8 Airborne Noise Impact Assessment

8.1 Introduction

This chapter presents the findings of the airborne noise assessment for the SCL (TAW-HUH) during both the construction and operational phases. Construction noise associated with the use of Powered Mechanical Equipment (PME) has been conducted. With the implementation of practical mitigation measures, construction noise impacts at most of the neighbouring noise sensitive uses would be controlled to acceptable levels. However, for some receivers that are very close to some of the works sites, residual impacts are anticipated even after implementing all practicable mitigation measures.

Operational noise impacts associated with fixed noise sources and railways have also been investigated. With the implementation of mitigation measures, potential noise impacts would comply with the statutory criteria.

8.2 Legislation and Standards

8.2.1 Construction Noise

The Noise Control Ordinance (NCO) (Cap. 400)[8-1] provides the statutory framework for noise control in Hong Kong. Assessment procedures and standards are set out in the respective Technical Memoranda (TM) promulgated under the NCO. The following TMs are applicable to the assessment and control of construction noise.

- TM on Noise from Construction Work other than Percussive Piling (TM-GW)[8-2];
- TM on Noise from Percussive Piling (TM-PP)[8-3]; and
- TM on Noise on Construction Work in Designated Areas (TM-DA)[8-4].

To ensure a better environment, the TM-EIAO[8-5] promulgated under the Environmental Impact Assessment Ordinance (EIAO) (Cap. 499) has imposed more stringent criteria. For construction, there is no statutory limit on daytime construction noise under the NCO and related TMs. Nevertheless, the TM-EIAO stipulates noise standards of 65 - 75dB(A) for daytime construction activities, as shown **Table 8.1**.

Table 8.1: Noise Standards for Construction Activities

Uses	**Noise Standards [1] , $L_{eq\ (30\ mins)}$ dB(A)**	
	0700 to 1900 hours on any day not being a Sunday or general holiday	**1900 to 0700 hours or any time on Sundays or general holiday**
All domestic premises including temporary housing accommodation	75	(See Note 2)
Hotels and hostels	75	
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	70 65 (During examinations)	

Notes:

[1] The above standards apply to uses that rely on opened windows for ventilation.

[2] The criteria laid down in the relevant technical memoranda under the NCO for designated areas and construction works other than percussive piling may be used for planning purpose. A Construction Noise Permit (CNP) shall be required for the carrying out construction work during the period.

8.2.2 Construction Noise during Restricted Hours

The NCO also provides statutory control on general construction works during restricted hours (ie 1900 to 0700 hours (of the next day) from Monday to Saturday and at any time on Sundays or public holidays). The use of Powered Mechanical Equipment (PME) for

construction works during restricted hours would require a Construction Noise Permit (CNP). The TM-GW details the procedures adopted by EPD for assessing such application. The granting of a CNP is subject to conditions stated in the CNP and it may be revoked at any time for failure to comply with the permit conditions.

In addition to the general controls on the use of PME during restricted hours, the use of Specified Powered Mechanical Equipment (SPME) and the undertaking of Prescribed Construction Work (PCW) during the restricted hours in a designated area are controlled by the TM-DA. Construction plant or equipment classified as SPME under the TM-DA includes hand-held breakers, bulldozers, concrete mixer lorries, dump trucks and poker vibrators. The PCW includes the erection or dismantling of formwork or scaffolding, hammering, handling of rubble, wooden boards, steel bars, or scaffolding material, and the disposal of rubble through plastic chutes.

The TM-DA details the procedures that should generally be adopted by the Authority for assessing the use of SPME during restricted hours and for determining whether a CNP would be issued.

Maximum noise levels from construction activities during restricted hours at affected NSRs are controlled under the TMs and shall not exceed the specified Acceptable Noise Levels (ANLs). These ANLs are stipulated in accordance with the Area Sensitivity Ratings established for the NSRs. The ANLs for construction works in Designated Areas are more stringent than those given in the GW-TM and summarised in **Table 8.2**.

Table 8.2: Acceptable Noise Levels for Construction during Restricted Hours

Time Period	Acceptable Noise Levels for Area Sensitivity Ratings, dB(A)		
	A	B	C
All weekdays during the evening (1900 to 2300 hours), and general holidays (including Sundays) during the day and evening (0700 to 2300 hours)	60 (45)	65 (50)	70 (55)
All days during the night-time (2300 to 0700 hours)	45 (30)	50 (35)	55 (40)

Note: Figures in brackets are ANLs for SPME construction work in designated areas

Despite any description made in this EIA, there is no guarantee that a CNP will be issued for the project construction. The Noise Control Authority will consider a well-justified CNP application, once filed, for construction works within restricted hours as guided by the relevant TMs issued under the NCO. The Noise Control Authority will take into account contemporary conditions / situations of adjoining land uses and any previous complaints against construction activities at the site before making a decision in granting a CNP. Nothing in the EIA report shall bind the Noise Control Authority in making a decision. If a CNP is to be issued, the Noise Control Authority shall include in it any conditions demand. Failure to comply with any such conditions will lead to cancellation of the CNP and prosecution under the NCO.

8.2.3 Percussive Piling

Under the TM-PP, CNPs are also required for percussive piling involving the use of diesel, pneumatic and / or steam hammer. This TM specifies the permitted hours and other conditions for percussive piling. **Table 8.3** lists the acceptable percussive piling noise levels for various types of NSR.

Table 8.3: Acceptable Noise Levels for Percussive Piling

NSR Window Type or Means of Ventilation	ANL (dB(A))
(i) NSR (or part of NSR) with no window or other opening	100
(ii) NSR with central air conditioning system.	90
(iii) NSR with windows or other openings but without central air conditioning system	85

Depending on the numbers and types of piling machines and the separation from NSRs, percussive piling may be restricted to 12, 5 or 3 hours per day. For NSRs that are particularly sensitive to noise, such as hospitals, medical clinics, educational institutions and courts of law, a further reduction of 10 dB(A) shall be applied to the above ANLs.

8.2.4 Blasting

The administrative and procedural control of all blasting operations in Hong Kong is vested in the Mines Division of the Civil Engineering and Development Department (CEDD). The Dangerous Goods (General) Regulations, Chapter 295 also stipulates that no person shall carry out blasting unless he possesses a valid mine blasting certificate to be issued by the Mines Division of CEDD. The Superintendent of Mines will review the application on a case-by-case basis before issuing the Mine Blasting Certificate. Although there is no statutory noise level for blasting, the noise associated with the removal of debris and rocks are controlled under the TM-EIAO.

8.2.5 Operational Noise

The TM-EIAO has stipulated the noise standards for various noise sources as shown in the following table.

Table 8.4 Noise Standards for Operational Phase

Common Uses	Noise Standards [1]				
	Aircraft Noise (Noise Exposure Forecast: NEF)	Helicopter Noise L_{max} dB(A)	Road Traffic Noise $L_{10\ (1hour)}$ dB(A)	Rail Noise[2]	Fixed Noise Sources
All domestic premises including temporary housing accommodation	25	85	70	(a) The appropriate Acceptable Noise Levels shown in Table 2 of the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites (b) L_{max} (2300-0700 hours) = 85dB(A) and (c) $L_{eq\ 24hrs}$ =65dB(A)	(a) 5dB(A) below the appropriate Acceptable Noise Levels (ANL) shown in Table 2 of the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites, or (b) the prevailing background noise levels (For quiet areas with level 5 dB(A) below the ANL)
Hotels and hostels	25	85	70		
Offices	30	90	70		
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	25	85	65		
Places of public worship and courts of law	25	85	65		
Hospitals, clinics, convalescences and homes for the aged, diagnostic rooms, wards	25	85	55		

Notes:

[1] The above standards apply to uses that rely on opened windows for ventilation.

[2] Rail noise is under the control of the Noise Control Ordinance and shall comply with the Acceptable Noise Levels laid down in the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites. The criteria for noise transmitted primarily through the structural elements of the building or buildings should be 10dB(A) less than the relevant acceptable noise level.

8.2.6 Railway Noise

Noise from railway, station plant items, train stabling sidings and ventilation building is controlled under the NCO and the associated Technical Memorandum on Noise from Places Other Than Domestic Premises, Public Places or Construction Sites (TM-Places), and the relevant noise criteria are listed in Table 1A, Annex 5 of TM-EIAO. In accordance with the Hong Kong Planning Standards and Guidelines (HKPSG), a 24-hour averaged noise level of 65 dB(A) $L_{eq\ 24\ hr}$ has been specified.

Table 8.5 below summarises the noise standards for railway noise as given in Table 1A, Annex 5 of TM-EIAO.

Table 8.5: Noise criteria for railway noise

Area Sensitivity Rating	Time Period [1]	Acceptable Noise Levels (ANL), $L_{Aeq,\ 30\ mins}$, dB(A)	Maximum A-weighted sound pressure level, L_{max} (2300-0700hrs) dB(A)
A	Day & evening	60	85
	Night	50	
B	Day & evening	65	
	Night	55	
C	Day & evening	70	
	Night	60	

Note: [1] Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours

8.2.7 Fixed Noise Sources

Operational noise from fixed noise sources is controlled under the NCO's Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites[8-6]. To plan for a better environment, the TM-EIAO has specified the following requirements.

- 5 dB(A) below the appropriate ANLs in the Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites; or
- the existing noise levels (For quiet areas with level 5dB(A) below the ANL).

The ANLs for different Area Sensitivity Ratings during different periods are summarized in the following table.

Table 8.6: Acceptable Noise Levels (ANL) for Fixed Noise Sources

Time Period	ANL, dB(A)			ANL-5, dB(A)		
	ASR A	ASR B	ASR C	ASR A	ASR B	ASR C
Day (0700 to 1900 hours)	60	65	70	55	60	65
Evening (1900 to 2300 hours)	60	65	70	55	60	65
Night (2300 to 0700 hours)	50	55	60	45	50	55

Note: ASR – Area Sensitivity Rating

8.2.8 Existing Noise Levels

Noise measurements have been conducted to establish the existing noise levels in the vicinity of the proposed ventilation buildings and stations where fixed noise sources are anticipated. **Appendix 8.1** shows the measurement locations for existing noise levels. A summary of the results is given in **Table 8.7**.

Table 8.7: Measurements of Existing Noise Levels

Measurement Location	Existing Noise Levels [2], dB(A) L_{eq}	
	Day & Evening [1]	Night [1]
Ma Chai Hang-MCV (PNM-1)	69 - 71	56 - 59
Ma Chai Hang-MCV (PNM-2)	66 - 68	58 - 61
Hin Keng-HIK (PNM-3)	58 - 65	50 - 53
Hin Keng-HIK (PNM-4)	58 - 62	56 - 58
Diamond Hill-DIH (PNM-5)	69 - 73	62 - 65
Diamond Hill-DIH (PNM-6)	76 - 79	71 - 73
Diamond Hill-DIH (PNM-7)	72 - 74	63 - 66
Kai Tak-KAT (PNM-8)	70 – 73	56 - 59
To Kwa Wan-TKW (PNM-9)	66 - 68	61 - 63
Ma Tau Wai-MTW (PNM-10)	69 – 71	56 – 58
Ma Tau Wai-MTW (PNM-11)	70 – 71	65 - 68
Fung Tak EA/EEA (PNM-12)	58 - 63	55 - 60

Note:

[1] Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours

[2] Measurements conducted in March 2009

8.2.9 Noise Criteria

A summary of the noise criteria at representative NSRs which would be subject to the impact of fixed plant noise is given in the following table. The existing noise level at each NSR would be determined based on measurement results at the nearest location as shown in **Appendix 8.1**.

Table 8.8: Summary of Noise Criteria at NSRs for Fixed Noise Sources

Area (NSR No.)	Time Period [1]	Existing Noise Levels, dB(A) [2]	ASR	ANL-5 dB(A) [3]	Criteria dB(A) [4]
Wang King House (DIH-21-1), Chun On House (DIH-23-1)	Day & evening	69	B	60	60
	Night	56	B	50	50
Baptist Rainbow Primary School (DIH-20-1), Carbo Anglo-Chinese Kindergarten (DIH-4-2)	Day & evening	66	B	60	60
	Night	58	B	50	50
L Louey (TAW-5-2)	Day & evening	58	B	60	58
	Night	50	B	50	50
Joyville (TAW-5-3)	Day & evening	58	B	60	58
	Night	50	B	50	50
Hin Yau House (TAW-6-5)	Day & evening	58	B	60	58
	Night	56	B	50	50
Galaxia (DIH-12-1 & DIH-12-2), Lung Wan House (DIH-11-1), Planned NSR (DIH-P2-16 to DIH-P2-24)	Day & evening	69	C	65	65
	Night	62	C	55	55
Shek On Building(DIH-9-1), Hong Kong Sheng Kung Hui Nursing Home (DIH-10-1), Planned NSR (DIH-P2-14 to DIH-P2-15)	Day & evening	76	B	60	60
	Night	71	B	50	50
Canossa Primary School (San Po Kong) (DIH-14-4)	Day & evening	72	C	65	65
	Night	63	C	55	55
Rhythm Garden Block 1 (DIH-	Day & evening	72	C	65	65

Area (NSR No.)	Time Period [1]	Existing Noise Levels, dB(A) [2]	ASR	ANL-5 dB(A) [3]	Criteria dB(A) [4]
14-5), Planned NSR (DIH-P2-11 to DIH-P2-13)	Night	63	C	55	55
Chui Yuen House (DIH-3-4), Rainbow Home (DIH-5-1), Wong Tai Sin Temple (DIH-16-1), Chuk Yuen United Village (DIH-17-1)	Day & evening	58	B	60	58
	Night	55	B	50	50
Planned NSR (KAT-P1-1, KAT-P1-2, KAT-P1-3 & KAT-P1-4)	Day & evening	70	B	60	60
	Night	56	B	50	50
Parc 22 (TKW-1-1), Holy Trinity Church (MTW-19-1), Fok On Building (MTW-6-1)	Day & evening	66	C	65	65
	Night	61	C	55	55
Planned NSR (TKW-P1-1)	Day & evening	66	B	60	60
	Night	61	B	50	50
Prince Ritz (TKW-3-1), Prosperity House (TKW-3-2)	Day & evening	67	B	60	60
	Night	61	B	50	50
Lucky Mansion (MTW-12-3), 352-354 Ma Tau Wai Rd (MTW-12-4), Lucky Building (MTW-12-10), SKH Good Shepherd Primary School (MTW-16-1)	Day & evening	69	B	60	60
	Night	56	B	50	50
Seng Cheong Building (MTW-12-5), Loyal Mansion (MTW-17-1), Residential premises along Chi Kiang Street (MTW-18-1)	Day & evening	70	B	60	60
	Night	65	B	50	50

Note:

[1] Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

[2] Existing noise level determined based on the measurement result recorded at the representative location nearest to the respective NSR.

[3] A 5 dB(A) has been deducted from ANL as specified in requirement of TM-EIAO.

[4] The Minimum of [2] & [3] is adopted.

8.3 Potential Concurrent Projects

The concurrent projects that would have cumulative environmental impacts during the construction and operational phases of SCL (TAW-HUH) are given in **Section 1**. As discussed in **Section 1.5.12**, the following concurrent projects are relevant for cumulative noise assessment.

Table 8.9 Summary of Cumulative Noise Issues from Concurrent Projects

Item	Project (Construction Method)	Issues During Project Stage	
		Construction	Operation
1	SCL (MKK-HUH) & SCL (HUH-ADM) (cut-&-cover tunnel)	• Airborne noise	• Groundborne noise
2	Central Kowloon Route (CKR)[1] (at-grade road construction)	• Airborne noise	• Nil
3	Housing Authority Development Sites 1A & 1B within Kai Tak Development (superstructure construction)	• Airborne noise	• Nil
4	Other Infrastructure within Kai Tak Development (Including EPIW)	• Airborne noise	• Nil
5	Kwun Tong Line Extension (Including EPIW)	• Airborne noise	• Groundborne noise

Item	Project (Construction Method)	Issues During Project Stage	
		Construction	Operation
	(cut-&-cover station and tunnel)		
6	MTR Tsz Wan Shan Wan Shan Pedestrian Link	• Airborne noise	• Nil

Notes:

[1] The construction programme of CKR will be concurrent with SCL (TAW-HUH). However, the cumulative construction impacts are obstructed by nearby building of the construction sites. Therefore, cumulative construction noise impacts are not anticipated.

8.3.1 Noise Sensitive Receivers

With reference to Annex 13 of the TM-EIAO, NSRs include residential uses (all domestic premises including temporary housing), institutional uses (educational institutions including kindergarten and nurseries), hospitals, medical clinics, homes for the aged, convalescent homes, places of worship, libraries, court of law, performing arts centres, auditoria and amphitheatres, country park and others. All hospitals and performance venues are air-conditioned and do not rely on openable windows for ventilation.

Representative NSRs within a distance of 300m from the either side of the project boundary have been identified. The first layer of NSRs has been identified and selected for assessment. These NSRs will cover all existing sensitive developments (including those occupied before completion of the construction) for construction noise assessment, and both the existing and planned developments for operational noise assessment.

The existing NSRs are identified by means of topographic maps, aerial photos, land status plans and several site surveys. Planned/committed NSRs are identified by making reference to relevant Outline Zoning Plans, Outline Development Plans, Layout Plans and other published plans in relation to the Planning and Development.

The existing and planned NSRs in the vicinity, which may be affected by the proposed SCL (TAW-HUH) are summarised in the following **Table 8.10** and **Table 8.11**. The locations of the NSRs are shown on **Figures 8.1.1** to **8.1.14**. Details and photos of NSRs are given in **Appendices 8.2** and **8.2A** respectively.

Table 8.10: Existing NSRs

NSR ID	NSR Description	Landuse [1]	No. of Storey
TAW-1-1	Carado Garden Block 6	R	28
TAW-2-1	Shatin Heights	R	7
TAW-3-1	K K Terrace	R	3
TAW-4-1	Woodcrest Hill Block 2&3	R	2
TAW-5-1	Chan's Garden	R	2
TAW-5-2	L Louey	R	2
TAW-5-3	Joyville	R	2
TAW-6-1	Hin Keng Estate - Hin Yiu House	R	34
TAW-6-2	Carmel Alison Lam Primary School	E	7
TAW 6-3	Hin Keng Estate - Hin Tak House	R	34
TAW 6-4	Hin Keng Estate - Hin Yeung House	R	34
TAW 6-5	Hin Keng Estate - Hin Yau House	R	35
TAW 6-6	Hin Keng Estate - Hin Kwai House	R	35
TAW 6-7	C.U.H.K.A.A. Thomas Cheung School	E	6
TAW-6-8	Hin Keng Estate – Hin Wan House	R	35
TAW-7-1	Kam Cheong Building	R	5

NSR ID	NSR Description	Landuse [1]	No. of Storey
TAW-8-1	Grandway Garden Block 2	R	24
TAW-9-1	Christian Alliance Cheng Wing Gee College	E	6
TAW-10-1	Holford Garden - Fook Siu Court	R	25
DIH-1-1	Tsui Chuk Garden Block 5	R	22
DIH 2-1	Chuk Yuen North Estate – Pak Yuen House	R	34
DIH-3-1	Chuk Yuen South Estate – Wah Yuen House	R	18
DIH-3-2	Chuk Yuen South Estate – Nga Yuen House	R	18
DIH-3-3	Chuk Yuen South Estate – Kwai Yuen House	R	18
DIH-3-4	Chuk Yuen South Estate – Chui Yuen House	R	18
DIH-4-1	Pang Ching Court	R	34
DIH-4-2	Carbo Anglo-Chinese Kindergarten	E	2
DIH-5-1	Rainbow Home	R	11
DIH-5-2	Residential premises	R	6
DIH-5-5	Our Lady's Kindergarten	E	2
DIH 6-1	Wong Tai Sin Fire Station and Quarters Block A	R	34
DIH-7-1	Tropicana Gardens Block 2	R	25
DIH-7-2	Tropicana Garden Block 3	R	25
DIH-8-1	Redemption Lutheran Church	W	3
DIH-9-1	Shek On Building	E + W	5
DIH-10-1	Hong Kong Sheung Keung Hui Nursing Home	H	9
DIH-11-1	Lung Poon Court – Lung Wan House	R	34
DIH-12-1	Galaxia Tower B	R	44
DIH-12-2	Galaxia Tower E	R	43
DIH-13-1	Canossa Primary School	E	5
DIH-14-1	Rhythm Garden Block 2	R	22
DIH-14-2	Rhythm Garden Block 5	R	22
DIH-14-3	Rhythm Garden Block 8	R	22
DIH-14-4	Canossa Primary School (San Po Kong)	E	6
DIH-14-5	Rhythm Garden Block 1	R	22
DIH-14-6	Rhythm Garden Block 3	R	22
DIH-15-1	Choi Hung Estate - Kam Wan House	R	20
DIH-15-2	Choi Hung Estate – Kam Pik House	R	6
DIH-15-2-A	Choi Hung Estate - Pik Hoi House	R	20
DIH-16-1	Wong Tai Sin Temple	W	1
DIH-17-1	Chuk Yuen United Village	R	1-3
DIH-18-1	Upper Wong Tai Sin Estate - Po Sin House	R	34
DIH-18-2	Upper Wong Tai Sin Estate - Tat Sin House	R	34
DIH-19-1	Lung Cheung Government Secondary School	E	5
DIH-20-1	Baptist Rainbow Primary School	E	7
DIH-21-1	Tin Wang Court - Wang King House	R	21
DIH-22-1	Price Memorial Catholic Primary School	E	7
DIH-23-1	Tin Ma Court - Chun On House	R	37

NSR ID	NSR Description	Landuse [1]	No. of Storey
DIH-24-1	Shing Wong Temple	W	1
TKW-1-1	Parc 22	R	11
TKW-1-2	Sanford Mansion	R	14
TKW-2-1	Skytower Tower 1	R	47
TKW-2-2	Skytower Tower 2	R	47
TKW-2-3	Skytower Tower 7	R	47
TKW-3-1	Prince Ritz	R	29
TKW-3-2	Prosperity House	R	3
TKW-4-1	No. 26 Hok Ling Street	R	4
TKW-5-1	No. 37 – 39, Sa Po Road	R	5
MTW-6-1	Fok On Building	R	11
MTW-6-2	Hong Kong Society for the Protection of Children	R	4
MTW-6-3	Chung Nam Mansion	R	10
MTW-6-4	Pok Oi Lau	R	6
MTW-7-1	Ma Tau Wai Estate - Geranium House	R	13
MTW-8-1	Horae Place	R	17
MTW-9-1	Majestic Park	R	18
MTW-10-1	18 Farm Road	R	42
MTW-11-1	Farm Road Government Primary School	E	3
MTW-12-1	Yuet Fai Mansion	R	10
MTW-12-2	Delight Court	R	21
MTW-12-3	Lucky Mansion	R	14
MTW-12-4	352-354 Ma Tau Wai Rd (East Façade)	R	8
MTW-12-4-1	352-354 Ma Tau Wai Rd (North Façade)	R	8
MTW-12-5	Seng Cheong Building	R	10
MTW-12-6	Great Wall Building	R	11
MTW-12-7	197-199 Ma Tau Wai Rd	R	6
MTW-12-8	Pak Tai Mansion	R	8
MTW-12-9	Residential premises along Hung Kwong Street	R	8
MTW-12-10	Lucky Building (South Façade)	R	18
MTW-12-10-1	Lucky Building (East Façade)	R	18
MTW-12-11	Jing Ming Building	R	5
MTW-13-1	Cheung Chuk Shan Memorial School	E	3
MTW-14-1	Po Leung Kuk Lam Man Chan English Primary School	E	3
MTW-15-1	Hung Hom Lutheran Primary School	E	4
MTW-16-1	SKH Good Shepherd Primary School	E	5
MTW-17-1	Loyal Mansion	R	14
MTW-18-1	Residential premises along Chi Kiang Street	R	5
MTW-18-2	No. 2 Kowloon City Road	R	5
MTW-19-1	Holy Trinity Church	W	1
HOM-1-1	Ko Shan Theatre	P	3

NSR ID	NSR Description	Landuse [1]	No. of Storey
HOM-2-1	Faerie Court (North Façade)	R	26
HOM-2-1A	Faerie Court (South Façade)	R	26
HOM-2-2	Lee Wing Bldg	R	22
HOM-2-3	Wing Lam Mansion	R	23
HOM-2-4	Tak Lee Court	R	24
HOM-2-5	Chat Ma Mansion	R	8
HOM-2-6	Chatham Mansion	R	9
HOM-3-1	Fook Sing Mansion	R	18
HOM-3-2	Marigold Mansion Block A	R	20
HOM-4-1	Yee Fu Building	R	25
HOM-5-1	271 Chatham Road North	R	5
HUH-1-1	Cartas Branchi College of Careers	E	14
HUH-1-2	Lok Ka House	R	7
HUH-1-3	Wing Fung Building	R	8
HUH-3-1	Royal Peninsula Block 2	R	42
HUH-4-1	The Metropolis Residence Tower 2[2]	S	18
HUH-4-2	The Metropolis Residence Tower 1[2]	S	18
HUH-8-1	No. 2, Gillies Avenue South	R	6
HUH-10-1	Harbourfront Horizon[3]	C + S	22

Notes:

[1] R– residential; E – educational; H – clinic/ home for the aged; W – worship; GIC – government, institution and community; P – performing arts centres; S – Service Apartment; C – Commercial

[2] Metropolis Residence is a service apartment and shall not rely on openable windows for ventilation. Nonetheless, for conservative consideration that occupier might open window under special circumstances, this premise has been considered as an assessment point.

[3] Harbourfront Horizon shall not rely on openable windows for ventilation. Nonetheless, for conservative consideration that occupier might open window under special circumstances, this premise has been considered as an assessment point.

Table 8.11: Planned NSRs

NSR ID	NSR Description	Landuse [1]	No. of Storey
TAW-P1-1[3]	Festival City (Façade facing Mei Tin Road)	R	44
TAW-P1-2[3]	Festival city (Façade not facing Mei Tin Road)	R	44
TAW-P2-1	Property above Tai Wai Station (Façade facing Mei Tin Road)	R	[2]
DIH-P1-1	Upper Wong Tai Sin Estate Phase 3	R	37
DIH-P2-1 to P2-24	Future receivers in the CDA Site atop the DIH Train Stabling Sidings	R/GIC	[2]
KAT-P1-1 to 7	Residential premises near KAT	R	14 - 57
TKW-P1-1	Residential premises near TKW	R	[2]
HOM-P2-1	HKPU Student Hostel, Phase 3	R	-
HOM-P3	Residential Building, HOM Development	R	-

Notes:

[1] R– residential; E – educational; H – clinic/ home for the aged; W – worship; GIC – government, institution and community; P – performing arts centres

[2] To be determined by respective project proponents

[3] Locations of NSR refer to http://www.ckh.com.hk/eng/index.htm

8.4 Construction Noise Assessment

8.4.1 General Assessment Procedures

Construction noise assessment has been conducted based on the following procedures:

- Determine the assessment area, and identify representative NSRs that may be affected by the works;
- Obtain the construction method and work sequence for the construction period;
- Obtain the plant items for each corresponding construction work sequence;
- Determine the sound power levels of the plant items according to the information stated in the TM-GW or other recognised sources of reference, where appropriate;
- Calculate the correction factors based on the distance between the NSRs and the notional noise source positions of the work sites;
- Apply corrections for façade, distance, barrier attenuation, acoustic reflection where applicable;
- Quantify the level of impact at the NSRs, in accordance with TM-GW;
- Predict the cumulative noise impacts by any concurrent construction works in the vicinity; and
- For any exceedance of noise criteria, all practical mitigation measures such as alternative construction methodology, quiet plant, silencer, enclosure, etc, shall be examined to alleviate the predicted noise impacts as much as practicable. Details of mitigation measures are discussed in **Section 8.4.6**.

8.4.2 Construction Noise Sources

Based on the construction methodologies, the major construction works would include the following activities:

- Site clearance and formation activities;
- Structure dismantling if required;
- Station / train stabling sidings construction (e.g. diaphragm walls etc);
- Tunnel construction (including bored tunnelling, cut-&-cover, open cut etc);
- Viaduct construction;
- Portal construction;
- Diversion of utilities if required;
- Spoils removal from underground works & stockpiling;
- Backfilling and reinstatement works; and
- Barging activities.

These construction activities would be carried out with the use of Powered Mechanical Equipment (PME) including breakers, pipe pile rigs, excavators, lorries, mobile cranes, concrete pumps, concrete mixers, pokers, rollers, etc. Sound Power Levels (SWLs) for each PME would be established according to TM-GW and other relevant information as appropriate.

The plant inventory for the above activities is provided by the Project Proponent and is given in **Appendix 8.3**. Powered Mechanical Equipment (PME) that would be used for the construction includes excavators, trucks, hydraulic breakers, concreting equipment etc.

As discussed in **Section 3**, there is a magazine site in TKO 137 and a number of off-site storage / office areas. As these areas would have very limited activities, they would not

generate any significant construction noise and hence they have not been included in the quantitative noise model.

Other than the magazine site in TKO 137 and storage / office areas, there is a number of off-site temporary works areas. The noise from Freight Pier Barging Point has been included in the construction noise assessment. The noise from the Freight Pier at Hung Hom has been estimated by SCL (MKK-HUH) and SCL (HUH-ADM) EIA and had been included in this EIA as cumulative impacts.

All the works associated with the tunnel blasting (e.g. holes drilling, rock excavation and loading to lorries, etc) would be conducted deep inside the tunnel. For the operation of rock crushers in particular, they would be located typically at about 20 to 30m from the portals inside the tunnel. Depending on the actual site constraints and logistics during different construction periods, the associated utilization rate for rock crushers would be less than 100%. Together with the noise screening effect within the tunnel shaft and that the NSRs are located at a distance from the shaft (for the portal at Hin Keng, the neighbouring NSRs are separated by 80 to 150m; for Ma Chai Hang construction shaft, the separation distance is about 50 to100m; while for the shaft at Shansi Street, the separation distance is about 20 to 30m away from the shaft), adverse construction noise impacts are not anticipated.

8.4.3 Utilisation Rates of Powered Mechanical Equipment

Practically, the PMEs will not be operating for all times within a work site. The utilization rates would depend on the construction sequences, work fronts scale and construction nature. In this assessment, the utilization rates for each work front during different periods have been reviewed by the Project Proponent and have been concluded to be practicable for the purpose of this EIA. **Appendix 8.3** summarises the adopted utilisation rates and the associated SWL for different construction sequences. **Appendix 8.3A** shows the sketch of typical temporary noise barrier / enclosure.

8.4.4 Noise Assessment Tool

An in-house program has been used for construction noise calculations. Initially, the program runs were conducted without any mitigation measures (i.e. the "Unmitigated Scenario"). Where noise level exceedance was identified, further runs would be made assuming different combinations of mitigation measures to be incorporated (i.e. the "Mitigated Scenario").

8.4.5 Assessment Results - Unmitigated Scenario

According to the latest engineering design, the construction would mainly comprise of the activities as described in **Section 8.4.2**. The corresponding Sound Power Levels (SWLs) of these activities have been estimated according to the PME's SWLs and the assessment methodology in the GW-TM. **Appendix 8.4** presents the index plan for various concurrent construction activities and the NSRs locations. **Appendices 8.5A to 8.11A** present the PME inventory adopted in each construction works area, including HIK, MCV, DIH, KAT, TKW, MTW, and Chatham Road North. **Appendices 8.5B to 8.11B** present the distance between the notional sources and the NSRs, screening effects due to terrains etc. **Appendices 8.5C – 8.11C** present the monthly unmitigated noise contribution during the construction period. **Appendices 8.5D to 8.11D** also present the unmitigated construction noise impacts at selected representative NSRs. The predicted construction noise impacts on the NSRs are summarised in the tables below.

Table 8.12: Predicted Maximum Unmitigated Construction Noise Levels at Noise Sensitive Receivers

NSR ID	NSR Description	Uses	Criterion [1] dB(A)	Unmitigated Noise Level [2] dB(A)	Exceedance dB(A)
Works Area – HIK					
TAW-5-1	Chan's Garden	R	75	**80**	5

NSR ID	NSR Description	Uses	Criterion [1] dB(A)	Unmitigated Noise Level [2] dB(A)	Exceedance dB(A)
TAW-5-2	L Louey	R	75	**85**	10
TAW-5-3	Joyville	R	75	**83**	8
TAW-6-4	Hin Keng Estate - Hin Yeung House	R	75	**80**	5
TAW-6-5	Hin Keng Estate - Hin Yau House	R	75	**85**	10
TAW-6-6	Hin Keng Estate - Hin Kwai House	R	75	**88**	13
TAW-6-7	C.U.H.K.A.A. Thomas Cheung School	E	70 (65)	**80**	10(15)
TAW-6-8	Hin Keng Estate – Hin Wan House	R	75	**89**	14
TAW-P1-2	Topside Property above Tai Wai Depot (Façade not facing Mei Tin Road)	R	75	72	0
TAW-6-2	Carmel Alison Lam Primary Schhol	E	70 (65)	**75**	5 (10)
Works Area – Ma Chai Hang Ventilation Building					
DIH-4-2	Carbo Anglo-Chinese Kindergarten	E	70 (65)	**77**	7(12)
DIH-20-1	Baptist Rainbow Primary School	E	70 (65)	**78**	8(13)
DIH-21-1	Tin Wang Court - Wang King House	R	75	**81**	6
DIH-22-1	Price Memorial Catholic Primary School	E	70 (65)	**78**	8(13)
DIH-23-1	Tin Ma Court - Chun On House	R	75	**77**	2
Works Area – DIH					
DIH-3-4	Chuk Yuen South Estate – Chui Yuen House	R	75	**82**	7
DIH-5-1	Rainbow Home	R	75	**81**	6
DIH-7-1	Tropicana Gardens Block 2	R	75	**77**	2
DIH-9-1	Shek On Building	E + W	70 (65)	**87**	17 (22)
DIH-10-1	Hong Kong Sheung Keung Hui Nursing Home	H	75	**87**	12
DIH-11-1	Lung Poon Court – Lung Wan House	R	75	**87**	12
DIH-12-1	Galaxia Tower B	R	75	**83**	8
DIH-12-2	Galaxia Tower E	R	75	**83**	8
DIH-13-1	Canossa Primary School	E	70 (65)	**82**	12 (17)
DIH-14-1	Rhythm Garden Block 2	R	75	**90**	15
DIH-14-3	Rhythm Garden Block 8	R	75	**78**[3]	3
DIH-14-4	Canossa Primary School (San Po Kong)	E	70 (65)	**84**	14 (19)
DIH-14-5	Rhythm Garden Block 1	R	75	**90**	15
DIH-15-1	Choi Hung Estate - Kam Wan House	R	75	**80**	5
DIH-15-2	Choi Hung Estate - Kam Pik House	R	75	74	0

NSR ID	NSR Description	Uses	Criterion [1] dB(A)	Unmitigated Noise Level [2] dB(A)	Exceedance dB(A)
DIH-15-2A	Choi Hung Estate - Pik Hoi House	R	75	**81**	6
DIH-17-1	Chuk Yuen United Village	R	75	**81**	6
Works Area – KAT					
KAT-P1-5-A	Residential premises near KAT	R	75	**76**[3]	1
KAT-P1-5-B	Residential premises near KAT	R	75	**90**	15
KAT-P1-5-C	Residential premises near KAT	R	75	**76**	1
KAT-P1-5-D	Residential premises near KAT	R	75	**81**	6
KAT-P1-6	Residential premises near KAT	R	75	**78**	3
Works Area – TKW					
MTW-6-1	Fok On Building	R	75	**83**	8
MTW-6-2	Hong Kong Society for the Protection of Children	R	75	**81**	5
TKW-1-1	Parc 22	R	75	**94**	20
TKW-1-2	Sanford Mansion	R	75	**88**	13
TKW-2-1	Skytower Tower 1	R	75	**87**	12
TKW-2-2	Skytower Tower 2	R	75	**90**	15
TKW-2-3	Skytower Tower 7	R	75	**80**	5
TKW-3-1	Prince Ritz	R	75	**82**	7
TKW-3-2	Prosperity House	R	75	**96**	21
TKW-4-1	No. 26 Hok Ling Street	R	75	N/A[4]	0
TKW-5-1	No. 37 – 39 Sa Po Road	R	75	69	0
Works Area – MTW					
MTW-8-1	Horae Place	R	75	**90**	15
MTW-12-2	Delight Court	R	75	**85**	10
MTW-12-3	Lucky Mansion	R	75	**96**	21
MTW-12-4	352-354 Ma Tau Wai Rd (East Façade)	R	75	**96**	21
MTW-12-4-1	352-354 Ma Tau Wai Rd (North Façade)	R	75	**99**	24
MTW-12-5	Seng Cheong Building	R	75	**89**	14
MTW-12-6	Great Wall Building	R	75	**90**	15
MTW-12-9	Residential premises along Hung Kwong Street	R	75	**80**	5
MTW-12-10	Lucky Building (South Façade)	R	75	**99**	24
MTW-16-1	SKH Good Shepherd Primary School	E	70 (65)	**94**	24(29)
MTW-17-1	Loyal Mansion	R	75	**90**	15
MTW-18-1	Residential premises along Chi Kiang Street	R	75	**89**	14
MTW-18-2	No. 2 Kowloon City Road	R	75	**97**	22
MTW-12-11	Jing Ming Building	R	75	**98**	23

NSR ID	NSR Description	Uses	Criterion [1] dB(A)	Unmitigated Noise Level [2] dB(A)	Exceedance dB(A)
MTW-12-10-1	Lucky Building (East Façade)	R	75	**96**	21
HOM-2-1	Faerie Court (North Façade)	R	75	**86**	11
HOM-2-1A	Faerie Court (East Façade)	R	75	**93**	18
HOM -2-2	Lee Wing Bldg	R	75	**89**	14
HOM -2-5	Chat Ma Mansion	R	75	**86**	11
Works Area – Chatham Road North					
HOM-5-1	271 Chatham Road North	R	75	71	0
HUH-1-1	Cartas Branchi College of Careers	E	70 (65)	**73**	3 (8)
HUH-1-2	Lok Ka House	R	75	**80**	5
HUH-1-3	Wing Fung Building	R	75	**89**	14
HUH-3-1	Royal Peninsula Block 2	R	75	68	0
HUH-4-1	The Metropolis Residence Tower 2	S	75	67	0
HUH-4-2	The Metropolis Residence Tower 1	S	75	67	0
HUH-8-1	No. 2, Gillies Avenue South	R	75	70	0
HUH-10-1	Harbourfront Horizon	C + S	75	67	0

Notes:

[1] Values in parentheses indicate the noise criterion during examination period of educational institution.

[2] Bolded values mean exceedance of the noise criteria.

[3] Cumulative impact from construction activities near Diamond Hill Stabling Sidings (**Appendix 8.7D**) and KAT (**Appendix 8.8D**) is included.

[4] No major construction site identified within 300m assessment area

Results show that, without any mitigation measures, the predicted construction noise levels during non-restricted hours would exceed the corresponding noise criteria at most of the selected NSRs by 1 to 24dB(A) and 3 to 29dB(A) for residential premises and educational institution respectively, especially for those NSR very close to cut-&-cover tunnel, station adit and station construction. Mitigation measures are therefore considered necessary to reduce the adverse construction noise impact associated with the project at all works area.

8.4.6 Mitigation Measures

The predicted construction noise levels show that the unmitigated construction noise impacts would exceed the daytime noise criteria. Mitigation measures are therefore required. The following mitigation measures have been considered:

- Group static PMEs at work site away from NSRs;
- Good site practices to limit noise emissions at the source;
- Use of quiet plant and working methods;
- Use of site hoarding as noise barrier to screen noise at ground level of NSRs;
- Use of shrouds / temporary noise barriers to screen noise from relatively static PMEs;
- Use of large full enclosure to screen all the plant;
- Scheduling of construction works outside school examination periods in critical area; and
- Alternative use of plant items within one worksite, wherever practicable.

The above mitigation measures would need to be implemented in all work sites as good practices. It should be noted that whilst "Good Practice" mitigation measures would help to alleviate the noise impacts, some of these measures have not be included in the quantitative assessment as discussed in the following sections. This would ensure a more conservative assessment.

Detailed descriptions of these mitigation measures are given in the following sections.

Group Static PME

Static noisy plant could be grouped and located at work site far away from NSRs to reduce the noise level. For example, bar benders and cutters are located at the stockpiling area of Hin Tin Playground for the construction of HIK. Similarly, filtering plant and bar bender are located at the stockpiling area of playground between Ma Tau Wai Road and To Kwa Wan Road, which is far away from the NSRs near Ma Tau Wai Road. This would help to reduce the noise impacts on some of the mostly adversely affected receiver.

Good Site Practices and Noise Management Techniques

Good site practice and noise management techniques could considerably reduce the noise impact from construction site activities on nearby NSRs. The following measures should be followed during each phase of construction:

- only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme;
- machines and plant (such as trucks, cranes) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;
- plant known to emit noise strongly in one direction, where possible, be orientated so that the noise is directed away from nearby NSRs;
- silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works;
- mobile plant should be sited as far away from NSRs as possible and practicable; and
- material stockpiles, site office and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.

The benefits of these techniques can vary according to specific site conditions and operations. The environmental noise climate would certainly be improved through these control practices, although the improvement can only be quantified during implementation when specific site parameters are known. The assessment has therefore not taken into account the effectiveness of "Good Site Practices and Noise Management Techniques".

Use of Site Hoarding

Purpose built temporary noise barriers (approximately 2.5m high) located on the site boundaries between noisy construction activities and NSRs could generally reduce noise levels at low-level zone of NSRs through partial screening. In general, this would provide minimum 5 dB(A) attenuation for the low level receivers. It would be possible for the Contractor to provide these in the form of site hoardings to achieve this attenuation effect, provided that the barriers have no openings or gaps. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period. For conservative assessments, however, the site hoarding has not been taken into consideration in the construction noise assessments.

Use of Temporary Movable Noise Barrier & Enclosure (with Sufficient Ventilation) for Relatively Static Plant

Movable temporary noise barriers that can be located close to noisy plant and be moved concurrently with the plant along a worksite can be very effective for screening noise from NSRs. A typical design which has been used locally is a wooden framed barrier with a

small-cantilevered on a skid footing with 25mm thick internal sound absorptive lining. This measure is particularly effective for low level zone of NSRs. A cantilevered top cover would be required to achieve screening benefits at upper floors of NSRs.

Movable barriers will be used for some PME (e.g. pipe pile rigs, auger). It is anticipated that suitably designed barriers could achieve at least 5 - 10dB(A) reduction. For a conservative assessment, only a reduction of 5dB(A) is assumed. Acoustic mat will be used for other plant items such as trench cutter, piling, oscillator and drilling rig and a 10 dB(A) noise reduction is anticipated. This assumption has been adopted in other approved EIA Reports.

The use of enclosure (with sufficient ventilation) has been considered in this assessment to shelter relatively static plant including air compressor, generator. The enclosures barriers can provide about 10dB(A) noise reduction. For electric saw, movable noise barriers of 5dB(A) attenuation have been assumed.

A summary of the temporary movable barriers and enclosures adopted for various PMEs, and the associated noise reduction is given in **Appendix 8.3**.

Large Full Enclosure for Construction Site

Another possible mitigation measures is the use of large full enclosure for construction site during cut-&-cover tunnel and station construction. A larger enclosure for the construction site would provide better noise attenuation than the use of temporary noise barriers / acoustic mats. However, the height of the enclosure would need to be at least 9m in order to accommodate all the plant. Given the nature of construction works, having such a tall barrier would impose adverse visual impacts to the neighbouring receptors and pedestrians. Together with potential nuisance / impacts on the access, the use of large enclosure for construction site would cause significant impacts and hence is not recommended.

Use of "Quiet" Plant and Working Methods

The use of quiet plant is a feasible solution to tackle adverse noise impacts associated with construction works. It is generally known (supported by field measurement) that particular models of construction equipment are quieter than standard types given in the TM-GW. Whilst it is generally considered too restrictive to specify that the Contractor has to use specific models or items of plant, it is reasonable and practicable to set plant noise performance specifications for specific PME so that some flexibility in selection of plant is allowed. A pragmatic approach would be to request that the Contractor independently verifies the noise level of the plant proposed to be used and demonstrates through furnishing of these results, that the plant proposed to be used on the site meets the requirements.

The use of quiet plant associated with the construction works is prescribed in British Standard "Noise Control on Construction and Open Sites, BS5228: Part 1: 2009" which contains the SWLs for specific quiet PME. It should be noted that while various types of silenced equipment could be found in Hong Kong, EPD when processing a CNP application for evening or night time works may apply the noise levels specified in the TM-GW and TM-DA. CNP applications which contain sufficient details of any particularly quiet items of PME or any special noise control measures which the CNP applicant proposes to employ on the site may be given special consideration by the Noise Control Authority.

A summary of the "Quiet" PMEs adopted and the associated SWLs is given in **Appendix 8.3**.

Sequencing Operation of Construction Plant Equipment

In practice, some plant items will operate sequentially within the same work site, and certain reduction of the predicted noise impacts could be achieved. However, any additional control on the sequencing of plant will impose a restrictive constraint to the Contractor on the operation and planning of plant items, and the implementation of the requirement would

be difficult to be monitored. Hence, sequencing operation of PME has not been taken into consideration in the construction noise assessments.

8.4.7 Assessment Results - Mitigated Scenario

With the implementation of the abovementioned mitigation measures, the construction noise levels at the affected NSRs are predicted and presented in the following tables. The predicted noise levels at most of the NSRs would comply with the corresponding noise criteria, except some NSRs near the works area at DIH, TKW, MTW, and Chatham Road North. Non-compliance at these NSRs is due to the shorter separation distance, and the construction method at the worksites. **Appendices 8.5E to 8.11E** present the mitigated noise contribution on a monthly basis during the construction period. **Appendices 8.5F to 8.11F** present the predicted mitigated construction noise levels at selected representative NSRs.

Noise impacts arisen from the Tsz Wan Shan Pedestrian Link and Barging Facility at Kai Tak Runway have also been included in this mitigated scenario assessment. **Appendices 8.12** presents the details of the construction noise assessment for Tsz Wan Shan Pedestrian Link and **Appendices 8.14** present the details of the construction noise assessment for Barging Facility at Kai Tak. The noise impacts from the Freight Pier would be included in the cumulative noise assessment. The construction programme of CKL will be concurrent with SCL (TAW-HUH). However, the cumulative construction impacts are obstructed by nearby building of the construction sites. Therefore, cumulative construction noise impacts are not anticipated.

Table 8.13: Predicted Maximum Mitigated Construction Noise Levels at Noise Sensitive Receivers

NSR ID	NSR Description	Uses	Criterion [1] dB(A)	Mitigated Noise Level [2] dB(A)	Exceedance [3] dB(A)
Works Area – HIK					
TAW-5-1	Chan's Garden	R	75	66	0
TAW-5-2	L Louey	R	75	71	0
TAW-5-3	Joyville	R	75	70	0
TAW-6-4	Hin Keng Estate - Hin Yeung House	R	75	66	0
TAW-6-5	Hin Keng Estate - Hin Yau House	R	75	72	0
TAW-6-6	Hin Keng Estate - Hin Kwai House	R	75	75	0
TAW-6-7	C.U.H.K.A.A. Thomas Cheung School	E	70 (65)	68	0 (3)
TAW-6-8	Hin Keng Estate – Hin Wan House	R	75	75	0
TAW-P1-2	Topside Property above Tai Wai Depot (Façade not facing Mei Tin Road)	R	75	58	0
TAW-6-2	Carmel Alison Lam Primary Schhol	E	70 (65)	60	0 (0)
Works Area – Ma Chai Hang Ventilation Building					
DIH-4-2	Carbo Anglo-Chinese Kindergarten	E	70 (65)	63	0 (0)
DIH-20-1	Baptist Rainbow Primary School	E	70 (65)	64	0 (0)
DIH-21-1	Tin Wang Court - Wang King House	R	75	67	0
DIH-22-1	Price Memorial Catholic Primary School	E	70 (65)	65	0 (0)
DIH-23-1	Tin Ma Court - Chun On House	R	75	64	0
Works Area – DIH					
DIH-3-4	Chuk Yuen South Estate – Chui Yuen House	R	75	67	0
DIH-5-1	Rainbow Home	R	75	66	0
DIH-7-1	Tropicana Gardens Block 2	R	75	63	0
DIH-9-1	Shek On Building	E + W	70 (65)	70	0 (5)
DIH-10-1	Hong Kong Sheung Keung Hui Nursing Home	H	75	70	0
DIH-11-1	Lung Poon Court – Lung Wan House	R	75	73	0
DIH-12-1	Galaxia Tower B	R	75	70[4]	0
DIH-12-2	Galaxia Tower E	R	75	74[4]	0
DIH-13-1	Canossa Primary School	E	70 (65)	67	0 (2)
DIH-14-1	Rhythm Garden Block 2	R	75	**77**	2
DIH-14-3	Rhythm Garden Block 8	R	75	64[5]	0
DIH-14-4	Canossa Primary School (San Po Kong)	E	70 (65)	69	0 (4)
DIH-14-5	Rhythm Garden Block 1	R	75	**78**	3

NSR ID	NSR Description	Uses	Criterion [1] dB(A)	Mitigated Noise Level [2] dB(A)	Exceedance [3] dB(A)
DIH-15-1	Choi Hung Estate - Kam Wan House	R	75	67	0
DIH-15-2	Choi Hung Estate - Kam Pik House	R	75	61	0
DIH-15-2A	Choi Hung Estate - Pik Hoi House	R	75	67	0
DIH-17-1	Chuk Yuen United Village	R	75	66	0
Works Area – KAT					
KAT-P1-5-A	Residential premises near KAT	R	75	61[5]	0
KAT-P1-5-B	Residential premises near KAT	R	75	75	0
KAT-P1-5-C	Residential premises near KAT	R	75	62	0
KAT-P1-5-D	Residential premises near KAT	R	75	66	0
KAT-P1-6	Residential premises near KAT	R	75	65	0
Works Area – TKW					
MTW-6-1	Fok On Building	R	75	69	0
MTW-6-2	Hong Kong Society for the Protection of Children	R	75	67	0
TKW-1-1	Parc 22	R	75	**80**	5
TKW-1-2	Sanford Mansion	R	75	75	0
TKW-2-1	Skytower Tower 1	R	75	73	0
TKW-2-2	Skytower Tower 2	R	75	**76**	1
TKW-2-3	Skytower Tower 7	R	75	66	0
TKW-3-1	Prince Ritz	R	75	67	0
TKW-3-2	Prosperity House	R	75	**80**	5
TKW-4-1	No. 26 Hok Ling Street	R	75	N/A[6]	0
TKW-5-1	No. 37 – 39 Sa Po Road	R	75	53	0
Works Area – MTW					
MTW-8-1	Block 1, Horae Place	R	75	75	0
MTW-12-2	Delight Court	R	75	71	0
MTW-12-3	Lucky Mansion	R	75	**80**	5
MTW-12-4	352-354 Ma Tau Wai Rd (East Façade)	R	75	**80**	5
MTW-12-4-1	352-354 Ma Tau Wai Rd (North Façade)	R	75	**84**	9
MTW-12-5	Seng Cheong Building	R	75	74	0
MTW-12-6	Great Wall Building	R	75	75	0
MTW-12-9	Residential premises along Hung Kwong Street	R	75	65	0
MTW-12-10	Lucky Building (South Façade)	R	75	**84**	9
MTW-16-1	SKH Good Shepherd Primary School	E	70 (65)	**79**	9 (14)
MTW-17-1	Loyal Mansion	R	75	75	0
MTW-18-1	Residential premises along Chi Kiang Street	R	75	74	0

NSR ID	NSR Description	Uses	Criterion [1] dB(A)	Mitigated Noise Level [2] dB(A)	Exceedance [3] dB(A)
MTW-18-2	No. 2 Kowloon City Road	R	75	**81**	6
MTW-12-11	Jing Ming Building	R	75	**82**	7
MTW-12-10-1	Lucky Building (East Façade)	R	75	**80**	5
HOM-2-1	Faerie Court (North Façade)	R	75	71	0
HOM-2-1A	Faerie Court (South Façade)	R	75	**78**	3
HOM-2-2	Lee Wing Bldg	R	75	74	0
HOM-2-5	Chat Ma Mansion	R	75	71	0
Works Area – Chatham Road North					
HOM-5-1	271 Chatham Road North	R	75	60	0
HUH-1-1	Caritas Branchi College of Careers	E	70 (65)	62	0 (0)
HUH-1-2	Lok Ka House	R	75	68	0
HUH-1-3	Wing Fung Building	R	75	**77**	2
HUH-3-1	Royal Peninsula Block 2	R	75	57	0
HUH-4-1	The Metropolis Residence Tower 2	S	75	55	0
HUH-4-2	The Metropolis Residence Tower 1	S	75	54	0
HUH-8-1	No. 2, Gillies Avenue South	R	75	58	0
HUH-10-1	Harbourfront Horizon	C + S	75	54	0
Barging Facility – Kai Tak					
KAT-P1-6	Residential premises near KAT	R	75	46	0

Notes:

[1] Values in parentheses indicate the noise criterion during examination period of educational institution.

[2] Bolded values mean exceedance of the noise criteria.

[3] Values in parentheses indicate the exceedances during examination period of educational institution.

[4] Cumulative impact arisen from Tsz Wan Shan Pedestrian Link is included.

[5] Cumulative impact from construction activities near Diamond Hill Stabling Sidings (Appendix 8.7D) and KAT (**Appendix 8.8D**) is included.

[6] No major construction site identified within 300m assessment area

8.4.8 Assessment Results – Cumulative Construction Noise for HUH and HOM

Cumulative construction noise assessment for HUH and HOM has been conducted by extracting relevant information and assessment associated with HUH and HOM from respective EIA reports. **Appendix 8.15** presents the mitigated construction noise impacts from HUH and HOM at selected representative NSRs. For the construction noise impacts from HOM, the predicted results from approved EIA-184/2010 "Kwun Tong Line Extension"[8-7] have been adopted.

Table 8.13a: Predicted Construction Noise Levels from SCL (TAW-HUH), HUH and HOM

NSR ID	NSR Description	Uses	Criterion [1] dB(A)	Mitigated Noise Level [2] dB(A)	Exceedance [3] dB(A)
HOM-5-1	271 Chatham Road North	R	75	60	0

NSR ID	NSR Description	Uses	Criterion [1] dB(A)	Mitigated Noise Level [2] dB(A)	Exceedance [3] dB(A)
HUH-1-1	Caritas Branchi College of Careers	E	70 (65)	72	2 (7)
HUH-1-2	Lok Ka House	R	75	70	0
HUH-1-3	Wing Fung Building	R	75	**78**	3
HUH-3-1	Royal Peninsula Block 2	R	75	73	0
HUH-4-1	The Metropolis Residence Tower 2	S	75	73	0
HUH-4-2	The Metropolis Residence Tower 1	S	75	54	0
HUH-8-1	No. 2, Gillies Avenue South	R	75	58	0

Notes:

[1] Values in parentheses indicate the noise criterion during examination period of educational institution.

[2] Bolded values mean exceedance of the noise criteria.

It can be seen from the above table that the additional impacts from the construction of HUH and HOM would not change the compliance of the criterion at the NSRs.

8.4.9 Assessment Results – Cumulative Construction Noise with Concurrent Projects

Amongst the NSRs considered, some of them would experience cumulative construction noise impacts from other concurrent projects (see **Section 8.3**). Liaisons have therefore been made with their respective project proponents and reference has also been made to the respective EIA Reports to obtain their construction noise prediction. The construction activities related from the construction of KTE and SCL (MKK-HUH) and SCL (HUH-ADM) have been included in the assessment. The following table summarises the results for the selected NSRs.

Table 8.14: Predicted Cumulative Construction Noise Levels at Noise Sensitive Receivers

NSR ID	NSR Description	Construction Noise Contribution [2] dB(A)				Criteria dB(A)	Total [2] dB(A)	Exceedance [1] dB(A)
		[4]	KTE	[5]	CKR			
HUH-1-1	Cartas Branchi College of Careers	62	72[3]	-	-	70 (65)	72	2(7)
HUH-1-2	Lok Ka House	68	73[3]	-	-	75	73	0
HUH-1-3	Wing Fung Building	**77**	67[3]	67	-	75	**78**	3
HUH-3-1	Royal Peninsula Block 2	57	-	73	-	75	73	0
HUH-4-1	The Metropolis Residence Tower 2	55	-	73	-	75	73	0
HUH-10-1	Harbourfront Horizon	54	-	73	-	75	73	0

Notes:

[1] Values in parentheses indicate the exceedance during examination period of educational institution.

[2] Bolded values mean exceedance of the noise criteria.
[3] Cumulative impacts arisen from EPIW is included.
[4] SCL (TAW-HUH)
[5] SCL (MKK-HUH) & SCL (HUH-ADM)

For Caritas Branchi College of Careers (HUH-1-1), recent site visit indicated that the college has been moved to Tseung Kwan O since Sept 2009. The ownership of HUH-1-1 has transferred back to the owner. The building is now non-occupied and is therefore not considered as a sensitive receiver. The results provided in **Table 8.14** are for reference only. The contractor should further confirm the use before commencement of the construction.

Housing Authority Development Sites 1A & 1B

As discussed in **Section 1**, the construction of the Housing Authority Development Sites 1A and 1B (i.e. KAT-P1-5-A, KAT-P1-5-B, KAT-P1-5-C, KAT-P1-5-D and KAT-P1-6) would be concurrent with the construction of the KAT and the associated cut-&-cover tunnel sections for about 1 year since the intake year for Sites 1A and 1B would be occurred in October 2012.

However, the site formation of the Sites 1A and 1B have been completed, the noise impacts caused by these superstructure works on the nearest receivers at Rhythm Garden and Choi Hung Estate (ie DIH-14-3 and DIH-15-2) at more than 270m and 330m respectively away would not be significant as compared to the construction noise generated by the construction of KAT and the associated cut-&-cover tunnel. Besides, it is anticipated that the project proponent of the Sites 1A and1B would implement effective good site practices such as quiet plant and temporary movable noise barriers for some of the mobile PME. Therefore, the cumulative construction noise impacts due to the construction of Sites 1A and 1B would not be significant.

Other Infrastructure Development within Kai Tak Development

As discussed in **Section 1**, the construction of some of the other infrastructure development within Kai Tak Development would be concurrent with the construction of the KAT and the associated cut-&-cover tunnel sections. However, the site formation of these infrastructure have been completed, the noise impacts caused by these superstructure works on the nearest receivers at Rhythm Garden, Choi Hung Estate and residential premises near KAT (ie DIH-14-3, DIH15-2, KAT-P1-5-A, KAT-P1-5-B, KAT-P1-5-C, KAT-P1-5-D and KAT-P1-6) at more than 990m, 1100m, 920m, 730m, 620m, 840m and 490m respectively away would not be significant as compared to the construction noise generated by the construction of KAT and the associated cut-&-cover tunnel. Besides, it is anticipated that the project proponent of the other infrastructure developments would implement effective good site practices such as quiet plant and temporary movable noise barriers for some of the mobile PME. Therefore, the cumulative construction noise impacts due to the construction of other infrastructure development within Kai Tak Development would not be significant.

8.4.10 Residual Impacts

As discussed above, even with all practicable construction noise mitigation measures adopted, such as the use of quiet PME, temporary movable noise barrier and enclosure, residual impacts exceeding the construction noise criterion are still expected at some NSRs, as summarised in the table below:

Table 8.15: Residual Impacts at Noise Sensitive Receivers

NSR ID	NSR Description	Uses	Criterion [1] dB(A)	Maximum Noise Level dB(A)	Residual Noise Impact dB(A)	Duration for Maximum Noise Level (Month) [5]
TAW-6-7	C.U.H.K.A.A. Thomas Cheung	E	70 (65)	68(67)	0 (2) [2]	0 (1)

NSR ID	NSR Description	Uses	Criterion [1] dB(A)	Maximum Noise Level dB(A)	Residual Noise Impact dB(A)	Duration for Maximum Noise Level (Month) [5]
	School					
DIH-9-1	Shek On Building	E + W	70 (65)	70 (70)	0(5) [2]	0 (2)
DIH-13-1	Canossa Primary School	E	70 (65)	67(66)	0(1) [2]	0 (2)
DIH-14-1	Rhythm Garden Block 2	R	75	77	2	5
DIH-14-4	Canossa Primary School (San Po Kong)	E	70 (65)	69 (68)	0 (3) [2]	0 (3)
DIH-14-5	Rhythm Garden Block 1	R	75	78	3	1
TKW-1-1	Parc 22	R	75	80	5	5
TKW-2-2	Skytower Tower 2	R	75	76	1	5
TKW-3-2	Prosperity House	R	75	80	5	4
MTW-12-3	Lucky Mansion	R	75	80	5	2
MTW-12-4	352-354 Ma Tau Wai Rd (East Façade)	R	75	80	5	3
MTW-12-4-1	352-354 Ma Tau Wai Rd (North Façade)	R	75	84	9	1
MTW-12-10	Lucky Building (South Façade)	R	75	84	9	1
MTW-12-10-1	Lucky Building (East Façade)	R	75	80	5	1
MTW-12-11	Jing Ming Building	R	75	82	7	1
MTW-16-1	SKH Good Shepherd Primary School	E	70 (65)	79 (79)	9(14) [2]	2(1)
MTW-18-2	No. 2 Kowloon City Road	R	75	81	6	2
HOM-2-1-A	Faerie Court (East Façade)	R	75	78	3	12
HUH-1-3	Wing Fung Building	R	75	77	2	1

Notes:

[1] Values in parentheses indicate the noise criterion during examination period (typical examination period in May, June, November and December) of educational institution.

[2] Residual impact is only expected during the examination period (typical examination period in May, June, November and December) of the educational institution.

[3] In general practice, examination period should only last for 2 weeks. By scheduling the construction works to avoid the examination period, the residual impact should be minimised.

[4] Values in parentheses indicate the duration of residual impact in consideration of the noise criterion during examination period.

[5] Please refer to Tables 8.16.1 to 8.16.3 for the total impact duration for noise exceedance.

The above table indicates that the maximum residual impacts and the associated duration despite of the implementation of all practicable noise mitigation measures. In order to

indicate the distribution of noise exceedance and the duration of the noise exceedence, the noise exceedence has been also categorised into different types of receivers and groups of duration, as summarised in **Table 8.16.1a**, **8.16.2a** and **8.13**.

Table 8.16.1a Residual Noise Impacts (Residential Premises)

NSR-ID	NSR Description	Impact Duration (Month) for Noise Exceedance							
		1 – 4dB(A)	5dB(A)	6dB(A)	7dB(A)	8dB(A)	9dB(A)	10 dB(A)	>=11 dB(A)
DIH-14-1	Rhythm Garden Block 2	5	-	-	-	-	-	-	-
DIH-14-5	Rhythm Garden Block 1	3	-	-	-	-	-	-	-
TKW-1-1	Parc 22	6	5	-	-	-	-	-	-
TKW-2-2	Skytower Tower 2	5	-	-	-	-	-	-	-
TKW-3-2	Prosperity House	-	4	-	-	-	-	-	-
MTW-12-3	Lucky Mansion	15	2	-	-	-	-	-	-
MTW-12-4	352-354 Ma Tau Wai Rd (East Façade)	14	3	-	-	-	-	-	-
MTW-12-4-1	352-354 Ma Tau Wai Rd (North Façade)	3	-	-	7	-	1	-	-
MTW-12-10	Lucky Building (South Façade)	-	-	5	2	-	1	-	-
MTW-12-10-1	Lucky Building (East Façade)	10	1	-	-	-	-	-	-
MTW-12-11	Jing Ming Building	3	7	2	1	-	-	-	-
MTW-18-2	No. 2 Kowloon City Road	2	-	2	-	-	-	-	-
HOM-2-1-A	Faerie Court (East Façade)	12	-	-	-	-	-	-	-
HUH-1-3	Wing Fung Building	2	-	-	-	-	-	-	-

It can be seen from the **Table 8.16.1a** for residential premises, the residual impacts exceeding the construction noise criterion are in the range of 1-9dB(A) and the duration of exceedance ranges from 2 – 17 months.

For some residential premises such as Parc 22, Prosperity House, 352-354 Ma Tau Wai Rd (East Façade and North Façade), Lucky Building (East Façade and South Façade), No. 2 Kowloon City Road and Jing Ming Building (TKW-1-1, TKW-3-2, MTW-12-4-1, MTW-12-4, MTW-12-10, MTW-12-10-1, MTW-18-2 and MTW-12-11), the residual impacts would be higher (> 79dB(A)), in the range of 5 – 9dB(A), with the duration of exceedance typically 1 – 10 months. This is attributable to the relatively short separation distance between the NSRs and the work sites. For example, the construction activities of adit work for 352-354 Ma Tau Wai Rd (North Façade) (MTW-12-4-1) and Lucky Building (South Façade) (MTW-12-10) are both located at 8m from the work sites respectively.

The magnitude of the residual impacts is assessed in accordance with Section 4.4.3 of the TM-EIAO in **Table 8.16.1b**.

Table 8.16.1b Assessment of Residual Impacts

Criteria	Assessment
Effects on public health and health of	The extent of noise nuisance would be unlikely to induce public

Criteria	Assessment
biota or risk of life.	health concern.
Magnitude of the adverse environmental impacts.	Residual impacts exceeding the construction noise criterion of between 1-9dB(A) could occur at up to 12 NSRs during the construction phase upon worse case scenarios.
Geographic extent of the adverse environmental impacts.	The geographic extent of the adverse impacts from noise is anticipated to be limited to within about 50m from the SCL (TAW-HUH) project works area.
Duration and frequency of the adverse environmental impacts.	The construction noise impacts of SCL (TAW-HUH) will be from 2 to 17 months and are, therefore, temporary and reversible.
Likely size of the community or the environmental that may be affected by the adverse impacts.	About 750 flats would be affected. In addition, pedestrians within immediate vicinity will be temporarily affected.
Degree to which the adverse environmental impacts are reversible or irreversible.	Construction phase impacts should be reversible.
Ecological context.	Not Applicable
Degree of disruption to sites of cultural heritage.	Very minimal as there would be no import cultural heritage resources in the immediate vicinity of work sites.
International and regional importance.	The impacts are localized and not of international and regional importance.
Likelihood and degree of uncertainty of adverse environmental impacts	The impacts predicted are based upon worst case assumptions and as such, would not occur to the extent predicted on all occasions. However, the assessment has been made using approved modelling techniques and the degree of certainty on the results is high.

The residual impacts exceeding the construction noise criterion on school during examination and non-examination periods are presented in **Table 8.16.2a** and **Table 8.16.3**. Typically examination period will be in May, June, November and December. For assessment purpose, it is assumed that examination periods would be in May, June, November and December and they are considered to exceed the noise criterion for school examination periods.

Table 8.16.2a shows the residual impacts exceeding the construction noise criterion on school during their normal period. Most of the schools during their normal period (i.e. non-examination period) would be subject to construction noise impacts complying with the criterion, except the SKH Good Shepherd Primary School (MTW-16-1). SKH Good Shepherd Primary School (MTW-16-1) is at around 21m from the cut-&-cover station of guide wall, diaphragm wall and king post construction. The predicted residual impacts on MTW-16-1 would be up to 9dB(A) for 2 months and the total number of months with noise impacts exceeding the noise criterion is 46 months.

Table 8.16.2a Residual Noise Impacts (Educational Institution During Normal Period)

NSR-ID	NSR Description	Impact Duration (Month) for Noise Exceedance							
		1 – 4dB(A)	5dB(A)	6dB(A)	7dB(A)	8dB(A)	9dB(A)	10dB(A)	11dB(A)
MTW-16-1	SKH Good Shepherd Primary School	12	6	16	6	4	2	-	-

Further analysis has also been conducted to evaluate the potential noise impacts by adopting the noise criterion for examination period (**Table 8.16.3** refers). It can be seen that a number of the schools along the alignment would be affected by construction noise during their examination periods. Typically examination period will be in May, June, November and

December. For assessment purpose, it is assumed that examination periods would be in May, June, November and December and they are considered to exceed the noise criterion for school examination periods. The duration for construction noise impacts during the school examination periods is shown in **Table 8.16.3**.

Table 8.16.3: Residual Noise Impacts (Educational Institution During Examination Period) [1]

NSR-ID	NSR Description	Impact Duration (Month) for Noise Exceedance			
		1 – 4dB(A)	5 – 9dB(A)	10 – 14dB(A)	>= 15dB(A)
TAW-6-7	C.U.H.K.A.A. Thomas Cheung School	1	-	-	-
DIH-9-1	Shek On Building	6	2	-	-
DIH-13-1	Canossa Primary School	2	-	-	-
DIH-14-4	Canossa Primary School (San Po Kong)	5	-	-	-
MTW-16-1	SKH Good Shepherd Primary School	-	3	13	-

Note:
[1] Typical examination period in May, June, November and December.

8.4.11 Consideration of Further Mitigation Measures

It can be seen from **Section 8.4.10** that some of the noise sensitive receivers would be subject to residual impacts exceeding the construction noise criterion. The feasibility of refining the construction methodologies and further noise mitigation measures have therefore been further considered as discussed in the following sections.

Works Area – HIK

There would be no exceedance over the noise criterion for the residual impacts on Hin Keng Estate, however, the CUHKAA Thomas Cheung School (TAW-6-7) would be exposed to residual impact of up to 2dB(A) during examination period. The noise impacts during normal school period would comply with the respective noise criterion. As such, it is recommended that the noisy construction works should be scheduled as far as practicable to avoid examination period. The Project Proponent would keep close liaison with the affected schools on their examination schedules.

Works Area – Ma Chai Hang Ventilation Building

There would be no exceedance over the noise criterion on both residential and educational institution noise sensitive receivers, which is near to Ma Chai Hang Ventilation Building. The noise impacts during examination period would still comply with the respective noise criterion.

Works Area – DIH

Rhythm Garden (DIH-14-1 and DIH-14-5) would be subject to a residual impacts of 1-3dB(A)and for a duration of 5 months. The noise impacts would be caused by mobilization for commencing the cut-&-cover tunnel directly in front of the receivers. In addition, although the use of large full enclosure for the construction site would alleviate the residual impact it would also cause significant visual impact to its neighbourhood. It is therefore not recommended.

For DIH stabling entry tunnels and mainline tunnels from north of Kai Tak Development area to Kai Tak, due to shallow soil cover to the tunnel crown of DIH stabling entry tunnels and the acute tunnel connection between DIH stabling entry tunnels and mainline tunnels, cut-&-cover construction method has been adopted. It is therefore concluded that all the practicable noise mitigation measures have been implemented.

For Shek On Building (DIH-9-1) which is a school, there would be no exceedance over the noise criterion during normal school period, and there would be a residual impacts of 1 - 5dB(A) during examination period. The noise impacts are attributable to the bored piles pipe pile wall and excavation construction concurrent occurred in the DIH. It is therefore concluded that all the practicable noise mitigation measures have been implemented. To further minimise the impact, it is recommended that the noisy construction works should be scheduled as far as practicable to avoid examination period. The Project Proponent would keep close liaison with the affected schools on their examination schedules.

For Canossa Primary School (DIH-13-1), the predicted construction noise impacts would comply with the criterion for normal school period. It would however have a residual impacts of 1 dB(A) during the examination period for 2 months. To further minimise the impact, it is recommended that the noisy construction works should be scheduled as far as practicable to avoid examination period. The Project Proponent would keep close liaison with the affected schools on their examination schedules.

For the Canossa Primary School (San Po Kong) (DIH-14-4), the predicted construction noise impacts would comply with the criterion for normal school period. It would however have a residual impacts of 1 - 3dB(A) during the examination period for five months. To further minimise the impact, it is recommended that the noisy construction works should be scheduled as far as practicable to avoid examination period. The Project Proponent would keep close liaison with the affected schools on their examination schedules.

Works Area – TKW

Residual impacts in the range of 1 – 5dB(A) are predicted at the various residential premises (TKW-1-1. TKW-2-2, and TKW-3-2) alongside of construction areas for adits. These residential premises are located at 14 – 30m from the adit construction areas.

As explained in **Section 8.3.6**, the use of full noise enclosure for the site has also been considered. However, for the NSRs located alongside of the Pak Tai Street and Nam Kok Road where the adit has to be located, erecting a full enclosure with sufficient headroom for the construction plant to manoeuvre inside would demand a very tall full noise enclosure of height taller than 9m. Such a full noise enclosure would block the ventilation and sunlight to the pedestrians and even to the lower level residential units. This would also cause concerns on safety and health. These secondary impacts are considered adverse and hence the use of full noise enclosures is not further considered.

As such, all direct mitigation measures are considered exhausted and the construction noise impact has been minimized as far as possible.

Works Area – MTW

The predicted residual impacts on the neighbouring sensitive receivers are 1-9dB(A) for the residential premises and up to 9dB(A) for SKH Good Shepherd Primary School (MTW-16-1). These sensitive receivers are located along MTW where cut-&-cover construction methodology is required.

Temporary decks have been considered and where practicable, would be provided to alleviate the impact of noise associated with the operation of construction plant underneath during the cut-&-cover station / tunnel construction. A sketch showing the indicative extent of the temporary deck is illustrated in **Appendix 8.16**. This approach has optimised the opportunity to reduce the number of above ground construction plant required during the excavation and backfilling processes. All the above ground stationary construction plant items have also been considered for implementing temporary noise enclosures etc whenever possible. Quiet construction plant has also been considered.

As explained in **Section 8.3.6**, the use of full noise enclosure for the site has also been considered. However, for the NSRs located alongside of the Ma Tau Wai Road where the station has to be located, erecting a full enclosure with sufficient headroom for the construction plant to manoeuvre inside would demand a very tall full noise enclosure of

height taller than 9m. Such a full noise enclosure would block the ventilation and sunlight to the pedestrians and even to the lower level residential units. This would also cause concerns on safety and health. These secondary impacts are considered adverse and hence the use of full noise enclosures is not further considered.

Entrance A of MTW Station and the ventilation shafts are located adjacent to the SKH Good Shepherd Primary School (MTW-16-1). The construction methodology includes concrete slab breaking and removal, utility diversion and protection, diaphragm walling, pipe pile installation, excavation and concreting. During the course of developing the plant inventory for the road opening works required, major considerations have been made to the presence of numerous utilities located in the footpaths and carriageways along Ma Tau Wai Road which will need extreme careful excavation and protection. In particular, it must be noted that Ma Tau Wai Road is an old urban area where accurate utilities records are not available. Also, the as-built drawings of the road pavements are not available thus the actual site conditions will need to be verified on site.

For works to be carried out within the footpaths, the use of any machine mounted plant will not be possible due to the high risk of damage to the utilities which have shallow covers. It is considered that there is no alternative to the use of hand operated pneumatic breakers for the opening of the footpaths.

For works to be carried out within the carriageways, alternative methods to conventional hydraulic breakers for breaking the road slab have been considered, e.g. saw cutting the slab and lifting out in small sections, by mechanical ripping or hydraulic crushing. However, due to the unknown depth of the concrete construction of the road, saw cutting can be discounted as the size of saw cannot be determined. Application of such methods will impose high risk to the existing roads and also the utilities underneath. To summarise, use of conventional plants is considered to be the most appropriate construction method for road opening works in Ma Tau Wai Road.

As such, all direct mitigation measures are considered exhausted and the construction noise impact has been minimized as far as possible. The Project Proponent would keep close liaison with the affected schools on their examination schedules.

Works Area – Chatham Road North

The predicted residual impacts on the neighbouring residential buildings such as Wing Fung Building (HUH-1-3) are 1-2dB(A). The total period with noise exceedance is 2 months.

Quiet PMEs, temporary movable noise barrier, and temporary movable noise enclosure have already been proposed to alleviate the noise impact from the construction works near Chatham Road North. However, Wing Fung Building (HUH-1-3) would still be affected by the construction noise impact arisen from the project. The main reason for the adverse residual impact would be its very limited separation distance of 25m from the construction site. In view of this constraint, the predicted residual impact is considered minimised and no further practical direct mitigation measures were available.

Indirect Technical Remedies (ITR)

Residual impacts have been minimised via exhausting all practical direct noise mitigation measures, including the use of quiet PME, temporary movable noise barriers, and noise enclosure for various construction plant. Review of the further mitigation measures have been conducted in consideration of the constraints and works nature. It is considered that all practicable mitigation measures have been exhausted and residual impacts have been minimised.

Due to the closed proximity to the affect NSRs, residual impact could not be abated by further direct mitigation measures. The Project Proponent will facilitate communications with concerned parties on the residual impacts during construction and review to consider other initiatives, such as ITR, if required. However, it should be noted that the use of ITR as a mitigation measure is neither a requirement regulated under Annex 13 of the TM-EIAO nor

the EIA Study Brief. However, the provision of ITR may be considered as the last resort to reduce the noise nuisance arisen from the construction of SCL (TAW-HUH). ITR would generally require the consideration to upgrade the window glazing if necessary for the façades exposed to excessive noise. Provision of air-conditioning would also be considered for those affected dwellings.

8.5 Operational Noise Assessment

8.5.1 Operational Airborne Noise Source

Most of the alignment would be in tunnel and hence would not have adverse airborne noise impact. However, there are 2 sections of at-grade or elevated tracks, one in Tai Wai and one in Hung Hom which are exposed and would generate airborne noise. In addition, the ventilation building at Ma Chai Hang, ventilation system for stations and stabling sidings would be a fixed industrial noise that needs to be considered.

It should be noted that any preparation works for engineering trains will only be carried out inside the Tai Wai Depot which is underneath the deck. The uses and operational pattern of the tail track would not change after the commissioning of the SCL (TAW-HUH).

8.5.2 Noise Sensitive Receivers

While alignment within the project boundary is assessed, NSRs within 300m of the boundary are included. Planned NSRs of the top-side property developments in Tai Wai would be included in this assessment. Their Area Sensitive Ratings and the night-time assessment goal, which is the most critical period for operational train noise assessment, are summarised in **Table 8.17**. The locations of all NSRs are given in **Figures 8.1.1 to 8.1.14**.

Table 8.17: Summary of Noise Sensitive Receivers and Area Sensitivity Ratings

NSR ID	NSR Description	Type [3]	ASR	Assessment Goal[2]
TAW-1-1	Block 6, Carado Garden	R	B	45[1]
TAW-2-1	Shatin Heights	R	B	45[1]
TAW-3-1	K K Terrace	R	C	50[1]
TAW-4-1	Block 2&3, Woodcrest Hill	R	C	50[1]
TAW-5-1	Chan's Garden, The Blossom	R	B	45[1]
TAW-5-2	L Louey, The Blossom	R	B	45[1]
TAW-5-3	Joyville	R	B	45[1]
TAW-6-1	Hin Yiu House, Hin Keng Estate	R	B	45[1]
TAW-6-2	Carmel Alison Lam Primary School, Hin Keng Estate	E	B	55[1]
TAW-6-3	Hin Tak House, Hin Keng Estate	R	B	45[1]
TAW-6-4	Hin Yeung House, Hin Keng Estate	R	B	45[1]
TAW-7-1	Kam Cheong Building	R	B	45[1]
TAW-8-1	Block 2, Grandway Garden	R	B	45[1]
TAW-9-1	Christian Alliance Cheng Wing Gee College	E	B	55[1]
TAW-10-1	Holford Garden	R	B	45[1]
TAW-P1-1	Festival City (Façade facing Mei Tin Road)	R	B	45[1]
TAW-P1-2	Festival City (Façade not facing Mei Tin Road)	R	B	45[1]
TAW-P2-1	Property above Tai Wai Station (Façade facing Mei Tin Road)	R	B	45[1]
HUH-1-3	Wing Fung Mansion	R	C	50[1]
HUH-3-1	Block 2, Royal Peninsula	R	C	50[1]
HUH-4-1	Tower 2, The Metropolis Residence[4]	S	B	45[1]
HUH-4-2	Tower 1, The Metropolis Residence[4]	S	B	45[1]
HUH-8-1	2 Gillies Avenue South	R	C	50[1]

NSR ID	NSR Description	Type [3]	ASR	Assessment Goal[2]
HUH-10-1	Harbourfront Horizon[5]	C + S	B	55

Notes:

[1] A 10dB(A) is 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) is adopted.

[2] Daytime criterion is adopted for educational institutes. It is assumed that there would be no night-time activities (2300 – 0700 hours) for education institutes.

[3] R– residential; E – educational; H – clinic/ home for the aged; W – worship; GIC – government, institution and community; P – performing arts centres; S – Service Apartment; C – Commercial

[4] Metropolis Residence is a service apartment and shall not rely on openable windows for ventilation. Nonetheless, for conservative consideration that occupier might open window under special circumstances, this premise has been considered as an assessment point.

[5] Harbourfront Horizon shall not rely on openable windows for ventilation. Nonetheless, for conservative consideration that occupier might open window under special circumstances, this premise has been considered as an assessment point.

8.5.3 Assessment Methodology – Operational Noise

8.5.3.1 Railway Noise

The assessment covers rail alignment within the project boundary. As discussed in **Section 8.4.1**, most of the tracks for SCL (TAW-HUH) will be in tunnels and adverse operational airborne train noise impacts are not anticipated. However, a short section between HIK and Tai Wai depot would be on embankment and viaduct and another section near HUH would be at-grade, thereby inevitably generating airborne railway noise impacts. The proposed methodology for predicting the airborne train noise impacts is given below.

Assessment Software

Arup's train noise model (OveRail) will be used to predict and assess the propagation of airborne train noise. The modelling methodology for propagation is based on the prediction procedures in Calculation of Railway Noise 1995 (CRN)[8-8] and it has been validated against the examples listed in CRN handbooks.

Airborne Noise Source Term

Whilst the propagation model would be based on CRN, the train noise (both rolling noise and A/C noise) source term would base upon the noise level measured during the commissioning of SP1900 train[8-9] and is based on a disc braked Electric Multiple Unit (EMU). The source term measurement report is given in **Appendix 8.17**. A description of the noise source term is given below.

Parameters	On Ballast Track
L_{max}	75.3 dB(A)
Rail	Continuously weld rail
Trackform	Ballasted track
Speed	130kph
Distance	25m

The calculation of SEL (single train event) from L_{max} is based on the following equation

$$SEL = L_{max} + 10 \log (L/V) + 10.5 - 10 \log (4D / (4D^2+1)) + 2 \tan^{-1} (1/2D))$$

Where L = train length, m (200m for SCL (TAW-HUH) train, the same as MOL 8-car configuration)

V = train speed, kph

d = Distance from track, m (reference distance at 25m)

$D = d / L$

SEL for 8 car	82.7 dB(A)

For non-revenue trains (eg engineering trains) of SCL (TAW-HUH), noise will also be generated by rolling stock operating during the non-revenue hours of the railway typically between 0200 and 0500. These will be used to support maintenance operations in the transporting of personnel and plant for inspection and remedial works. As discussed in **Section 8.4.1**, there would not be any preparation of engineering trains on the existing tail track to the south of the Tai Wai Depot. During the maintenance of the tracks, as overhead line power supply may need to be turned off for safety and other requirements, the rolling stock will be independently powered locomotives. These will typically trail a short rake of wagons or self-propelled ballast tamping machines and rail grinding apparatus.

Noise from non-revenue trains would be governed by Construction Noise Permit and hence would not be quantified in this EIA.

Correction Factors

The tracks would be modelled as segments such that the variation of noise contribution within the track segment is less than 2 dB(A), which is in line with CRN. For each segment, corrections would be applied to compute its noise contribution to NSRs. The total noise levels at receivers would then be computed by combining the noise contributions from all the segments.

As the nighttime noise criteria is 10dB(A) more stringent than the daytime, compliance with the nighttime criteria would typically mean compliance with the daytime criteria at the NSRs. During the daytime period, 24 trains/direction/hour is assumed for this noise assessment. In addition, a sensitivity test has been conducted to examine the noise effect if the train frequency is increased in the future operation. As compared with the predicted daytime noise levels based on the assumption of 24 trains/direction/hour, an increase of 0.3dB(A) and 0.7dB(A) would be predicted respectively for 26 and 28 trains/direction/hour.

A summary of other correction factors to be included in the airborne train noise prediction model is given below.

Table 8.18: Summary of Correction Factors

Parameters	Assumptions	Remarks
Rail deterioration	+3dB(A)	The source term measurement was taken with typical rail condition. The adopted +3 dB(A) correction is a conservative approach to account for the deviation from typical rail condition.
Train speed	Change of SEL with speed = 20 log (V / V_{ref}) dB(A)	V and V_{ref} are the average train speeds
Distance	Change of L_{max} with distance = 10 log (d_1 / 25) dB(A)	d_1 is the distance between track and receiver
Deck Reflection	• Viaduct with ballast track = 0 dB(A) • Viaduct without ballast track = 2.5 dB(A) • At-Grade non-ballast track = 2.5 dB(A)	Consistent with MOL[8-10]
Barrier effects	As per Chart 6(a) of CRN[8-8]	
Joints / Crossovers	7dB(A)	To represent the augmentation in noise due to thermal expansion joints. Average value of 5 dB(A) is summarised in Ref. [8-11]. A conservative correction of 7 dB(A) which is consistent with MOL[8-10] EIA is adopted. 2m long rail segment is used to represent a joint.
Air absorption	0.2 – 0.008*d*	
Train Frequency	10log(N_1)	• N_1 is the train frequency in 30 minutes

Parameters	Assumptions	Remarks
		• Frequency (trains / direction / 30 minutes) 6 trains during nighttime 12 trains during day time
View Angle	10 log (ðè/180-cos2á sinè) – 5 dB(A)	α is the acute angle between a line drawn through the receiver point, parallel to the track and the line bisecting the angle view θ. θ is the view angle.
Façade Reflection	2.5dB(A)	
To $L_{eq, 30\ min}$	10 log(1 / 1800)	

Portal Effect

Consideration is given to the potential intermittent nature of the noise resulting from a train passing a tunnel portal. Two potential locations have been identified with the SCL (TAW-HUH) alignment. For the tunnel portal at Hung Hom, installation of absorptive lining at the interior tunnel surface can be considered near the tunnel exit to minimise the portal effect.

With regard to HIK, trains travelling in and out of the station are running at a reduced speed and the station shelter provided some buffer to reduce the aerodynamic effect. Therefore, significant portal effect is not expected at HIK.

Cumulative Airborne Railway Noise Impacts

There would be cumulative air-borne train noise impacts at the following locations.

Location	Cumulative Train Noise Sources
Tai Wai	• Existing East Rail
Hung Hom	• Existing East Rail within HUH • SCL (MKK – HUH)

The surroundings at the Tai Wai and Hung Hom exposed sections have been reviewed. Following the opening of SCL (TAW-HUH), the cumulative noise impact from East Rail have been addressed by considering an assessment goal of 10 dB(A) lower than the ANL. This approach would ensure that noise contribution from the SCL (TAW-HUH) operation is insignificant and is considered appropriate for these areas.

8.5.3.2 Fixed Noise Sources

Noise Sources

A summary of the fixed noise sources within the SCL (TAW-HUH) include:

- Ventilation Building at Ma Chai Hang;
- Ventilation systems for each station; and
- Train stabling sidings at DIH (with stabling trains only).

All the above noise sources (see **Appendix 8.1** for locations) would be accommodated inside solid buildings with louvers. Maximum allowable Sound Power Level (SWL) for above-grade louvres and ventilation plants will be established by considering the following:

- Separation distances and orientation from the nearest NSR(s); and
- Cumulative noise impacts from noise sources of concurrent projects (e.g. ventilation shafts) on the NSR.

Assessment Methodology

The following general procedures have been adopted for the operation noise assessment.

- Identify and locate representative NSRs that may be affected by the noise sources;
- Determine the noise criteria for both daytime and nighttime;
- Use standard acoustic principle for attenuation and directivity;
- Determine the maximum sound power levels (SWLs) of the fixed noise sources;

8.5.4 Assessment Results – Operational Noise

8.5.4.1 Railway Noise – Night-time and Daytime Noise Impacts

North of Tai Wai Depot

The NSRs at Festival City would be affected by the bridge section of Mei Tin Road. The slant separation distance is relatively short and the NSRs at Festival City would be overlooking the tracks. With mitigation measures in the form of top cover as shown in **Appendix 8.19**, no operational railway noise impact would be expected.

A summary of predictions for night-time and daytime railway noise levels are presented in **Table 8.20** and **Table 8.20a** respectively below.

Table 8.20: Summary of Predicted Night-time Railway Noise Levels for Topside Property Developments

NSR ID & Noise Sensitive Receivers	Predicted Noise levels		Assessment Goal ($L_{Aeq,30min.}$)
	1/F	Floor with Max. Impact	
TAW-P1-1 (Festival City)	31	44 (5/F)	45[1] (ASR B)
TAW-P2-1 (Topside Property above Tai Wai Station)	34	44 (8/F)	45[1] (ASR B)

Note: [1] A 10dB(A) is 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) is adopted.

Table 8.20a: Summary of Predicted Daytime Railway Noise Levels for Topside Property Developments

NSR ID & Noise Sensitive Receivers	Predicted Noise levels		Assessment Goal ($L_{Aeq,30min.}$)
	1/F	Floor with Max. Impact[2]	
TAW-P1-1 (Festival City)	34	47 (5/F)	55[1] (ASR B)
TAW-P2-1 (Topside Property above Tai Wai Station)	37	47 (8/F)	55[1] (ASR B)

Note: [1] A 10dB(A) is 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) is adopted.

[2] The predicted noise levels would comply with the noise criterion even if 26 or 28 trains/direction/hour during daytime periods are adopted.

Tai Wai Depot

Within the project boundary, the alignment runs below the podium deck of topside property development. Significant noise impact to the top side developments on both the Tai Wai Depot and to the Tai Wai Station is not anticipated.

West of Tai Wai Depot

In addition to the topside developments, 4 existing NSRs on the west of the Tai Wai Depot have also been considered. These NSRs include the following:

(i) TAW-7-1 : Kam Cheong Building

(ii) TAW-8-1 : Blk 2, Grandway Garden

(iii) TAW-9-1 : Christian Alliance Cheng Wing Gee College

(iv) TAW-10-1: Holford Garden

A section of the alignment is illustrated in **Appendix 8.18**. The predicted night-time and daytime railway noise levels are summarised in **Table 8.21** and **Table 8.21a** respectively.

Results indicate that the predicted noise impacts would comply with the assessment goal and further noise mitigation measures are not required.

Table 8.21: Summary of Predicted Night-time Railway Noise Levels with Existing Mitigation Measures.

NSR ID & Noise Sensitive Receivers	Predicted Noise Levels, dB(A)		Assessment Goal[1] ($L_{Aeq,30min.}$)
	1/F	Floor with Max. Impact	
TAW-7-1 (Kam Cheong Building)	37	39 (5/F)	45 (ASR B)
TAW-8-1 (Blk 2, Grandway Garden)	30	34 (24/F)	45 (ASR B)
TAW-9-1 (Christian Alliance Cheng Wing Gee College)	NA	NA[2]	NA
TAW-10-1 (Holford Garden)	32	32 (1/F)	45 (ASR B)

Notes:

[1] A 10dB(A) is 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) is adopted.

[2] It is assumed that there would be no noise sensitive uses for educational institutions during night-time (2300 – 0700 hours).

Table 8.21a: Summary of Predicted Daytime Railway Noise Levels with Existing Mitigation Measures.

NSR ID & Noise Sensitive Receivers	Predicted Noise Levels, dB(A)		Assessment Goal[1] ($L_{Aeq,30min.}$)
	1/F	Floor with Max. Impact[2]	
TAW-7-1 (Kam Cheong Building)	40	42 (5/F)	55 (ASR B)
TAW-8-1 (Blk 2, Grandway Garden)	33	37 (24/F)	55 (ASR B)
TAW-9-1 (Christian Alliance Cheng Wing Gee College)	42	42 (1/F)	55 (ASR B)
TAW-10-1 (Holford Garden)	35	35 (1/F)	55 (ASR B)

Notes:

[1] A 10dB(A) is 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) is adopted.

[2] The predicted noise levels would comply with the noise criterion even if 26 or 28 trains/direction/hour during day time periods are adopted.

Between Tai Wai Depot and HIK

The current alignment between Tai Wai Depot and proposed HIK would be at-grade and uncovered. Assessment results indicate that the unmitigated impact would be 6 dB(A) above the assessment goal for some NSRs at Hin Keng Estate. It is therefore necessary to consider mitigation measures to reduce the noise impacts from SCL (TAW-HUH).

Mitigation in form of retaining wall and vertical barrier would be implemented along the rail tracks between HIK and Tai Wai stations to reduce noise impact to NSRs in the vicinity as shown in **Appendix 8.19**. These mitigation measures include:

- Approx. 350m of noise barrier at a height 2m from the down track level of SCL (TAW-HUH) (P1);

- Approx. 100m of noise barrier at a height 2m from the up track level of SCL (TAW-HUH) (P2);
- Approx. 150m of noise barrier at a height 3m from the up track level of SCL (TAW-HUH) (P3);
- Approx. 300m of noise barrier at a height 7m from the tail track level T2 of TAW (P4); and
- Approx. 50m of noise barrier at a height 3m from the down track level of SCL (TAW-HUH) (P5)

The proposed barriers under SCL (TAW-HUH) are not required if the existing retaining wall fulfil the height of the proposed barriers.

With the implementation of the above mitigation, the predicted noise levels would comply with the respective criteria. The predicted night-time and daytime railway noise levels are summarised in **Table 8.22** and **Table 8.22a** respectively.

Table 8.22: Summary of Predicted Night-time Railway Noise Levels for NSRs between Tai Wai Depot and HIK

NSR ID & Noise Sensitive Receivers	Predicted Noise levels				Assessment Goal[1] ($L_{Aeq,30min.}$)
	Unmitigated		Mitigated		
	1/F	Floor with Max. Impact	1/F	Floor with Max. Impact	
TAW-1-1 (Block 6, Carado Garden)	43	44 (23/F)	28	39 (28/F)	45 (ASR B)
TAW-2-1 (Shatin Heights)	**50**	**50** (1/F)	41	43 (8/F)	45 (ASR B)
TAW-3-1 (K K Terrace)	41	43 (3/F)	39	41 (3/F)	50 (ASR C)
TAW-4-1 (Block 2&3, Woodcrest Hill)	34	38 (2/F)	34	38 (2/F)	50 (ASR C)
TAW-5-1 (Chan's Garden, The Blossom)	37	42 (2/F)	37	41 (2/F)	45 (ASR B)
TAW-5-2 (L Louey, The Blossom)	<20	<20 (2/F)	<20	<20 (2/F)	45 (ASR B)
TAW-5-3 (Joyville)	41	41 (1/F)	41	41 (1/F)	45 (ASR B)
TAW-6-1 (Hin Yiu House, Hin Keng Estate)	**46**	**49** (34/F)	33	41 (34/F)	45 (ASR B)
TAW-6-2 (Carmel Alison Lam Primary School, Hin Keng Estate)	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]
TAW-6-3 (Hin Tak House, Hin Keng Estate)	**47**	**49** (11/F)	33	42 (34/F)	45 (ASR B)
TAW-6-4 (Hin Yeung House, Hin Keng Estate)	**46**	**49** (34/F)	33	42 (34/F)	45 (ASR B)
TAW-P1-2 (Festival City)	42	45 (10/F)	42	45 (10/F)	45 (ASR B)

Notes :

[1] A 10dB(A) is assumed as the noise contribution from existing East Rail and Intercity Train. To take into account the cumulative airborne noise impacts from the existing East Rail and Intercity Train, an assessment goal of ANL – 10 dB(A) is adopted.

[2] It is assumed that there would be no noise sensitive uses for educational institutions during night-time (2300 – 0700 hours).

[3] Bold results indicate values exceed assessment goal.

Table 8.22a: Summary of Predicted Daytime Railway Noise levels for NSRs between Tai Wai Depot and HIK

NSR ID & Noise Sensitive Receivers	Predicted Noise levels				Assessment Goal[1] ($L_{Aeq,30min.}$)
	Unmitigated		Mitigated[2]		
	1/F	Floor with Max. Impact	1/F	Floor with Max. Impact	
TAW-1-1 (Block 6, Carado Garden)	46	47 (23/F)	31	42 (28/F)	55 (ASR B)
TAW-2-1 (Shatin Heights)	53	53 (1/F)	44	46 (8/F)	55 (ASR B)
TAW-3-1 (K K Terrace)	44	46 (3/F)	42	44 (3/F)	60 (ASR C)
TAW-4-1 (Block 2&3, Woodcrest Hill)	37	41 (2/F)	37	41 (2/F)	60 (ASR C)
TAW-5-1 (Chan's Garden, The Blossom)	40	45 (2/F)	40	44 (2/F)	55 (ASR B)
TAW-5-2 (L Louey, The Blossom)	<20	<20 (2/F)	<20	<20 (2/F)	55 (ASR B)
TAW-5-3 (Joyville)	44	44 (1/F)	44	44 (1/F)	55 (ASR B)
TAW-6-1 (Hin Yiu House, Hin Keng Estate)	49	52 (34/F)	36	44 (34/F)	55 (ASR B)
TAW-6-2 (Carmel Alison Lam Primary School, Hin Keng Estate)	50	52 (7/F)	35	36 (7/F)	55 (ASR B)
TAW-6-3 (Hin Tak House, Hin Keng Estate)	50	52 (11/F)	36	45 (34/F)	55 (ASR B)
TAW-6-4 (Hin Yeung House, Hin Keng Estate)	49	52 (34/F)	36	45 (34/F)	55 (ASR B)
TAW-P1-2 (Festival City)	45	48 (10/F)	45	48 (10/F)	55 (ASR B)

Notes :

[1] A 10dB(A) is assumed as the noise contribution from existing East Rail and Intercity Train. To take into account the cumulative airborne noise impacts from the existing East Rail and Intercity Train, an assessment goal of ANL – 10 dB(A) is adopted.

[2] The predicted noise levels would comply with the noise criterion even if 26 or 28 trains/direction/hour during day time periods are adopted.

[3] Bold results indicate values exceed assessment goal.

Prior to the operation phase of the Project, a commissioning test will be conducted for verification of EIA predictions against the assessment goals and checking the compliance of the airborne noise levels with the NCO noise criteria.

Between HIK and Portal

With the current design, HIK would have building fabrics with sufficient acoustic attenuation. The alignment between HIK and portal will be completely enclosed in a concrete structure of about 700mm thick (partly as embankment and partly as viaduct) and hence would not have any adverse noise impacts to the NSRs TAW-6-5, TAW-6-6, TAW-6-7 and TAW-6-8 in the vicinity. The viaduct section between HIK and Portal will be installed with Floating Slab Trackform and no significant re-radiated noise from viaduct section would thus be anticipated.

DIH

As discussed in **Section 2.4**, there are a number of constraints to construct the DIH underground and hence the proposed design is to adopt a semi-underground design. It should however be noted that the entire semi-underground DHS would be enclosed. There would not be any tracks within the DHS and the approach tunnel sections that would be exposed. Hence, there would not be any air-borne rail noise impacts from the DHS and the associated tunnel sections. In addition, the locations of planned NSRs on top of the DHS (i.e. DIH P2-1 to P2-24) have already considered the worst case scenario and no adverse noise impacts are envisaged.

HUH

As discussed in **Section 8.4.1**, two sections of the alignment are running on exposed ballast track between HUH and the portal and south of HUH. As a result of the considerable setback and building screening, significant noise impacts to the nearby NSRs are not expected. The predicted night-time and daytime railway noise levels are summarised in **Table 8.23** and **Table 8.23a** below:

Table 8.23: Summary of Predicted Night-time Railway Noise Levels for HUH

Noise Sensitive Receivers	Predicted Noise Level, dB(A)		Assessment Goal[1] ($L_{Aeq,30min.}$)
	1/F	Floor with Max. Impact	
HUH-1-3 (Wing Fung Mansion)	39	39 (4/F) / 40 (4/F)[2]	50[1] (ASR C)
HUH-3-1 (Royal Peninsula)	42	48 (30/F)	50[1] (ASR C)
HUH-4-1 (Tower 2, The Metropolis Residence)	42	42 (9/F)	45[1] (ASR B)
HUH-4-2 (Tower 1, The Metropolis Residence)	41	41 (1/F)	45[1] (ASR B)
HUH-8-1 (No. 2, Gillies Avenue South)	44	44 (6/F)	50[1] (ASR C)
HUH-10-1 (Tower 2, Harbourfront Horizon)	26	47 (10/F)	55 (ASR B)

Note: [1] A 10dB(A) is 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) is adopted.

[2] Cumulative impact from operation of SCL (MKK-HUH) is included.

Table 8.23a: Summary of Predicted Daytime Railway Noise Levels for HUH

Noise Sensitive Receivers	Predicted Noise Level, dB(A)		Assessment Goal[1] ($L_{Aeq,30min.}$)
	1/F	Floor with Max. Impact[2]	
HUH-1-3 (Wing Fung Mansion)	42	42 (4/F) / 43 (4/F)[3]	60[1] (ASR C)
HUH-3-1 (Royal Peninsula)	45	51 (30/F)	60[1] (ASR C)
HUH-4-1 (Tower 2, The Metropolis Residence)	45	45 (9/F)	55[1] (ASR B)
HUH-4-2	44	44 (1/F)	55[1] (ASR B)

Noise Sensitive Receivers	Predicted Noise Level, dB(A)		Assessment Goal[1] ($L_{Aeq,30min.}$)
	1/F	Floor with Max. Impact[2]	
(Tower 1, The Metropolis Residence)			
HUH-8-1 (No. 2, Gillies Avenue South)	47	47 (6/F)	60[1] (ASR C)
HUH-10-1 (Tower 2, Harbourfront Horizon)	29	50 (10/F)	65 (ASR B)

Note: [1] A 10dB(A) is 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) is adopted.

[2] The predicted noise levels would comply with the noise criterion even if 26 or 28 trains/direction/hour during day time periods are adopted.

[3] Cumulative impact from operation of SCL (MKK-HUH) is included.

Prior to the operation phase of the Project, a commissioning test will be conducted for verification of EIA predictions against the assessment goals and checking the compliance of the airborne noise levels with the NCO noise criteria.

8.5.4.2 Railway Noise - Cumulative Noise Impacts from Depot

The fixed noise with Tai Wai depot have been considered in the approved MOS EIA study[8-10]. Their contributions to the overall noise level are not considered in the present assessment.

8.5.4.3 Railway Noise – Maximum Noise Level L_{max}

As presented in **Section 8.5.3.1**, the reference maximum noise level (L_{max}) is 75.3 dB(A), for train speed of 130km/h and measured at 25m from track. This noise level is significantly lower than the statutory requirement of 85 dB(A). Among the identified NSRs, the topside developments above Tai Wai station and Tai Wai depot are the closest to track with setback distance of 25m. This setback distance is the same as that with the reference condition and operating speed of the trains are substantially lower than the reference condition.

In consideration of the above comparison, exceedance of the statutory maximum noise level is not anticipated along the alignment.

8.5.4.4 Railway Noise – 24-Hour Average Noise Level $L_{eq,\ 24\ hour}$

Detailed schedule timetable for SCL (TAW-HUH) is not available at the time of reporting. Based on available information, it is estimated that headway over 24 hours is approximately 680 trains for both directions. Based on this assumption, the predicted 24-hour average railway noise levels would comply with the $L_{eq\ 24hr}$ criterion and are summarised in **Appendix 8.20**.

8.5.4.5 Fixed Noise Sources

According to the latest design information, there would only be one ventilation building for the SCL (TAW-HUH) at Ma Chai Hang.

Assessment has been conducted to evaluate the maximum Sound Power Level (SWL) for the louvers of the ventilation building. The orientation and locations of louvers has been based on latest information provided by the detail design consultant. Other than the ventilation building at Ma Chai Hang, the ventilation shafts in different stations have also been included in the assessment.

Locations of assessment point for fixed noise sources are shown in **Figure 8.2.1 to 8.2.5**. The predicted maximum allowable Sound Power Level (SWL) are summarised in **Table 8.24** below. Detailed calculations are presented in **Appendix 8.21**.

Table 8.24 : Maximum Allowable SWL for the Ventilation Building and Ventilation Shafts

Station/Location	Plant Item	Plant ID	Maximum allowable Sound Power Level, dB(A)		Remarks
			Daytime	Night-time	
Hin Keng Station	Ventilation Shaft (VS)	VS - HIK - 1 - 1	96	88	
		VS - HIK - 1 - 2	89	81	
		VS - HIK - 1 - 3	89	81	
		VS - HIK - 1 - 4	89	81	
		VS - HIK - 1 - 5	90	82	
Ma Chai Hang Ventilation Building	Ventilation Shaft (VS)	VS - MCV - 1 - 1	91	81	
		VS - MCV - 1 - 2	85	75	
		VS - MCV - 1 - 3	86	76	
		VS - MCV - 1 - 4	87	77	
		VS - MCV - 1 - 5	88	78	
		VS - MCV - 1 - 6	94	84	
		VS - MCV - 1 - 7	92	82	
		VS - MCV - 1 - 8	96	87	[1]
Diamond Hill Station	Ventilation Shaft (VS)	VS - DIH - 1 - 2	85	75	
		VS - DIH - 2 - 2	89	79	
		VS - DIH - 3 - 2	89	79	
		VS - DIH - 4 - 2	91	81	
		VS - DIH - 5 - 2	87	77	
		VS - DIH - 6 - 2	84	74	
		VS - DIH - 7 - 2	90	80	
		VS - DIH - 8 - 2	88	78	
		VS - DIH - 9 - 1	79	69	
		VS - DIH - 9 - 2	80	70	
		VS - DIH - 9 - 3	84	75	[1]
		VS - DIH - 9 - 4	82	72	
		VS - DIH - 9 - 5	77	67	
		VS - DIH - 10 - 3	79	69	
		VS - DIH - 10 - 4	81	71	
		VS - DIH - 11 - 1	79	69	
		VS - DIH - 11 - 2	78	68	
		VS - DIH - 11 - 3	75	65	
		VS - DIH - 11 - 4	78	68	
		VS - DIH - 26 - 5	73	63	
		VS - DIH - 27 - 5	76	66	
		VS - DIH - 28 - 5	78	68	
		VS - DIH - 29 - 5	75	65	

Station/Location	Plant Item	Plant ID	Maximum allowable Sound Power Level, dB(A)		Remarks
			Daytime	Night-time	
		VS - DIH - 30 - 5	75	65	
		VS - DIH - 31 - 5	77	67	
		VS - DIH - 32 - 5	75	65	
		VS - DIH - 33 - 1	78	68	
		VS - DIH - 33 - 2	83	73	
		VS - DIH - 33 - 3	76	66	
		VS - DIH - 33 - 4	83	73	
		VS - DIH - 34 - 5	76	66	
		VS - DIH - 35 - 5	75	65	
		VS - DIH - 36 - 1	79	69	
		VS - DIH - 36 - 2	75	65	
		VS - DIH - 36 - 3	77	67	
		VS - DIH - 36 - 4	79	69	
		VS - DIH - 37 - 1	77	67	
		VS - DIH - 37 - 2	76	66	
		VS - DIH - 37 - 3	76	66	
		VS - DIH - 37 - 4	77	67	
		VS - DIH - 38 - 1	79	69	
		VS - DIH - 38 - 2	77	67	
		VS - DIH - 38 - 3	77	67	
		VS - DIH - 38 - 4	79	69	
		VS - DIH - 39 - 1	81	71	
		VS - DIH - 39 - 2	76	66	
		VS - DIH - 39 - 3	81	71	
		VS - DIH - 39 - 4	85	75	
		VS - DIH - 40 - 1	80	70	
		VS - DIH - 40 - 2	77	67	
		VS - DIH - 40 - 3	82	72	
		VS - DIH - 40 - 4	85	75	
		VS - DIH - 41 - 1	75	65	
		VS - DIH - 41 - 2	79	69	
		VS - DIH - 41 - 3	79	69	
		VS - DIH - 41 - 4	85	75	
		VS - DIH - 41 - 5	78	68	
		VS - DIH - 42 - 1	86	76	
		VS - DIH - 42 - 2	82	72	
		VS - DIH - 42 - 3	77	67	
		VS - DIH - 42 - 4	83	73	
		VS - DIH - 42 - 5	77	67	

Station/Location	Plant Item	Plant ID	Maximum allowable Sound Power Level, dB(A)		Remarks
			Daytime	Night-time	
Fung Tak Emergency Escape Access	Ventilation Shaft (VS)	VS - WTS - 1 - 1	92	84	
		VS - WTS - 1 - 2	87	79	
		VS - WTS - 1 - 3	90	82	
		VS - WTS - 1 - 4	93	85	
		VS - WTS - 1 - 5	90	82	
Kai Tak Station	Ventilation Shaft (VS)	VS - KAT - 1 - 1	95	85	
		VS - KAT - 1 - 4	95	85	
		VS - KAT - 1 - 5	95	85	
		VS - KAT - 2 - 1	94	84	
		VS - KAT - 2 - 2	94	84	
		VS - KAT - 2 - 3	94	84	
		VS - KAT - 2 - 4	94	84	
		VS - KAT - 2 - 5	94	84	
		VS - KAT - 3 - 5	90	80	
		VS - KAT - 4 - 5	89	79	
		VS - KAT - 5 - 1	89	79	
		VS - KAT - 5 - 2	89	79	
		VS - KAT - 5 - 3	89	79	
		VS - KAT - 5 - 5	89	79	
		VS - KAT - 6 - 1	89	79	
		VS - KAT - 6 - 3	89	79	
		VS - KAT - 6 - 4	89	79	
		VS - KAT - 6 - 5	89	79	
		VS - KAT - 7 - 1	88	78	
		VS - KAT - 7 - 2	84	74	
		VS - KAT - 7 - 3	90	80	
		VS - KAT - 7 - 4	90	80	
		VS - KAT - 7 - 5	85	75	
To Kwa Wan Station	Ventilation Shaft (VS)	VS - TKW - 1 - 1	93	83	
		VS - TKW - 1 - 2	85	75	
		VS - TKW - 1 - 3	94	84	
		VS - TKW - 1 - 4	101	91	
		VS - TKW - 1 - 5	88	78	
		VS - TKW - 2 - 2	109	101	[1]
		VS - TKW - 2 - 4	98	96	[1]
		VS - TKW - 3 - 2	109	99	[1]
		VS - TKW - 3 - 4	98	95	[1]
		VS - TKW - 3 - 5	98	94	[1]

Station/Location	Plant Item	Plant ID	Maximum allowable Sound Power Level, dB(A)		Remarks
			Daytime	Night-time	
		VS - TKW - 4 - 1	95	85	
		VS - TKW - 4 - 2	100	90	
		VS - TKW - 4 - 3	101	91	
		VS - TKW - 4 - 4	95	85	
		VS - TKW - 4 - 5	95	85	
Ma Tau Wai Station	Ventilation Shaft (VS)	VS - MTW - 1 - 1	85	81	[1]
		VS - MTW - 1 - 2	89	79	
		VS - MTW - 1 - 3	89	79	
		VS - MTW - 1 - 4	85	75	
		VS - MTW - 1 - 5	86	76	
		VS - MTW - 2 - 1	80	70	
		VS - MTW - 2 - 2	81	71	
		VS - MTW - 2 - 3	87	77	
		VS - MTW - 2 - 4	84	74	
		VS - MTW - 2 - 5	82	72	
		VS - MTW - 3- 1	85	75	
		VS - MTW - 3- 2	86	76	
		VS - MTW - 3- 3	82	72	
		VS - MTW - 3- 4	85	75	

Note: [1] Nighttime permissible sound power level in dB(A) is excluded due to educational activities.

The equipment should be free of the characteristics of tonality, impulsiveness and intermittency. If the selected equipment could not be free of characteristics of tonality, impulsiveness and intermittency, the maximum SWL should be reduced in accordance with the correction factors, in the range of 3 to 6 dB(A), as given in Section 3.3 of TM-IND.

The Contractor shall install acoustic silencers, noise barriers, acoustic louvers where appropriate to ensure that the specified maximum SWLs shown in **Table 8.24** will not be exceeded.

8.5.5 Mitigation Measures

8.5.5.1 Operational Phase

The detailed design should incorporate the following good practice in order to minimise the nuisance on the neighboring NSRs. In case the Contractor would change the design and locations of the vents, they would need to comply with the legislative maximum impacts at the receivers.

- Louvres should be orientated away from adjacent NSRs, preferably onto main roads which are less sensitive.
- Direct noise mitigation measures including silencers, acoustic louvers and acoustic enclosures should be allowed for in the design for the ventilation building, stations and stabling sidings.
- The façade for these plant areas / ventilation shafts should have adequate sound insulation properties to minimise the noise emanating through the building fabric.

8.5.5.2 Residual Impacts and Constraints on Future Receivers

The operational noise generated by the proposed railway can be properly mitigated by implementing the proposed mitigation measures. Adverse residual impacts are not anticipated and there are no constraints on the future sensitive receivers that could be identified at this stage.

8.6 Cumulative Impacts from HOM and HUH

As discussed in **Section 1.2**, the EIA Study Brief has included HOM and HUH. However, during the design development, it is considered that HOM be better implemented by the KTE and HUH by the SCL (MKK-HUH) and SCL (HUH-ADM). It should be noted that the assessment results in **Tables 8.14, 8.15, 8.16.1a and 8.16.2a** have incorporated the cumulative construction noise contributions from SCL (MKK-HUH) & SCL(HUH-ADM). Similarly, the assessment results in **Table 8.23** have incorporated the cumulative airborne noise impacts from SCL (MKK-HUH). Furthermore, to take into account the cumulative airborne noise impacts from the existing East Rail Line and Intercity Train, an assessment goal of ANL-10 is adopted for NSRs which would experience cumulative impact from existing East Rail Line and Intercity Train. SCL (HUH-ADM) section is underground and no airborne operational noise impacts. Hence, the cumulative airborne noise impacts due to HOM and HUH have been assessed.

The Project would have ventilation shafts or large cooling system in HOM and HUH. There are ventilation shafts in the HOM under the KTE Project, ventilation shafts and cooling tower in the HUH under SCL (MKK-HUH) and SCL (HUH-ADM). Maximum near-field Sound Power Levels at 1m from the louvres of these ventilation shafts have been quantified in their respective EIAs. Since the louvres at HOM and HUH are located at more than 300m away from the nearest fixed noise sources of this Project, i.e. ventilation shafts of MTW, there would not be any cumulative operational noise impacts from SCL (MKK-HUH) & SCL(HUH-ADM) and KTE ventilation shafts to SCL (TAW-HUH) Projects.

8.7 Conclusion

Construction noise assessment has been conducted. All practicable mitigation measures have been exhausted to minimise the noise impacts. These mitigation measures include the optimisation of construction methodology (i.e. schedule of using PME), quiet plant, temporary noise barrier and good site practices. However, given the site constraints, some of the receivers (See **Table 8.16.1a**, **Table 8.16.2a** and **Table 8.16.3**) would still be subject to residual impacts exceeding the construction noise criterion.

Residual impacts have been assessed and considered the impacts are temporary and reversible. With all the proposed mitigation measures, the residual impact has been reduced to be minimal.

For the operational phase, mitigation with retaining wall and vertical noise barrier would be required for the at-grade track between Tai Wai Depot and HIK. Maximum sound power levels allowed to be emitted from louvers of fixed noise sources at ventilation building at Ma Chai Hang, Fung Tak Emergency Escape Access, ventilation system for stations and stabling sidings were predicted. With the proper selection of plant and adoption of noise control measure such as acoustic silencers, noise barriers, acoustic louvers, the NSRs located in the vicinity of these fixed noise sources would not be affected.

8.8 References

[8-1] Noise Control Ordinance (Cap 400), HKSAR dated June 1997.

[8-2] Technical Memorandum on Noise from Construction Work other than Percussive Piling, EPD dated March 1996.

[8-3] Technical Memorandum on Noise from Percussive Piling, EPD dated June 1999.

[8-4] Technical Memorandum on Noise from Construction Work in Designated Areas, EPD dated June 1999.

[8-5] Technical Memorandum on Environmental Impact Assessment Process (EIA Ordinance), EPD dated September 1997.

[8-6] Technical Memorandum for the Assessment of Noise from Places Other Than Domestic Premises, Public Places or Construction Sites.

[8-7] Kwun Tong Line Extension: Environmental Impact Assessment, MTR Corporation Limited.

[8-8] Calculation of Railway Noise 1995, the Department of Transport, UK.

[8-9] SEL Source Term Measurement, MTR Corporation Limited.

[8-10] Tai Wai to Ma On Shan Extension: Environmental Impact Assessment, Kowloon-Canton Railway Corporation, October 1999.

[8-11] "Transportation Noise Reference Book" by P.M. Nelson, published by Butterworth & Co. (Publishers) Ltd, 1987.