0	
CCF	dB Y/N N																
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 0																
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	7.6	2.1	2.9	7.7	7.9	-0.4	0.7	-1.4	-12.2	-16.6	-10.2	-8.5	-7.7	-10.6	-12.0	
Up Track Vib. Level	dB re 10 ⁻⁶ in/sec	36.6	35.1	34.9	37.7	36.9	32.6	36.7	35.6	24.8	16.4	21.8	22.5	20.3	18.4	14.0	
Down Track Calculation																	
FDL	dB re 1 lb/in ^{0.5}	34.0	38.0	37.0	35.0	34.0	38.0	41.0	42.0	42.0	38.0	37.0	36.0	33.0	34.0	31.0	
CCF	dB Y/N N																
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 0																
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	12.8	11.5	12.9	12.4	12.5	10.9	11.4	10.9	6.9	1.3	3.8	0.2	-1.4	-1.4	-2.1	
Down Track Vib. Level	dB re 10 ⁻⁶ in/sec	41.8	44.5	44.9	42.4	41.5	43.9	47.4	47.9	43.9	34.3	35.8	31.2	26.7	27.7	24.0	
Total of Up and Down Tracks Calculation																	
Total Vibration Level Outside Building		42.9	44.9	45.3	43.6	42.8	44.2	47.7	48.1	43.9	34.4	36.0	31.7	27.5	28.1	24.4	
BCF	dB Y/N 0																
BVR-up	dB Floor 2	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
BVR - Resonance	dB	6.0	6.0	6.0	6.0	5.8	5.4	5.2	5.0	4.8	4.0	3.0	2.0	1.0	0.7	0.7	
CTN	dB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
SAF	dB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Predicted Noise Level	1/3 Oct, dB	56.9	58.9	59.3	57.6	56.6	57.6	60.9	61.1	56.7	46.4	47.0	41.7	36.5	36.8	33.1
Predicted Noise Level	Oct, dB			63.5			63.5			62.6			48.4			38.4
L_{max}	dB(A)	47.4														
L_{eq,30mins}	dB(A)	36.1														
Noise Criteria	dB(A)	45														
Compliance		Yes														

- Notes: [1] Linear interpolation has been applied to slant distance where appropriate.
 [2] FDL based on 60kph data and adjusted by the correction factor of 20xlog(V/Vref), in line with FTA manual.
 [3] LSR based on the same or the next available smaller borehole depth. LSR data are interpolated against slant distance.
 [4] Lmax has incorporated a +0.5dB(A) correction to passby Leq as per measurement at Pat Heung Depot.
 [5] L_{eq,30mins} = L_{eq}(double passbys) + 10*log(Passby duration in sec) + 3dB(A) + 10*log(no. of events in 30mins per direction) - 32.6dB
 (3dB(A) correction is added to L_{eq,30mins} for leading and trailing effect for conservative approaches.)
 [6] L_{eq,30mins} is based on train frequency of 6 trains per 30mins in each direction.
 [7] Track Type 0 = Direct Fixation, 1 = Atl 1 Baseplate; Type 2 = Egg type baseplate; Type 3 = 12.5Hz FST.

Appendix 9.3: Detailed Operational Groundborne Noise Calculations

Project: SCL (HHS)
NSR Ref.: KAT-P1-1
Location: Residential premises near Kai Tak Station
Assessed Floor Item: 2
 4

Train Speed: 35 kph

	Horizontal Dist, m	Vertical Dist, m	Slant Dist, m
Up Track	75	15	76
Down Track	90	17	92

Selected Borehole Details:

	Borehole Ref.	Rockhead Depth, m	Hole Depth, m	Slant Dist, m
Up Track	D018	28	15	76[1]
Down Track	D018	28	15	92[1]

Description	Unit	Frequency (Hz)														
		20	25	32	40	50	63	80	100	125	160	200	250	315	400	500
Up Track Calculation																
FDL	dB re 1 lb/in ^{0.5}	29.3	33.3	32.3	30.3	29.3	33.3	36.3	37.3	37.3	33.3	32.3	31.3	28.3	29.3	26.3
CCF	dB Y/N N															
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 1	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	15.8	13.8	8.6	1.9	-5.3	-8.4	-13.2	-15.0	-18.4	-17.3	-18.1	-16.2	-16.3	-19.4	-19.6
Up Track Vib. Level	dB re 10 ⁻⁶ in/sec	50.1	52.1	45.9	37.2	29.0	29.9	28.1	27.3	23.9	21.0	19.2	20.1	17.0	14.9	11.7
Down Track Calculation																
FDL	dB re 1 lb/in ^{0.5}	29.3	33.3	32.3	30.3	29.3	33.3	36.3	37.3	37.3	33.3	32.3	31.3	28.3	29.3	26.3
CCF	dB Y/N N															
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	15.8	13.8	8.6	1.9	-5.3	-8.4	-13.2	-15.0	-18.4	-17.3	-18.1	-16.2	-16.3	-19.4	-19.6
Down Track Vib. Level	dB re 10 ⁻⁶ in/sec	40.1	42.1	35.9	27.2	19.0	19.9	18.1	17.3	13.9	11.0	9.2	10.1	7.0	4.9	1.7
Total of Up and Down Tracks Calculation																
Total Vibration Level Outside Building		50.5	52.5	46.3	37.6	29.4	30.3	28.5	27.7	24.3	21.4	19.6	20.5	17.4	15.3	12.1
BCF	dB Y/N 0															
BVR-up	dB Floor 2	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
BVR - Resonance	dB	6.0	6.0	6.0	6.0	5.8	5.4	5.2	5.0	4.8	4.0	3.0	2.0	1.0	0.7	0.7
CTN	dB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
SAF	dB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Predicted Noise Level	1/3 Oct, dB	64.5	66.5	60.3	51.6	43.2	43.7	41.7	40.7	37.1	33.4	30.6	30.5	26.4	24.0	20.8
Predicted Noise Level	Oct, dB			67.6			47.8			42.8			34.4			25.7
L_{max}	dB(A)	31.9														
L_{eq,30mins}	dB(A)	23.1														
Noise Criteria	dB(A)	45														
Compliance		Yes														

- Notes: [1] Linear interpolation has been applied to slant distance where appropriate.
 [2] FDL based on 60kph data and adjusted by the correction factor of 20xlog(V/Vref), in line with FTA manual.
 [3] LSR based on the same or the next available smaller borehole depth. LSR data are interpolated against slant distance.
 [4] Lmax has incorporated a +0.5dB(A) correction to passby Leq as per measurement at Pat Heung Depot.
 [5] L_{eq,30mins} = L_{eq}(double passbys) + 10*log(Passby duration in sec) + 3dB(A) + 10*log(no. of events in 30mins per direction) - 32.6dB
 (3dB(A) correction is added to L_{eq,30mins} for leading and trailing effect for conservative approaches.)
 [6] L_{eq,30mins} is based on train frequency of 6 trains per 30mins in each direction.
 [7] Track Type 0 = Direct Fixation, 1 = Atl 1 Baseplate; Type 2 = Egg type baseplate; Type 3 = 12.5Hz FST.

Appendix 9.3: Detailed Operational Groundborne Noise Calculations

Project: SCL (HHS)
NSR Ref.: KAT-P1-2
Location: Residential premises near Kai Tak Station
Assessed Floor Item: 2
 5

Train Speed: 50 kph

	Horizontal Dist, m	Vertical Dist, m	Slant Dist, m
Up Track	75	15	76
Down Track	90	17	92

Selected Borehole Details:

	Borehole Ref.	Rockhead Depth, m	Hole Depth, m	Slant Dist, m
Up Track	D018	28	15	76[1]
Down Track	D018	28	15	92[1]

Description	Unit	Frequency (Hz)														
		20	25	32	40	50	63	80	100	125	160	200	250	315	400	500
Up Track Calculation																
FDL	dB re 1 lb/in ^{0.5}	32.4	36.4	35.4	33.4	32.4	36.4	39.4	40.4	40.4	36.4	35.4	34.4	31.4	32.4	29.4
CCF	dB Y/N N															
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 0															
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	15.8	13.8	8.6	1.9	-5.3	-8.4	-13.2	-15.0	-18.4	-17.3	-18.1	-16.2	-16.3	-19.4	-19.6
Up Track Vib. Level	dB re 10 ⁻⁶ in/sec	43.2	45.2	39.0	30.3	22.1	23.0	21.2	20.4	17.0	14.1	12.3	13.2	10.1	8.0	4.8
Down Track Calculation																
FDL	dB re 1 lb/in ^{0.5}	32.4	36.4	35.4	33.4	32.4	36.4	39.4	40.4	40.4	36.4	35.4	34.4	31.4	32.4	29.4
CCF	dB Y/N N															
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 1	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	15.8	13.8	8.6	1.9	-5.3	-8.4	-13.2	-15.0	-18.4	-17.3	-18.1	-16.2	-16.3	-19.4	-19.6
Down Track Vib. Level	dB re 10 ⁻⁶ in/sec	53.2	55.2	49.0	40.3	32.1	33.0	31.2	30.4	27.0	24.1	22.3	23.2	20.1	18.0	14.8
Total of Up and Down Tracks Calculation																
Total Vibration Level Outside Building		53.6	55.6	49.4	40.7	32.5	33.4	31.6	30.8	27.4	24.5	22.7	23.6	20.5	18.4	15.2
BCF	dB Y/N 0															
BVR-up	dB Floor 2	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
BVR - Resonance	dB	6.0	6.0	6.0	6.0	5.8	5.4	5.2	5.0	4.8	4.0	3.0	2.0	1.0	0.7	0.7
CTN	dB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
SAF	dB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Predicted Noise Level	1/3 Oct, dB	67.6	69.6	63.4	54.7	46.3	46.8	44.8	43.8	40.2	36.5	33.7	33.6	29.5	27.1	23.9
Predicted Noise Level	Oct, dB			70.7			50.8			45.9			37.5			28.8
L_{max}	dB(A)	35.0														
L_{eq,30mins}	dB(A)	24.6														
Noise Criteria	dB(A)	45														
Compliance		Yes														

- Notes: [1] Linear interpolation has been applied to slant distance where appropriate.
 [2] FDL based on 60kph data and adjusted by the correction factor of 20xlog(V/Vref), in line with FTA manual.
 [3] LSR based on the same or the next available smaller borehole depth. LSR data are interpolated against slant distance.
 [4] Lmax has incorporated a +0.5dB(A) correction to passby Leq as per measurement at Pat Heung Depot.
 [5] L_{eq,30mins} = L_{eq}(double passbys) + 10*log(Passby duration in sec) + 3dB(A) + 10*log(no. of events in 30mins per direction) - 32.6dB(A)
 (3dB(A) correction is added to L_{eq,30mins} for leading and trailing effect for conservative approaches.)
 [6] L_{eq,30mins} is based on train frequency of 6 trains per 30mins in each direction.
 [7] Track Type 0 = Direct Fixation, 1 = Atl 1 Baseplate; Type 2 = Egg type baseplate; Type 3 = 12.5Hz FST.

Appendix 9.3: Detailed Operational Groundborne Noise Calculations

Project: SCL (HHS)
NSR Ref.: KAT-P1-3
Location: Residential premises near Kai Tak Station
Assessed Floor Item: 2
 6

Train Speed: 70 kph

	Horizontal Dist, m	Vertical Dist, m	Slant Dist, m
Up Track	55	15	57
Down Track	70	17	72

Selected Borehole Details:

	Borehole Ref.	Rockhead Depth, m	Hole Depth, m	Slant Dist, m
Up Track	D018	28	15	57[1]
Down Track	D018	28	15	72[1]

Description	Unit	Frequency (Hz)														
		20	25	32	40	50	63	80	100	125	160	200	250	315	400	500
Up Track Calculation																
FDL	dB re 1 lb/in ^{0.5}	35.3	39.3	38.3	36.3	35.3	39.3	42.3	43.3	43.3	39.3	38.3	37.3	34.3	35.3	32.3
CCF	dB Y/N N															
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
TOC	dB Type 1	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	17.9	15.6	10.0	4.3	-2.1	-6.1	-9.9	-12.3	-15.4	-14.2	-15.2	-12.6	-12.5	-15.9	-16.3
Up Track Vib. Level	dB re 10 ⁻⁶ in/sec	60.2	61.9	55.3	47.6	40.2	40.2	39.4	38.0	34.9	32.1	30.1	31.7	28.8	26.4	23.0
Down Track Calculation																
FDL	dB re 1 lb/in ^{0.5}	35.3	39.3	38.3	36.3	35.3	39.3	42.3	43.3	43.3	39.3	38.3	37.3	34.3	35.3	32.3
CCF	dB Y/N N															
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
TOC	dB Type 0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	15.8	13.8	8.6	1.9	-5.3	-8.4	-13.2	-15.0	-18.4	-17.3	-18.1	-16.2	-16.3	-19.4	-19.6
Down Track Vib. Level	dB re 10 ⁻⁶ in/sec	48.1	50.1	43.9	35.2	27.0	27.9	26.1	25.3	21.9	19.0	17.2	18.1	15.0	12.9	9.7
Total of Up and Down Tracks Calculation																
Total Vibration Level Outside Building		60.5	62.2	55.6	47.9	40.4	40.5	39.6	38.3	35.2	32.3	30.4	31.9	29.0	26.6	23.2
BCF	dB Y/N 0															
BVR-up	dB Floor 2	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
BVR - Resonance	dB	6.0	6.0	6.0	6.0	5.8	5.4	5.2	5.0	4.8	4.0	3.0	2.0	1.0	0.7	0.7
CTN	dB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
SAF	dB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Predicted Noise Level	1/3 Oct, dB	74.5	76.2	69.6	61.9	54.2	53.9	52.8	51.3	48.0	44.3	41.4	41.9	38.0	35.3	31.9
Predicted Noise Level	Oct, dB			77.2			58.5			53.5			45.5			37.0
L_{max}	dB(A)	42.6														
L_{eq,30mins}	dB(A)	30.7														
Noise Criteria	dB(A)	45														
Compliance		Yes														

- Notes: [1] Linear interpolation has been applied to slant distance where appropriate.
 [2] FDL based on 60kph data and adjusted by the correction factor of 20xlog(V/Vref), in line with FTA manual.
 [3] LSR based on the same or the next available smaller borehole depth. LSR data are interpolated against slant distance.
 [4] Lmax has incorporated a +0.5dB(A) correction to passby Leq as per measurement at Pat Heung Depot.
 [5] L_{eq,30mins} = L_{eq}(double passbys) + 10*log(Passby duration in sec) + 3dB(A) + 10*log(no. of events in 30mins per direction) - 32.6dB
 (3dB(A) correction is added to L_{eq,30mins} for leading and trailing effect for conservative approaches.)
 [6] L_{eq,30mins} is based on train frequency of 6 trains per 30mins in each direction.
 [7] Track Type 0 = Direct Fixation, 1 = Atl 1 Baseplate; Type 2 = Egg type baseplate; Type 3 = 12.5Hz FST.

Appendix 9.3: Detailed Operational Groundborne Noise Calculations

Project: SCL (HHS)
NSR Ref.: KAT-P1-4
Location: Residential premises near Kai Tak Station
Assessed Floor Item: 2
 7

Train Speed: 65 kph

	Horizontal Dist, m	Vertical Dist, m	Slant Dist, m
Up Track	80	15	81
Down Track	65	17	67

Selected Borehole Details:

	Borehole Ref.	Rockhead Depth, m	Hole Depth, m	Slant Dist, m
Up Track	D018	28	15	81[1]
Down Track	D018	28	15	67[1]

Description	Unit	Frequency (Hz)														
		20	25	32	40	50	63	80	100	125	160	200	250	315	400	500
Up Track Calculation																
FDL	dB re 1 lb/in ^{0.5}	34.7	38.7	37.7	35.7	34.7	38.7	41.7	42.7	42.7	38.7	37.7	36.7	33.7	34.7	31.7
CCF	dB Y/N N															
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 0															
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	15.8	13.8	8.6	1.9	-5.3	-8.4	-13.2	-15.0	-18.4	-17.3	-18.1	-16.2	-16.3	-19.4	-19.6
Up Track Vib. Level	dB re 10 ⁻⁶ in/sec	45.5	47.5	41.3	32.6	24.4	25.3	23.5	22.7	19.3	16.4	14.6	15.5	12.4	10.3	7.1
Down Track Calculation																
FDL	dB re 1 lb/in ^{0.5}	34.7	38.7	37.7	35.7	34.7	38.7	41.7	42.7	42.7	38.7	37.7	36.7	33.7	34.7	31.7
CCF	dB Y/N N															
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 0															
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	16.5	14.4	9.1	2.7	-4.2	-7.6	-12.1	-14.1	-17.4	-16.3	-17.1	-15.0	-15.0	-18.2	-18.5
Down Track Vib. Level	dB re 10 ⁻⁶ in/sec	46.2	48.1	41.8	33.4	25.5	26.1	24.6	23.6	20.3	17.4	15.6	16.7	13.7	11.5	8.2
Total of Up and Down Tracks Calculation																
Total Vibration Level Outside Building		48.9	50.8	44.5	36.0	28.0	28.7	27.1	26.2	22.8	20.0	18.1	19.1	16.1	13.9	10.7
BCF	dB Y/N 0															
BVR-up	dB Floor 2	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
BVR - Resonance	dB	6.0	6.0	6.0	6.0	5.8	5.4	5.2	5.0	4.8	4.0	3.0	2.0	1.0	0.7	0.7
CTN	dB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
SAF	dB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Predicted Noise Level	1/3 Oct, dB	62.9	64.8	58.5	50.0	41.8	42.1	40.3	39.2	35.6	32.0	29.1	29.1	25.1	22.6	19.4
Predicted Noise Level	Oct, dB			65.9			46.2			41.3		32.9			24.3	
L_{max}	dB(A)	30.4														
L_{eq,30mins}	dB(A)	<20														
Noise Criteria	dB(A)	45														
Compliance		Yes														

- Notes: [1] Linear interpolation has been applied to slant distance where appropriate.
 [2] FDL based on 60kph data and adjusted by the correction factor of 20xlog(V/Vref), in line with FTA manual.
 [3] LSR based on the same or the next available smaller borehole depth. LSR data are interpolated against slant distance.
 [4] Lmax has incorporated a +0.5dB(A) correction to passby Leq as per measurement at Pat Heung Depot.
 [5] L_{eq,30mins} = L_{eq}(double passbys) + 10*log(Passby duration in sec) + 3dB(A) + 10*log(no. of events in 30mins per direction) - 32.6dB
 (3dB(A) correction is added to L_{eq,30mins} for leading and trailing effect for conservative approaches.)
 [6] L_{eq,30mins} is based on train frequency of 6 trains per 30mins in each direction.
 [7] Track Type 0 = Direct Fixation, 1 = Atl 1 Baseplate; Type 2 = Egg type baseplate; Type 3 = 12.5Hz FST.

Appendix 9.3: Detailed Operational Groundborne Noise Calculations

Project: SCL (HHS)
NSR Ref.: KAT-P1-5
Location: Residential premises near Kai Tak Station Site 1
Assessed Floor Item: 2
 8

Train Speed: 60 kph

	Horizontal Dist, m	Vertical Dist, m	Slant Dist, m
Up Track	10	15	18
Down Track	20	17	26

Selected Borehole Details:

	Borehole Ref.	Rockhead Depth, m	Hole Depth, m	Slant Dist, m
Up Track	D018	28	15	18[1]
Down Track	D018	28	15	26[1]

Description	Unit	Frequency (Hz)															
		20	25	32	40	50	63	80	100	125	160	200	250	315	400	500	
Up Track Calculation																	
FDL	dB re 1 lb/in ^{0.5}	34.0	38.0	37.0	35.0	34.0	38.0	41.0	42.0	42.0	38.0	37.0	36.0	33.0	34.0	31.0	
CCF	dB Y/N N																
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
TOC	dB Type 0																
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	20.7	20.8	20.5	21.1	19.3	13.8	11.2	8.9	5.4	1.6	3.0	6.5	4.2	7.2	6.4	
Up Track Vib. Level	dB re 10 ⁻⁶ in/sec	51.7	55.8	54.5	53.1	50.3	48.8	49.2	47.9	44.4	36.6	37.0	39.5	34.2	38.2	34.4	
Down Track Calculation																	
FDL	dB re 1 lb/in ^{0.5}	34.0	38.0	37.0	35.0	34.0	38.0	41.0	42.0	42.0	38.0	37.0	36.0	33.0	34.0	31.0	
CCF	dB Y/N N																
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
TOC	dB Type 0																
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	19.4	19.3	17.9	18.3	12.5	2.5	-2.1	-5.3	-8.7	-6.0	-7.5	-2.4	-3.6	-2.9	-6.9	
Down Track Vib. Level	dB re 10 ⁻⁶ in/sec	50.4	54.3	51.9	50.3	43.5	37.5	35.9	33.7	30.4	29.1	26.5	30.6	26.4	28.1	21.1	
Total of Up and Down Tracks Calculation																	
Total Vibration Level Outside Building		54.1	58.1	56.4	55.0	51.1	49.1	49.4	48.0	44.5	37.3	37.4	40.0	34.9	38.6	34.6	
BCF	dB Y/N 0																
BVR-up	dB Floor 2	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
BVR - Resonance	dB	6.0	6.0	6.0	6.0	5.8	5.4	5.2	5.0	4.8	4.0	3.0	2.0	1.0	0.7	0.7	
CTN	dB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
SAF	dB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Predicted Noise Level	1/3 Oct, dB	68.1	72.1	70.4	69.0	64.9	62.5	62.6	61.0	57.3	49.3	48.4	50.0	43.9	47.3	43.3	
Predicted Noise Level	Oct, dB			75.5			68.3			62.8			52.8			48.8	
L_{max}	dB(A)	50.9															
L_{eq,30mins}	dB(A)	39.7															
Noise Criteria	dB(A)	45															
Compliance		Yes															

- Notes: [1] Linear interpolation has been applied to slant distance where appropriate.
 [2] FDL based on 60kph data and adjusted by the correction factor of 20xlog(V/Vref), in line with FTA manual.
 [3] LSR based on the same or the next available smaller borehole depth. LSR data are interpolated against slant distance.
 [4] Lmax has incorporated a +0.5dB(A) correction to passby Leq as per measurement at Pat Heung Depot.
 [5] L_{eq,30mins} = L_{eq}(double passbys) + 10*log(Passby duration in sec) + 3dB(A) + 10*log(no. of events in 30mins per direction) - 32.6dB
 (3dB(A) correction is added to L_{eq,30mins} for leading and trailing effect for conservative approaches.)
 [6] L_{eq,30mins} is based on train frequency of 6 trains per 30mins in each direction.
 [7] Track Type 0 = Direct Fixation, 1 = Atl 1 Baseplate; Type 2 = Egg type baseplate; Type 3 = 12.5Hz FST.
 [8] A 3dB(A) upward adjustment is made to account for the daytime headway of 22 EMU trains within a 30 minutes period.
 [9] Daytime criteria are used for educational buildings, church and temple.

Appendix 9.3: Detailed Operational Groundborne Noise Calculations

Project: SCL (HHS)
NSR Ref.: KAT-P1-6
Location: Residential premises near Kai Tak Station Site 1
Assessed Floor Item: 2
 9

Train Speed: 55 kph

	Horizontal Dist, m	Vertical Dist, m	Slant Dist, m
Up Track	180	15	181
Down Track	165	17	166

Selected Borehole Details:

	Borehole Ref.	Rockhead Depth, m	Hole Depth, m	Slant Dist, m
Up Track	D018	28	15	181[1]
Down Track	D018	28	15	166[1]

Description	Unit	Frequency (Hz)														
		20	25	32	40	50	63	80	100	125	160	200	250	315	400	500
Up Track Calculation																
FDL	dB re 1 lb/in ^{0.5}	33.2	37.2	36.2	34.2	33.2	37.2	40.2	41.2	41.2	37.2	36.2	35.2	32.2	33.2	30.2
CCF	dB Y/N N															
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 1	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	15.8	13.8	8.6	1.9	-5.3	-8.4	-13.2	-15.0	-18.4	-17.3	-18.1	-16.2	-16.3	-19.4	-19.6
Up Track Vib. Level	dB re 10 ⁻⁶ in/sec	54.0	56.0	49.8	41.1	32.9	33.8	32.0	31.2	27.8	24.9	23.1	24.0	20.9	18.8	15.6
Down Track Calculation																
FDL	dB re 1 lb/in ^{0.5}	33.2	37.2	36.2	34.2	33.2	37.2	40.2	41.2	41.2	37.2	36.2	35.2	32.2	33.2	30.2
CCF	dB Y/N N															
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
TOC	dB Type 0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	15.8	13.8	8.6	1.9	-5.3	-8.4	-13.2	-15.0	-18.4	-17.3	-18.1	-16.2	-16.3	-19.4	-19.6
Down Track Vib. Level	dB re 10 ⁻⁶ in/sec	44.0	46.0	39.8	31.1	22.9	23.8	22.0	21.2	17.8	14.9	13.1	14.0	10.9	8.8	5.6
Total of Up and Down Tracks Calculation																
Total Vibration Level Outside Building		54.5	56.5	50.3	41.6	33.4	34.3	32.5	31.7	28.3	25.4	23.6	24.5	21.4	19.3	16.1
BCF	dB Y/N 0															
BVR-up	dB Floor 2	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
BVR - Resonance	dB	6.0	6.0	6.0	6.0	5.8	5.4	5.2	5.0	4.8	4.0	3.0	2.0	1.0	0.7	0.7
CTN	dB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
SAF	dB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Predicted Noise Level	1/3 Oct, dB	68.5	70.5	64.3	55.6	47.2	47.7	45.7	44.7	41.1	37.4	34.6	34.5	30.4	28.0	24.8
Predicted Noise Level	Oct, dB			71.5			51.7			46.8			38.3			29.7
L_{max}	dB(A)	35.8														
L_{eq,30mins}	dB(A)	25.0														
Noise Criteria	dB(A)	45														
Compliance		Yes														

- Notes: [1] Linear interpolation has been applied to slant distance where appropriate.
 [2] FDL based on 60kph data and adjusted by the correction factor of 20xlog(V/Vref), in line with FTA manual.
 [3] LSR based on the same or the next available smaller borehole depth. LSR data are interpolated against slant distance.
 [4] Lmax has incorporated a +0.5dB(A) correction to passby Leq as per measurement at Pat Heung Depot.
 [5] L_{eq,30mins} = L_{eq}(double passbys) + 10*log(Passby duration in sec) + 3dB(A) + 10*log(no. of events in 30mins per direction) - 32.6dB
 (3dB(A) correction is added to L_{eq,30mins} for leading and trailing effect for conservative approaches.)
 [6] L_{eq,30mins} is based on train frequency of 6 trains per 30mins in each direction.
 [7] Track Type 0 = Direct Fixation, 1 = Atl 1 Baseplate; Type 2 = Egg type baseplate; Type 3 = 12.5Hz FST.

Appendix 9.3: Detailed Operational Groundborne Noise Calculations

Project: SCL (HHS)
NSR Ref.: HUH-1-3
Location: Wing Fung Building
Assessed Floor Item: 1
 10

Train Speed: 25 kph

	Horizontal Dist, m	Vertical Dist, m	Slant Dist, m
Up Track	45	5	45

Selected Borehole Details:

	Borehole Ref.	Rockhead Depth, m	Hole Depth, m	Slant Dist, m
Up Track	D018	28	15	45[1]

Description	Unit	Frequency (Hz)															
		20	25	32	40	50	63	80	100	125	160	200	250	315	400	500	
Up Track Calculation																	
FDL	dB re 1 lb/in ^{0.5}	26.4	30.4	29.4	27.4	26.4	30.4	33.4	34.4	34.4	30.4	29.4	28.4	25.4	26.4	23.4	
CCF	dB Y/N N																
TIL	dB Type 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCF	dB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOC	dB Type 0																
LSR	dB re 10 ⁻⁶ in/s*in ^{0.5} /lb	18.6	16.6	11.5	5.2	-1.6	-5.1	-8.9	-11.5	-15.0	-13.0	-13.7	-11.1	-11.2	-14.0	-15.5	
Track Vib. Level	dB re 10 ⁻⁶ in/sec	45.0	47.0	40.9	32.6	24.8	25.3	24.5	22.9	19.4	17.4	15.7	17.3	14.2	12.4	7.9	
Total Vibration Level Outside Building		45.0	47.0	40.9	32.6	24.8	25.3	24.5	22.9	19.5	17.5	15.9	17.4	14.4	12.7	8.6	
BCF	dB Y/N -																
BVR-up	dB Floor 1	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
BVR - Resonance	dB	6.0	6.0	6.0	6.0	5.8	5.4	5.2	5.0	4.8	4.0	3.0	2.0	1.0	0.7	0.7	
CTN	dB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
SAF	dB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	

Predicted Noise Level	1/3 Oct, dB	61.0	63.0	56.9	48.6	40.6	40.7	39.7	37.9	34.3	31.5	28.9	29.4	25.4	23.4	19.3
Predicted Noise Level	Oct, dB			64.1			45.2			40.1			33.0		24.8	
L_{max}	dB(A)	29.7														
L_{eq,30mins}	dB(A)	22.3														
Noise Criteria	dB(A)	45														
Compliance		Yes														

- Notes: [1] Linear interpolation has been applied to slant distance where appropriate.
 [2] FDL based on 60kph data and adjusted by the correction factor of 20xlog(V/Vref), in line with FTA manual.
 [3] LSR based on the same or the next available smaller borehole depth. LSR data are interpolated against slant distance.
 [4] L_{max} has incorporated a +0.5dB(A) correction to passby Leq as per measurement at Pat Heung Depot.
 [5] L_{eq,30mins} = L_{eq}(double passbys) + 10*log(Passby duration in sec) + 3dB(A) + 10*log(no. of events in 30mins per direction) - 32.6dB(A) (3dB(A) correction is added to L_{eq,30mins} for leading and trailing effect for conservative approaches.)
 [6] L_{eq,30mins} is based on train frequency of 6 trains per 30mins at tunnel section under Chatham Road North for turning around.
 [7] Track Type 0 = Direct Fixation, 1 = Atl 1 Baseplate; Type 2 = Egg type baseplate; Type 3 = 12.5Hz FST.