

## 5 Noise

### 5.1 Legislation, Standards and Guidelines

5.1.1.1 The relevant legislation and associated guidance applicable to the present study for the assessment of noise impacts include:

- Noise Control Ordinance (NCO) (Cap.400);
- Environmental Impact Assessment Ordinance (EIAO) (Cap. 499);
- Technical Memoranda (TM) on Noise from Construction Work other than Percussive Piling (TM-GW);
- TM on Noise from Percussive Piling (TM-PP); and
- TM on Noise on Construction Work in Designated Areas (TM-DA); and
- TM on Noise from Places other than Domestic Premises, Public Places or Construction Sites (TM-Places); and
- Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO).

#### 5.1.2 Construction Noise

5.1.2.1 The NCO provides the statutory framework for noise control in Hong Kong. Assessment procedures and standards are set out in the respective TM promulgated under NCO.

5.1.2.2 To ensure a better environment, the TM-EIAO promulgated under the EIAO 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 criteria of 65 - 75dB(A) for daytime construction activities, as shown in the following **Table 5.1**.

**Table 5.1** Noise standards for construction activities

Uses	Noise Standards <sup>[1]</sup> , $L_{eq}$ (30mins)
	0700-1900 hours on any day not being a Sunday or general Holiday
All domestic premises including temporary housing accommodation	75
Hotel and Hostels	75
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	70 65 (During Examination)

Note:

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

## 5.1.3 Construction Noise During Restricted Hours

**5.1.3.1** The NCO also provides statutory control on general construction works during restricted hours (i.e. 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.

**5.1.3.2** 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 lorry mixers, dump trucks and vibratory pokers. 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.

**5.1.3.3** 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.

**5.1.3.4** Maximum noise levels from construction activities during restricted hours at affected Noise Sensitive Receivers (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 TM-GW and are summarised in the following **Table 5.2**.

**Table 5.2** ANLs for construction during restricted hours

Time period	ANLs for Area Sensitivity Ratings <sup>[1]</sup> , dB(A)		
	A	B	C
All weekdays during the evening (1900 to 2300), 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:

[1] Figures in brackets are ANLs for SPME construction work in designated area.

**5.1.3.5** Despite any description made in this draft EIA report, 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 report shall bind the Noise Control Authority in making a decision. If a CNP is to be issued, the Noise Control Authority shall include it in any conditions demand. Failure to comply with any such conditions will lead to cancellation of the CNP and prosecution under the NCO.

## 5.1.4 Percussive Piling

**5.1.4.1** 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. The following **Table 5.3** lists the acceptable percussive piling noise levels for various types of NSR.

**Table 5.3** ANLs for percussive piling

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

**5.1.4.2** 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 10dB(A) shall be applied to the above ANLs.

## 5.1.5 Construction Groundborne Noise

**5.1.5.1** Noise arising from tunnelling works during construction that may generate groundborne noise during normal working hours is governed by the TM-EIAO under the EIAO as shown in **Table 5.1**. TM-Places under the NCO stipulates that noise transmitted primarily through the structural elements of building, or buildings, shall be 10 dB(A) less than the relevant ANLs.

**5.1.5.2** For construction works conducted on general holidays, Sundays and weekdays during evening (i.e. 1900-2300 hrs) and night time (i.e. 2300-0700 hrs) till the following day, the construction groundborne noise level shall be limited to 10 dB(A) below the respective ANLs for the

Area Sensitivity Rating appropriate to those NSRs affected by the Project. A summary of these criteria is given in the **Table 5.4** below.

**5.1.5.3** Based on the same principle for the ground-borne noise criteria (i.e. ANL-10 dB(A) under the TM-Places), the construction groundborne noise levels inside domestic premises and schools shall be limited to 65 dB(A) and 60 dB(A) respectively when compared to the TM-EIAO.

**Table 5.4** Construction groundborne noise criteria

NSR type	Noise Criteria, dB(A)		
	[1]	[2]	[3]
All domestic premises including temporary housing accommodation	65	50/55/60 <sup>[4],[5]</sup>	35/40/45 <sup>[4],[5]</sup>
Hotels and hostel			
Educational institutions including kindergarten, nurseries and all others where unaided voice communication is required	60 55 (During Examination)	N/A <sup>[6]</sup>	N/A <sup>[6]</sup>

Note:

- [1] Daytime (0700 – 1900 hrs) except general holidays and Sunday.
- [2] Daytime (0700 – 1900 hrs) during general holidays and Sundays and all days during Evening (1900 – 2300 hrs).
- [3] Night-time (2300 – 0700 hrs).
- [4] Based on the Basic Noise Level for NSRs with Area Sensitivity Ratings of A, B, and C detailed in the TM-GW.
- [5] Construction Noise Permit is required for works during this period.
- [6] No sensitive use in educational institutions during evening and night-time period is assumed except specified.

## 5.1.6 Operational Noise

**5.1.6.1** The Annex 5 of TM-EIAO has stipulated the noise standards for various noise sources as shown in **Table 5.5**. It should, however, be noted that the following noise criteria are only applicable to uses that rely on opened windows for ventilation.

**Table 5.5** Noise standards for operational phase

Common Uses	Noise Standards <sup>[1]</sup>				
	Aircraft Noise (Noise Exposure Forecast: NEF)	Helicopter Noise L <sub>max</sub> dB(A)	Road Traffic Noise L <sub>10</sub> (1hr) dB(A)	Rail Noise <sup>[2]</sup>	Fixed Noise Sources
All domestic premises including temporary housing accommodation	25	85	70	(a) The appropriate ANLs shown in Table 3 of the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites and (b) L <sub>max</sub> (2300-0700 hours) = 85dB(A)	(a) 5dB(A) below the appropriate ANLs 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		

Note:

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

[2] Rail noise is under the control of the NCO and shall comply with the ANLs laid down in the TM- Places. The criteria for noise transmitted primarily through the structural elements of the building of buildings should be 10dB(A) less than the relevant acceptable noise level.

## 5.1.7 Road Traffic Noise Criteria

**5.1.7.1** The criteria for assessing road traffic noise is given in the TM-EIAO and tabulated in **Table 5.5**. For domestic premises, hotels, hostels and offices, the criterion is 70dB(A). For educational institutes and places of worship, the criterion is 65dB(A). For hospitals, clinics etc, a more stringent criterion of 55dB(A) is stipulated. It should be noted that all of these criteria only apply to NSRs that rely on open-windows for ventilation.

## 5.1.8 Fixed Noise Criteria

**5.1.8.1** Operational noise from fixed noise sources is controlled under the NCO's TM on Noise from Places other than Domestic Premises, Public Places or Construction Sites (TM-Places). To plan for a better environment, the TM-EIAO has specified the following requirements, whichever is more stringent.

- 5dB(A) below the appropriate ANLs in the TM-Places; or
- The prevailing background noise levels.

**5.1.8.2** The ANLs for different Area Sensitivity Ratings during different periods are summarised in the following **Table 5.6**.

**Table 5.6** ANLs for fixed noise sources

Time Period	ANL, dB(A)		
	Area Sensitivity Rating A	Area Sensitivity Rating B	Area Sensitivity Rating C
Day (0700 to 1900 hours)	60	65	70
Evening (1900 to 2300 hours)	60	65	70
Night (2300 to 0700 hours)	50	55	60

## 5.2 Description of the Environment

### 5.2.1 Existing Environment

**5.2.1.1** The proposed site for development of columbarium, crematorium and related facilities is located at the hillsides of Sandy Ridge and to the northwest of Man Kam To Road, and is partially occupied by Sandy Ridge Cemetery. The existing noise climate is dominated by the road traffic from Man Kam To Road and nearby roads in the vicinity.

**5.2.1.2** Other than the areas in the immediate vicinity of Man Kam To Road, most of the area within the project boundary consist of hillsides and Sandy Ridge Cemetery and has a tranquil environment. As compared to Man Kam To Road, the traffic flow along Sha Ling Road is relatively light especially during normal days as only very limited traffic would use Sha Ling Road to access either the existing Sandy Ridge Cemetery or scattered residential premises nearby.

**5.2.1.3** To the south of the site is the Man Kam To Road running in the north east direction, and leading to Man Kam To Boundary Control Point. For the areas along both sides of Man Kam To Road, which is a heavily trafficked road, the noise environment is dominated by the traffic noise generated by heavy vehicles commuting between Hong Kong and Shenzhen.

- 5.2.1.4** The MTR Lo Wu Station is located to the west of project boundary. Other than using buses etc. to access Sandy Ridge, some people would take off at MTR Lo Wu Station and use the existing footpath to access Sandy Ridge. The noise environment in this area is dominated by the noise from East Rail and other community noise from Shenzhen.
- 5.2.1.5** In addition, as discussed in **Section 2**, part of the existing Lin Ma Hang Road would need to be widened to 7.3m. The adjacent area of the concerned sections of Lin Ma Hang Road is characterized by rural land uses with scattered village houses, agricultural land and natural terrain. The shortest separation distance between the existing village houses and Lin Ma Hang Road is around 10m. For the area to the south of Lin Ma Hang Road, the noise climate is mainly dominated by the road traffic due to heavy vehicles commuting between Shenzhen and Hong Kong via Man Kam To Boundary Control Point. For area further north, however, noise from Man Kam To Boundary Control Point diminishes and traffic noise from Lin Ma Hang road dominates.
- 5.2.1.6** The barging point is located off-site along Tsing Fat Street in Tuen Mun (see **Figure 1.3**). The current location is an existing barging point used by the Express Rail Link project. The adjacent area is mostly characterized by developed urban areas. The noise climate is mainly dominated by Castle Peak Road (Tai Lam) and Tsing Fat Street.

## **5.2.2 Existing and Planned Noise Sources**

### **Existing Noise Sources**

- 5.2.2.1** The area for noise impact assessment shall generally include all areas within 300m from the Project. The major existing noise sources within 300m from the Project include the road traffic noise generated from existing Man Kam To Road, Man Kam To Boundary Control Point and Lin Ma Hang Road. Man Kam To Road is a two-way road link between Jockey Club Road and the Closed Area Boundary with an Annual Average Daily Traffic (AADT) of 15,960 in Year 2013. Lin Ma Hang Road is a two-way road link between Man Kam To Road near Man Kam To Boundary Control Point and Sha Ho Road in Sha Tau Kok. Where Lin Ma Hang Road is a local distributor, Man Kam To Road and Sha Ho Road are rural roads.

### **Planned Noise Sources**

- 5.2.2.2** Other than the road traffic noise generated from the existing Man Kam To Road and Lin Ma Hang Road as discussed in **Section 5.2.2.1**, there are also planned noise sources from the proposed development which may give rise to potential impacts on existing NSRs as listed below and illustrated in **Figure 5.2.1**.

5.2.2.3 More details of these noise sources are described as follows.

**Proposed Pick-up and Drop-off Area within Sandy Ridge Cemetery**

5.2.2.4 A pick-up and drop-off area will be constructed to facilitate the increased number of visitors at Sandy Ridge Cemetery during both normal days and festive days (i.e. Chung Yeung Festival Day, Ching Ming Festival Day and the two weekends before and after these two days). According to the current arrangement, both franchised buses and private cars will be allowed to park inside the proposed pick-up and drop-off area during normal days while only franchised buses will be allowed to park during festive days.

**Proposed Pick-up and Drop-off Point at Man Kam To Road**

5.2.2.5 A pick-up and drop-off point will be constructed at Man Kam To Road to facilitate the increased number of visitors at Sandy Ridge Cemetery. Unlike the pick-up and drop-off area within Sandy Ridge, this proposed pick-up and drop-off point at Man Kam To Road is only for passengers to get on and off of taxi and minibus. This pick-up and drop-off point would be put in operation during both normal days and festive days.

**Proposed Off-site Pick-up and Drop-off Points**

5.2.2.6 According to the latest proposal, several off-site pick-up and drop-off points have been selected, all of which are far away from the Project (i.e. > 300m). The locations of these off-site pick-up and drop-off points are shown in **Figure 5.2.2** and are listed below:

- MTR Kwu Tung Station;
- Sheung Shui Landmark North Public Transport Interchange;
- MTR Fanling Station; and
- Layby at Pak Wo Road near Flora Plaza.

5.2.2.7 All the above off-site pick-up and drop-off points have been operating as part of the existing / planned transportation system to serve the local community in various aspects. Buses, coaches, private cars etc. are utilising these nodes to facilitate commuters to exchange with the rail system.

**Proposed Barging Point in Siu Lam**

5.2.2.8 The barging point is located off-site along Tsing Fat Street in Tuen Mun (see **Figure 1.3**). In order to reduce the impact on road traffic, surplus inert construction and demolition (C&D) materials from the construction of the C&C facilities at Sandy Ridge Cemetery and Lin Ma Hang Road will be stored at a temporary stockpile area on-site. The surplus C&D materials will be transported to the designated barging point facility in Tuen Mun by lorries, and then transported by barges for the reuse of other concurrent projects. The current location is an existing barging point used by the Express Rail Link project. Minor



construction works for the tipping halls and new ramps are required. No maintenance dredging is required and no night-time operation is anticipated. The predicted induced construction traffic is approximately 50 veh/hour (Two way), and the handling capacity of the barging point is about 750m<sup>3</sup>/day (16,500m<sup>3</sup>/month).

#### **Proposed Utilities Construction along Man Kam To Road**

- 5.2.2.9** It is noted that the proposed diversion of utilities including the main water pipe lines are aligned along the northern side of Man Kam To Road. The village houses on the northern side would have a separation distance of at least 30m from Man Kam To Road while those on the southern side would be within 10m.

#### **Planned Road Networks connecting between the Project and Man Kam To Road**

- 5.2.2.10** Sha Ling Road is currently a two-way single road. In order to cater for the increased number of visitors and to facilitate the traffic circulation during festive days, Sha Ling Road will be modified to form a round loop connecting Man Kam To Road to relieve excess traffic during peak hour.

#### **Proposed Road Widening of Lin Ma Hang Road**

- 5.2.2.11** A section of Lin Ma Hang Road (about 1km in length) would need to be widened for the purpose of the Project (see **Figure 5.2.1**). In order to cater for the increased number of visitors and to facilitate the traffic circulation during festive days, Lin Ma Hang Road will be widened to accommodate the traffic during peak hour.

#### **Induced traffic on existing road network**

- 5.2.2.12** There would be no physical works imposed on the road links of Lo Wu Station Road and Man Kam To Road and no change on the configuration and traffic capacity of these roads. However, induced traffic by the proposed C&C facilities will still be observed on Lo Wu Station Road and Man Kam To Road.

#### **Planned Crematorium**

- 5.2.2.13** The crematorium is a Designated Project under Item N4 of Schedule 2 of TM-EIAO. A separate EIA study will be conducted to fulfil all the statutory requirements and procedures under the EIAO.
- 5.2.2.14** Identification of planned noise sources to be included in construction noise and operational noise assessments are summarised as below and detailed rationales for inclusion have been elaborated in **Sections 5.5.3** and **5.6.1** respectively.

	<u>Construction Noise</u>	<u>Operational Noise</u>
Proposed pick-up and drop-off area within Sandy Ridge Cemetery	√	√
Proposed pick-up and drop-off point at Man Kam To Road	√	√
Proposed off-site pick-up and drop-off points (see <b>Figure 5.2.2</b> )	√	√
Proposed barging point in Siu Lam (see <b>Figure 1.3</b> )	√	-
Proposed utilities construction along Man Kam To Road	√	-
Planned road networks connecting between the Project and Man Kam To Road	√	√
Proposed road widening of Lin Ma Hang Road	√	√
Induced traffic on existing road network	-	√
Planned crematorium (As the crematorium is a Designated Project under Item N.4 of Schedule 2 of TM-EIAO, a separate EIA study would be conducted to fulfil all the statutory requirements and procedures under the EIAO and thus the fixed noise impact will be excluded from this Assignment.)	√	-

## 5.3 Potential Concurrent Projects

**5.3.1.1** The potential concurrent projects that would have cumulative environmental impacts during the construction and operational phases of the Project is given in **Section 1**. The following concurrent projects are relevant for the assessment of cumulative noise assessment.

### Construction Phase

- Development of Organic Waste Treatment Facilities, Phase 2 (OWTF Phase II); and

- Widening of Lin Ma Hang Road (Section outside of the Project boundary).

### **Operational Phase**

- Operation of the Crematorium at Sandy Ridge;
- Police Facilities in Kong Nga Po;
- Widening of Lin Ma Hang Road (Section outside of the Project boundary);
- Liantang / Heung Yuen Wai Boundary Control Point and Associated Works;
- Development of Lok Ma Chau Loop;
- North East New Territories New Development Areas; and
- Widening of Tolo Highway / Fanling Highway between Island House Interchange and Fanling.

**5.3.1.2** The cumulative impact due to construction work for OWTF Phase II and widening of Lin Ma Hang Road (i.e.: section outside of the Project boundary) have been included in the assessment. Moreover, the induced traffic from Operation of the Crematorium at Sandy Ridge, Police Facilities in Kong Nga Po, Widening of Lin Ma Hang Road, Liantang / Heung Yuen Wai Boundary Control Point and Associated Works, Development of Lok Ma Chau Loop, North East New Territories New Development Areas, and widening of Tolo Highway / Fanling Highway between Island House Interchange and Fanling have also been included in the cumulative operational road traffic noise assessment.

## **5.4 Representative Noise Sensitive Receivers**

**5.4.1.1** 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. Representative existing NSRs within the 300m assessment area have been identified. The first layer of NSRs which are most affected by the project are selected for assessment by means of topographic maps, aerial photos, land status plans, S.16 / S.12a Town Planning Ordinance, layout plans of the Project and site inspections and they have been used for construction and operational noise impact assessments. The locations of these NSRs are illustrated in **Figure 5.4.1** to **Figure 5.4.9** and tabulated in **Table 5.7**.

**5.4.1.2** Photos of the existing NSRs are provided in **Appendix 5.1**. Clarification with Educational Bureau (EDB), Lands Department (LandD) and Planning Department (PlanD) have been conducted and it

was informed that there is currently no implementation program for Lo Wu Public School and Sam Wo Public School. Hence, they will not be included in noise assessments.

**5.4.1.3** Verification on the status of “V” zone near Lin Ma Hang Road as shown in statutory plan No. S/NE-MKT/2 with PlanD has been conducted and for conservative approach, planned NSRs have been temporarily assigned for road traffic noise impact assessment. The overlay of OZP on the 300m assessment area is also shown in **Figure 5.4.1** to **Figure 5.4.9**. Locations of NSRs may be affected by the Project are illustrated in **Figure 5.5.1** to **Figure 5.5.9** for construction noise assessment and **Figure 5.6.1** to **Figure 5.6.8** for road traffic noise assessment.

**Table 5.7** Locations of representative NSRs

No.	NSR <sup>[1],[2]</sup>	Uses <sup>[3]</sup>	No. of Storey
N1	Lo Wu Public School <sup>[4]</sup>	E	1
N2	Lo Wu Village	R	1-3
N3	Village houses to the south of Lo Wu Station Road	R	1
N4	Village houses to the west of Sha Ling Playground	R	1-3
N5	Village houses to the west of Sha Ling Road	R	1-3
N6	Village houses to the north of Border District Police Quarters	R	1-2
N7	Village houses to the south of Sha Ling Road	R	1-2
N8	Village houses to the north of Livestock Waste Control Centre	R	1
N9	Village house to the north of Man Kam To Road	R	2
N10	Village houses to the east of Sha Ling Road	R	1-3
N11	Village houses to the east of Man Kam To Road	R	1
N12	Village house to the south of Man Kam To Boundary Control Point	R	1
N13	Village house near Man Kam To Operation Base	R	1-3
N14	Village house to the south of Sha Ling Playground	R	1
N15	Village houses to the south of Kong Nga Po Road	R	1-2
N16	Village houses to the west of Man Kam To Road	R	2
N17	Village houses to the south of Man Kam To Boundary Control Point	R	1-2
N18	Village houses near San Uk Ling	R	1-3
N19	Village houses opposite to San Uk Ling	R	1-2
N20	Village houses to the northeast of San Uk Ling	R	1-2
N21	Village houses of Muk Wu	R	1-2
N22	Sam Wo Public School <sup>[5]</sup>	E	1-2

No.	NSR <sup>[1], [2]</sup>	Uses <sup>[3]</sup>	No. of Storey
N23	Village houses of Muk Wu Nga Yiu <sup>[6]</sup>	R	1-3
N24	Aqua Blue Block 36, Tuen Mun	R	3

## Note:

- [1] The assessment will only include NSRs which rely on opened windows for ventilation.
- [2] The first layer of NSRs which are most affected by the project within 300m from Project boundary is included. Representative NSRs for construction noise and operational road traffic noise assessments are tabulated in **Tables 5.8 and 5.13** respectively.
- [3] R – Residential Premises, E – Educational Institutions.
- [4] Land status of Lo Wu Public School (NSR N1-1) has been sought with EDB, LandsD and PlanD and it was informed that there is currently no implementation program. Hence it is excluded in the noise impact assessment.
- [5] Land status of Sam Wo Public School (NSR N22-1) has been sought with EDB, LandsD and PlanD and it was informed that there is currently no implementation program. Hence it is excluded in the noise impact assessment.
- [6] Planned NSRs are assigned within the "V" zone in N23.

## 5.5 Construction Noise Assessment

### 5.5.1 Noise Sensitive Receivers

**5.5.1.1** For construction noise assessment, representative NSRs that would be affected by the construction activities have been selected from **Table 5.7**. The locations of representative NSRs for construction noise assessment are shown in **Figure 5.5.1** to **Figure 5.5.9** and are summarised in the table below.

**Table 5.8** Representative NSRs for construction noise assessment

No.	NSR <sup>[1,2]</sup>	NSR ID	Uses <sup>[3]</sup>	No. of Storey
N2	Lo Wu Village	N2-1	R	1-3
N5	Village houses to the west of Sha Ling Road	N5-2 N5-5 N5-9 N5-10 N5-12	R	1-3
N6	Village houses to the north of Border District Police Quarters	N6-3 N6-4	R	1-2
N7	Village houses to the south of Sha Ling Road	N7-1 N7-2	R	1-2
N8	Village houses to the north of Livestock Waste Control Centre	N8-1	R	1
N9	Village house to the north of Man Kam To Road	N9-1	R	2
N10	Village houses to the east of Sha Ling Road	N10-1 N10-4	R	1-3
N13	Village house near Man Kam To Operation Base	N13-1	R	1-3
N14	Village house to the south of Sha Ling Playground	N14-1	R	1
N15	Village houses to the south of Kong Nga Po Road	N15-1 N15-2	R	1-2
N16	Village houses to the west of Man Kam To Road	N16-1	R	2
N18	Village houses near San Uk Ling	N18-5	R	1-3
N19	Village houses opposite to San Uk Ling	N19-1	R	1-2
N21	Village houses of Muk Wu	N21-3 N21-4	R	1-2
N23	Village houses of Muk Wu Nga Yiu	N23-5 N23-6	R	1-3
N24	Aqua Blue Block 36, Tuen Mun	N24-1	R	3

Note:

- [1] The assessment will only include NSRs which rely on opened windows for ventilation.
- [2] The first layer of NSRs which are most affected by the project within 300m from Project boundary is included.
- [3] R – Residential Premises.

## 5.5.2 Assessment Methodology

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

- Determine 300 metres from the boundary of the Project Site and associated works;
- 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 recognized 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;
- 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; and
- Consideration of noise mitigation measures will follow Annex 13 of TM-EIAO and EIAO Guidance Note “Preparation of Construction Noise Impact Assessment under the Environmental Impact Assessment Ordinance” [GN 9/2010]<sup>[5-1]</sup>.

### Construction Noise Assessment Tool

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

## 5.5.3 Identification of Environmental Impacts

5.5.3.1 As mentioned in **Section 5.2.2**, a list of planned noise sources have been identified and the rationales for inclusion in construction noise assessment are summarised below.



**Proposed Pick-up and Drop-off Area within Sandy Ridge Cemetery**

- 5.5.3.2** Though the nearest existing NSRs are located at least 300m away from the proposed pick-up and drop-off area and there are no planned NSRs in the vicinity, the associated construction noise impacts generated has been addressed in this EIA.

**Proposed Pick-up and Drop-off Point at Man Kam To Road**

- 5.5.3.3** Since there are existing NSRs within 20m, the associated construction noise impacts generated has been addressed in this EIA.

**Proposed Off-site Pick-up and Drop-off Points**

- 5.5.3.4** As the current design does not require any excavation works within these off-site pick-up and drop-off points and only road furnishing would be conducted. For MTR Fanling Station, one backhoe, one hand-held breaker and one dump truck would be deployed for the site. For Sheung Shui Landmark North, one backhoe, one roller and one concrete lorry mixer would be deployed for the site. With the use of quality powered mechanical equipment adopted, the mitigated SWL of the PMEs are ranged from 93 to 108 dB(A) and the maximum SWL among the sites is 109dB(A). The nearest NSR is about 30m away from the PME, resulting in about 38dB(A) distance attenuation which is within the noise criterion of 75dB(A). Nonetheless, quiet plant, movable noise barrier / enclosure would be considered to further reduce the construction noise impacts. Hence, adverse construction noise impacts from these off-site pick-up and drop-off points are not anticipated.

**Proposed Barging Point in Siu Lam**

- 5.5.3.5** The barging point at Tuen Mun under the operation for Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (AEIAR-143/2009) is proposed to be adopted for this project and the nearest NSR is about 110m away from the PME. As minor works including construction of new ramps and tipping halls is required to facilitate the barging point operation, the associated construction noise impact generated has been addressed in this EIA.

**Proposed Utilities Construction along Man Kam To Road**

- 5.5.3.6** The village houses on the northern side would have a separation distance of at least 30m from Man Kam To Road while those on the southern side would be within 10m. As such, the associated construction noise impacts generated has been addressed in this EIA.

### **Planned Road Networks connecting between the Project and Man Kam To Road**

**5.5.3.7** Since Sha Ling Road will be modified to form a round loop connecting Man Kam To Road to relieve excess traffic during peak hour and nearby NSRs are at a short separation distance of around 10m, the associated construction noise impacts generated has been addressed in this EIA.

### **Proposed Road Widening of Lin Ma Hang Road**

**5.5.3.8** A section of Lin Ma Hang Road (about 1km in length) would need to be widened for the purpose of the Project and hence the associated construction noise impacts generated has been addressed in this EIA.

### **Planned Crematorium**

**5.5.3.9** The crematorium is a Designated Project under Item N4 of Schedule 2 of TM-EIAO (see **Figure 5.2.1**) and a separate EIA study will be conducted to fulfil all the statutory requirements and procedures under the EIAO. Nevertheless, the site formation work and associated infrastructural works for planned crematorium area has been addressed in this EIA.

**5.5.3.10** To summarise, it is anticipated that the major construction works would include the following activities:

- Site clearance and formation activities;
- Retaining wall;
- Slope works;
- Viaducts;
- Access roads;
- Construction of noise barrier;
- Diversion of utilities;
- Road widening; and
- Construction of new ramps and tipping halls at barging point in Siu Lam.

**5.5.3.11** These construction activities will involve the use of Powered Mechanical Equipment (PME) including air compressor, excavators, lorries, mobile cranes, concrete lorry mixers, pokers, rollers, etc.

### **Utilization Rates and SWLs of Powered Mechanical Equipment**

**5.5.3.12** Practically, the PMEs will not be operating for all times within a work site. The utilization rates would depend on the construction sequences, workfronts scale and construction nature. In this assessment, the utilization rates for most of the PME in each workfront during different periods have been assumed as 100% as a conservative approach, except dump trucks and concrete lorry mixers.

**5.5.3.13** According to EIAO Guidance Note No. 9/2010 “Preparation of Construction Noise Impact Assessment under the Environmental Impact Assessment Ordinance”<sup>[5-1]</sup>, for some PME which only stay on site for a short period in 30 minutes, for example concrete lorry mixer in case of concreting and dump truck, a reasonable percentage on-time to reflect the actual situation has been applied for this assessment. These utilisation rates have been considered to be reasonable assumptions for the purpose of this assessment.

**5.5.3.14** The adopted utilisation rates, the type and quantity of the PME have been confirmed by Engineer as practicable and are presented in **Appendix 5.2**.

#### **Screening effect from natural terrain**

**5.5.3.15** The proposed site for this Project is located at the hillsides and some of the concerned NSRs (N2-1, N5-2, N5-12 and N10-4) are sited at locations where there are hills blocking the direct view towards the construction works area. Screening effects from the natural terrain on these NSRs are thus put into consideration in the construction noise assessment as an alleviation towards the construction noise impact. An assumption of -10 dB(A) is used for N2-1, N5-2, N5-12 and N10-4 due to total screening by adjacent mountain, while -5 dB(A) is used for N5-2 due to partial screening by the adjacent slope. Section drawings demonstrating screening effect from natural terrain are presented in **Appendix 5.2**.

**5.5.3.16** For construction groundborne noise, as tunneling works are excluded from Project scope due to design changes, construction groundborne noise is not anticipated.

### **5.5.4 Prediction and Evaluation of Environmental Impacts**

**5.5.4.1** According to the latest engineering design, construction would mainly comprise the activities as described in **Section 5.5.3**. The corresponding SWLs of these activities have been estimated according to the PME’s SWLs and the assessment methodology in the TM-GW. **Appendix 5.2** presents the SWLs for each PME. **Appendix 5.3** gives the plant inventory adopted for each workfront and **Appendix 5.4** shows the locations of workfronts adopted for this construction noise assessment.

**5.5.4.2** The unmitigated noise contribution from workfronts during the construction period has been conducted in accordance with the work programme given in **Appendix 5.5**. **Appendix 5.6** presents the calculated construction noise impacts at selected representative NSRs. **Appendix 5.6a** shows the location of barging point and calculated construction noise impacts at selected representative NSR. The predicted construction noise impacts at the NSRs under unmitigated scenario are summarised in **Table 5.9** below.

**Table 5.9** Predicted construction noise impact at NSRs under unmitigated scenario

No	NSR <sup>[1, 2]</sup>	NSR ID	Uses <sup>[3]</sup>	Criterion	L <sub>eq</sub> (30mins), dB(A)	
					Unmitigated Noise Level <sup>[4]</sup>	Exceedance
N2	Lo Wu Village	N2-1	R	75	57	-
N5	Village houses to the west of Sha Ling Road	N5-2	R	75	<b>93</b>	18
		N5-5	R	75	<b>91</b>	16
		N5-9	R	75	<b>79</b>	4
		N5-10	R	75	<b>80</b>	5
		N5-12	R	75	68	-
N6	Village houses to the north of Border District Police Quarters	N6-3	R	75	<b>83</b>	8
		N6-4	R	75	<b>85</b>	10
N7	Village houses to the south of Sha Ling Road	N7-1	R	75	<b>81</b>	6
		N7-2	R	75	<b>80</b>	5
N8	Village houses to the north of Livestock Waste Control Centre	N8-1	R	75	<b>79</b>	4
		N9-1	R	75	<b>83</b>	8
N10	Village houses to the east of Sha Ling Road	N10-1	R	75	<b>76</b>	1
		N10-4	R	75	<b>82</b>	7
N13	Village house near Man Kam To Operation Base	N13-1	R	75	<b>77</b>	2
		N14-1	R	75	<b>84</b>	9
N15	Village houses to the south of Kong Nga Po Road	N15-1	R	75	<b>82</b>	7
		N15-2	R	75	<b>82</b>	7
N16	Village houses to the west of Man Kam To Road	N16-1	R	75	<b>88</b>	13
		N18-5	R	75	<b>88</b>	13
N19	Village houses opposite to San Uk Ling	N19-1	R	75	<b>83</b>	8
		N21-3	R	75	<b>80</b>	5
N21	Village houses of Muk Wu	N21-4	R	75	<b>92</b>	17
		N23-5	R	75	<b>88</b>	13
N23	Village houses of Muk Wu Nga Yiu	N23-6	R	75	<b>85</b>	10
		N24-1	R	75	73	-
N24	Aqua Blue Block 36, Tuen Mun					

Note:

[1] The assessment will only include NSRs which rely on opened windows for ventilation.

[2] The first layer of NSRs which are most affected by the project within 300m from Project boundary is included.

[3] R – Residential Premises

[4] Bolded values mean exceedance of the relevant noise criteria.

**5.5.4.3** It can be seen from the above table that, before the implementation of mitigation measures, the majority of the NSRs would be exposed to noise impacts exceeding the daytime noise criteria by 1 to 18 dB(A). The most affected NSRs are those village houses to the west of Sha Ling Road and village houses of Muk Wu. This is attributable to the fact that those NSRs are located in close proximity to the neighbouring workfronts including those for widening works for Sha Ling Road and slope works / widening works for Lin Ma Hang Road. It is therefore required to implement all practicable noise mitigation measures to alleviate construction noise impacts. The following sections discuss these mitigation measures.

## **5.5.5 Mitigation Measures**

**5.5.5.1** The predicted 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:

- Good site practices to limit noise emissions at the source;
- Use of quality powered mechanical equipment (QPME);
- Use of site hoarding as noise barrier to screen noise at ground level of NSRs;
- Use of temporary noise barriers, noise enclosure and acoustic mat to screen noise from relatively static PMEs; and
- Alternative use of plant items within one worksite, wherever practicable.

**5.5.5.2** The above mitigation measures would need to be implemented in work sites as good practices where appropriate. Detailed descriptions of these mitigation measures are given in the following sections.

### **Good Site Management Practices**

**5.5.5.3** Good site practices and noise management techniques could considerably reduce the noise impact from construction site activities on nearby NSRs. The following measures should be practised 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.

**5.5.5.4** The benefits of these techniques can vary according to specific site conditions and operations. The environmental noise climate would certainly be improved with these control practices, although the improvement can only be quantified during implementation when specific site parameters are known

**Use of Quality Powered Mechanical Equipment (QPME)**

**5.5.5.5** The use of quiet plant associated with the construction of viaduct, widening of Sha Ling Road, construction of platform for crematorium and widening of Lin Ma Hang Road is made reference to the PME listed in the TM or the QPME/ other commonly used PME listed in EPD web pages or taken from BS5228: Part 1: 2009 Noise Control on Construction and Open Sites as far as possible which includes the SWLs for specific quiet PME. 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. **Section 5.1.3** gives more details on the CNP/NCO requirements. 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. It should be noted that EPD may apply the noise levels specified in the TM-GW and TM-DA when processing a CNP application for evening or night time works.

**Use of Site Hoarding**

**5.5.5.6** Purpose built temporary noise barriers (approx 2.4m 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. It would be possible for the Contractor to provide these in the form of site hoardings to achieve this attenuation effect, provided that they 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.

**Use of Movable Noise Barrier, Full Enclosure and Acoustic Mat for Relatively Fixed Plant Source**

- 5.5.5.7** 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 upper portion of superficial density no less than 7kg/m<sup>2</sup> 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.
- 5.5.5.8** Movable barriers will be used for some PME (e.g. excavator). It is anticipated that suitably designed barriers could achieve at least 5dB(A) reduction for movable plant and 10 dB(A) for stationary plant.
- 5.5.5.9** The use of standard enclosure has been considered in this assessment to shelter relatively fixed plant including air compressor, generator. These standard enclosures can provide at least 15dB(A) noise reduction.
- 5.5.5.10** The use of acoustic mat has been also considered in this assessment to shelter relatively piling machine. These standard acoustic mat can provide at least 10dB(A) noise reduction.
- 5.5.5.11** To ensure the design and logistics of movable barrier can be effectively manoeuvred with the PME, a noise mitigation plan shall be prepared to provide construction details, manoeuvring mechanism and trailing routes for the respective PME as part of the detailed implementation requirements.
- 5.5.5.12** A summary of the barrier and standard enclosure adopted for various PMEs is given in **Appendix 5.2** and indicative drawing for barrier and standard enclosure is shown in **Appendix 5.7**, and the associated noise reduction is summarised in **Table 5.10** below.

**Table 5.10** Summary of barrier, standard enclosure and acoustic mat adopted for PMEs

PME	Enclosure / Barriers <sup>[1]</sup>	Attenuation, dB(A)
Air compressor	Enclosure	-15dB(A)
Asphalt Paver	Movable Barrier	-5dB(A)
Hand-held breaker	Movable Barrier	-10dB(A)
Concrete Lorry Mixer	Movable Barrier	-5dB(A)
Concrete pump	Movable Barrier	-10dB(A)
Mobile Crane	Movable Barrier	-5dB(A)
Drill, Percussive, Hand-held (electric)	Movable Barrier	-10dB(A)

PME	Enclosure / Barriers <sup>[1]</sup>	Attenuation, dB(A)
Dump Truck	Movable Barrier	-5dB(A)
Excavator	Movable Barrier	-5dB(A)
Piling, Large Dia. Bored, Oscillator	Acoustic Mat	-5dB(A)
Vibratory Poker	Movable Barrier	-10dB(A)
Roller	Movable Barrier	-5dB(A)
Saw, Circular, Wood	Movable Barrier	-10dB(A)
Water Pump	Movable Barrier	-10dB(A)
Backhoe	Movable Barrier	-5dB(A)
Generator	Enclosure	-15dB(A)
Piling Rig and Drilling Rig	Movable Barrier	-5dB(A)
Piling, Large Dia. Bored, Reverse Circulation Drill	Movable Barrier	-5dB(A)

Note:

[1] The listed noise mitigation measures are only applicable for the workfronts for construction of viaduct, widening of Sha Ling Road and Lin Ma Hang Road, utility laying works along Man Kam To Road, construction of platform for crematorium at Sandy Ridge and minor slope work required at Lin Ma Hang Road.

### Alternative Use of Plant Items within One Worksite

**5.5.5.13** 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.

## **5.5.6 Assessment Results of Construction Noise under Mitigated Scenario**

**5.5.6.1** It should be noted that the noise mitigation measures such as noise enclosures, acoustics mats and movable barriers as described in **Table 5.10** are only applicable for the workfronts for construction of viaduct, widening of Sha Ling Road and Lin Ma Hang Road, utility laying works along Man Kam To Road, construction of platform for crematorium at Sandy Ridge and minor slope work required at Lin Ma Hang Road. The PME within the workfront for the columbarium platform formation that are located at least 200m from the nearest NSRs and would not require these noise mitigation measures. With the adoption of the above mitigation measures, the contribution from workfronts during the construction period has been assessed in accordance with the work programme given in **Appendix 5.8**. **Appendix 5.9** also presents a summary of the calculated construction noise impacts at selected representative NSRs. The predicted construction noise impacts at the NSRs are summarised in **Table 5.11**.



**Table 5.11** Predicted construction noise impact at NSRs under mitigated scenario

No	NSR <sup>[1,2]</sup>	NSR ID	Uses <sup>[3]</sup>	Leq (30mins), dB(A)		
				Criterion	Mitigated Noise Level <sup>[4]</sup>	Exceedance
N2	Lo Wu Village	N2-1	R	75	57	-
		N5-2	R	75	75	-
		N5-5	R	75	72	-
N5	Village houses to the west of Sha Ling Road	N5-9	R	75	60	-
		N5-10	R	75	61	-
		N5-12	R	75	64	-
N6	Village houses to the north of Border District Police Quarters	N6-3	R	75	64	-
		N6-4	R	75	66	-
N7	Village houses to the south of Sha Ling Road	N7-1 <sup>[5]</sup>	R	75	64	-
		N7-2	R	75	61	-
N8	Village houses to the north of Livestock Waste Control Centre	N8-1 <sup>[5]</sup>	R	75	70	-
N9	Village house to the north of Man Kam To Road	N9-1	R	75	74	-
N10	Village houses to the east of Sha Ling Road	N10-1	R	75	68	-
		N10-4	R	75	73	-
N13	Village house near Man Kam To Operation Base	N13-1	R	75	66	-
N14	Village house to the south of Sha Ling Playground	N14-1	R	75	65	-
N15	Village houses to the south of Kong Nga Po Road	N15-1	R	75	63	-
		N15-2	R	75	63	-
N16	Village houses to the west of Man Kam To Road	N16-1	R	75	69	-
N18	Village houses near San Uk Ling	N18-5	R	75	69	-

No	NSR [1, 2]	NSR ID	Uses [3]	Leq (30mins), dB(A)		
				Criterion	Mitigated Noise Level [4]	Exceedance
N19	Village houses opposite to San Uk Ling	N19-1	R	75	64	-
N21	Village houses of Muk Wu	N21-3	R	75	63	-
		N21-4	R	75	74	-
N23	Village houses of Muk Wu Nga Yiu	N23-5	R	75	69	-
		N23-6 [6]	R	75	69	-
N24	Aqua Blue Block 36, Tuen Mun	N24-1	R	75	73	-

Note:

[1] The assessment will only include NSRs which rely on opened windows for ventilation.

[2] The first layer of NSRs which are most affected by the project within 300m from Project boundary is included.

[3] R – Residential Premises.

[4] Bolded values mean exceedance of the relevant noise criteria.

[5] Cumulative construction noise impact from this concurrent project, OWTF2 (AEIAR-280/2013) has also been included in the nearest NSR (N7-1 and N8-1).

[6] Cumulative construction noise impact from this concurrent project, Widening of Lin Ma Hang Road (EIA-264/2013) has also been included in the nearest NSR (N23-6).

**5.5.6.2** It can be seen from the above **Table 5.11** that, all NSRs will be mitigated to within the criterion after implementation of the recommended noise mitigation measures.

## **5.5.7 Residual Environmental Impact**

**5.5.7.1** Construction noise impact arising from the Project can be properly mitigated by implementing the proposed noise control measures. Adverse residual noise impacts are thus not anticipated.

## **5.6 Operational Noise Assessment**

### **5.6.1 Identification of Environmental Impacts**

**5.6.1.1** As mentioned in **Section 5.2.2**, a list of planned noise sources have been identified and the rationales for inclusion in operational noise assessment are summarised below.

#### **Proposed Pick-up and Drop-off Area within Sandy Ridge Cemetery**

**5.6.1.2** Though the nearest existing NSRs are located at least 300m away from the proposed pick-up and drop-off area and there are no planned NSRs in the vicinity, the induced traffic has been addressed in this EIA. In addition, the noise nuisance due to operation in the proposed pick-up and drop-off area is not anticipated.

#### **Proposed Pick-up and Drop-off Point along Man Kam To Road**

**5.6.1.3** Unlike the pick-up and drop-off area within Sandy Ridge, this proposed pick-up and drop-off point at Man Kam To Road is only for passengers to get on and off of taxi and minibus. This pick-up and drop-off area would be put in operation during both normal days and festive days.

**5.6.1.4** Shelter with panels at the pick-up and drop-off point at Man Kam To Road is proposed to avoid the line of sight and alleviate nuisance of the pick-up and drop-off point at the representative NSRs nearby. Considering the justification above, noise nuisance from the proposed pick-up and drop-off point at Man Kam To Road to nearby NSRs is not anticipated.

#### **Proposed Off-site Pick-up and Drop-off Points**

**5.6.1.5** A comparison has been made on the traffic flow along major roads in the vicinity of the aforesaid pick-up and drop-off points for the prevailing, without Project scenario and with Project scenario for both the normal and festive days. The traffic flow prediction adopted has been endorsed by the Transport Department. As can be seen in **Table 5.12a** below, the traffic flow induced by the Project on nearby major

roads near the proposed off-site pick-up and drop-off points would be insignificant for both the normal and festive days.

**5.6.1.6** Besides, the proposed off-site pick-up and drop-off points will not affect the design capacity at the road junctions in the vicinity. Hence, it is considered that the road traffic noise impacts caused by the proposed off-site pick-up and drop-off points are insignificant.

**5.6.1.7** Since these off-site pick-up and drop-off points have been operating as part of the existing transportation system and the traffic flow induced by the Project on nearby major roads would be insignificant (see **Table 5.12a**). It should also be noted that the traffic will immediately join the major roads (e.g. Fanling Highway, Po Shek Wu Road, etc.) after it leaves the off-site pick-up and drop-off points and further distributed when it reaches the major town centre (e.g. Sheung Shui, Fanling, etc.). The noise level differences between with and without project is less than 1.0dB(A), which demonstrates that the road traffic noise impacts caused by the proposed off-site pick-up and drop-off points on nearby NSRs are insignificant.

**Table 5.12a** Peak hourly traffic flow on major roads in Year 2037<sup>[1]</sup> of different scenarios

Proposed off-site pick-up and drop-off point	Major Road	Prevailing Year 2016			Without Project			With Project Normal Day			With Project Festive Day		
		Flow (veh/hr)	% Heavy Vehicle	BNL <sup>[2]</sup> , dB(A)	Flow (veh/hr)	% Heavy Vehicle	BNL <sup>[2]</sup> , dB(A)	Flow (veh/hr)	% Heavy Vehicle	BNL <sup>[2]</sup> , dB(A)	Flow (veh/hr)	% Heavy Vehicle	BNL <sup>[2]</sup> , dB(A)
MTR Kwu Tung Station Existing	Fanling Highway	5,562	48.0	87.5	9,714	32.8	88.8	9,742	32.7	88.8	5,842	24.1	85.8
		2,349	61.0	81.6	3,053	49.6	82.0	3,054	49.3	82.0	1,757	40.2	78.9
MTR Fanling Station	Jockey Club Road	797	48.2	76.1	771	44.4	75.6	790	44.1	75.7	616	39.6	74.3
	Fanling Highway	5,053	41.0	86.6	8,696	28.2	87.9	8,699	28.1	87.9	5,174	18.2	84.7
Layby at Pak Wo Road near Flora Plaza	Pak Wo Road	676	66.4	76.5	693	61.9	76.4	692	61.7	76.4	361	57.1	73.2

Note:

[1] The assessment year for road traffic noise is taken as Year 2037 (which is the maximum traffic projection within 15 years upon operation of the proposed road networks and assuming the induced traffic will be capped after Year 2032 as it would not induce traffic growth due to the Project). Details could be referred to **Section 5.6.3**.

[2] BNL – Basic Noise Level as per the methodology in Calculation of Road Traffic Noise (CRTN).

### **Planned Road Networks connecting between the Project and Man Kam To Road**

- 5.6.1.8** Sha Ling Road will be modified to form a round loop connecting Man Kam To Road to relieve excess traffic during peak hour. Nearby NSRs are at a short separation distance from Sha Ling Road at about 10m. Therefore, the operational road traffic noise impacts generated from the planned road networks have been addressed in this EIA.

### **Proposed Road Widening of Lin Ma Hang Road**

- 5.6.1.9** A section of Lin Ma Hang Road (about 1km in length) would need to be widened for the purpose of the Project and hence the operational road traffic noise impacts on village houses near that section of Lin Ma Hang Road have been addressed in this EIA.

### **Induced traffic on existing road network**

- 5.6.1.10** Induced traffic will be observed in existing roads such as Lo Wu Station Road, Man Kam To Road, Jockey Club Road and Po Wan Road. As seen in **Table 5.12b**, the induced traffic on these roads would be insignificant during both the normal days and festive days. The traffic flow prediction adopted has been endorsed by the Transport Department.
- 5.6.1.11** For all of the major existing roads shown in **Table 5.12b**, the noise level differences between with and without project is less than 1.0dB(A), which demonstrates that the road traffic noise impacts due to induced traffic on these roads are insignificant.

**Table 5.12b** Peak hourly traffic flow on major roads in Year 2037<sup>[1]</sup> of different scenarios

Major Road	Prevailing Year 2016			Without Project			With Project Normal Day			With Project Festive Day		
	Flow (veh/hr)	% Heavy Vehicle	BNL <sup>[2]</sup> , dB(A)	Flow (veh/hr)	% Heavy Vehicle	BNL <sup>[2]</sup> , dB(A)	Flow (veh/hr)	% Heavy Vehicle	BNL <sup>[2]</sup> , dB(A)	Flow (veh/hr)	% Heavy Vehicle	BNL <sup>[2]</sup> , dB(A)
Lo Wu Station Road	235	22.1	68.2	278	23.0	69.0	279	22.9	69.0	98	30.5	65.4
Man Kam To Road	1,394	65.9	79.6	1,669	54.6	79.7	1,718	53.3	79.8	1,391	41.6	78.0
Jockey Club Road	720	73.0	77.2	776	66.3	77.1	817	62.3	77.1	700	78.6	77.3
Po Wan Road	304	53.3	72.2	230	42.2	70.2	274	36.6	70.5	151	46.8	68.7

Note:

[1] The assessment year for road traffic noise is taken as Year 2037 (which is the maximum traffic projection within 15 years upon operation of the proposed road networks and assuming the induced traffic will be capped after Year 2032 as it would not induce traffic growth due to the Project). Details could be referred to **Section 5.6.3**.

[2] BNL – Basic Noise Level as per the methodology in Calculation of Road Traffic Noise (CRTN).

## 5.6.2 Noise Sensitive Receivers

**5.6.2.1** For operational road traffic noise assessment, the first layer representative NSRs which are most affected by the project in the vicinity of project roads have been selected from **Table 5.7**. The locations of representative NSRs for operational road traffic noise assessment are shown in **Figure 5.6.1** to **Figure 5.6.8** and are summarised in the table below.

**Table 5.13** Representative NSRs for operational road traffic noise assessment

No.	NSR <sup>[1,2]</sup>	NSR ID	Uses <sup>[3]</sup>	No. of Storey
N5	Village houses to the west of Sha Ling Road	N5-1 to N5-6	R	1-3
N9	Village house to the north of Man Kam To Road	N9-1	R	2
N10	Village houses to the east of Sha Ling Road	N10-1, N10-4, N10-5	R	1-3
N18	Village houses near San Uk Ling	N18-1 to N18-9	R	1-3
N19	Village houses opposite to San Uk Ling	N19-1 to N19-3	R	1-2
N20	Village houses to the northeast of San Uk Ling	N20-1 to N20-3	R	1-2
N21	Village houses of Muk Wu	N21-1 to N21-4	R	1-2
N23	Village houses of Muk Wu Nga Yiu <sup>[4]</sup>	N23-1 to N23-7 and N23 P1 to N23-P5	R	1-3

Note:

- [1] The assessment will only include NSRs which rely on opened windows for ventilation.
- [2] The first layer of NSRs which are most affected by the project within 300m from Project boundary is included.
- [3] R – Residential Premises.
- [4] Planned NSRs are assigned within the "V" zone in N23.

## 5.6.3 Assessment Methodology

**5.6.3.1** Road traffic noise calculation is based on the method of the UK Department of Transport “Calculation of Road Traffic Noise” (CRTN). The predicted noise levels at the NSRs include a 2.5dB(A) façade reflection and correction factors of effects due to gradient, distance, view angle, road surface and barriers.

**5.6.3.2** In preparation for noise prediction, the project roads and existing roads within the assessment area have been included in the model with parameters of road width, surface type, and traffic condition.

**5.6.3.3** The computer programme, RoadNoise 2000, has been used to model traffic noise from road networks. It complies with the Calculation of Road Traffic Noise (CRTN) developed by the UK Department of Transport. The road traffic noise will be presented in terms of noise levels exceeded for 10% of the one-hour period during peak traffic flow [ie  $L_{10(1hr)}$  dB(A)].



**5.6.3.4** The future road traffic noise, under both unmitigated and mitigated scenarios, have been calculated based on peak hourly traffic for the maximum traffic projected within the next 15 years upon commencement of operation of the proposed road network of the Project. Since the commissioning year of the proposed road network will be in Year 2022, the assessment year for road traffic noise is taken as Year 2037 (which is the maximum traffic projection within 15 years upon operation of the proposed road networks and the induced traffic due to the Project will be capped after Year 2032). The assessment year for prevailing scenario would be the year prior to commencement of road construction works, i.e. Year 2016. **Figure 5.6.1** shows the 300m from the boundary of the Project and the associated road works for the assessment.

**5.6.3.5** Where the predicted noise impact exceeds the noise criteria, direct mitigation measures shall be considered on the project roads to reduce the noise from the project roads to a level that:

- it is not higher than the standard; and
- it has no significant contribution to the overall noise from other existing roads, if the cumulative noise level, i.e. noise from the project roads together with other existing roads exceeds the standard (i.e. less than 1.0 dB(A)).

## **5.6.4 Modelling Scenarios**

**5.6.4.1** The road traffic noise impact assessment of the Project has been conducted with respect to the criteria set in Annex 5 of the TM (see **Section 5.1**). It includes the following scenarios and details of the traffic forecast under these conditions are presented in **Appendix 5.10**.

- Unmitigated scenario at assessment year (Year 2037); and
- Mitigated scenario at assessment year (Year 2037).

**5.6.4.2** In general, the road traffic noise impact induced by the Project during typical normal day will be assessed in an EIA. Given the nature of this Project for which most of the visitors will be visiting the Sandy Ridge Cemetery during Ching Ming and Chung Yeung festive days, the impacts during the festive days have also been assessed.

**5.6.4.3** As discussed in **Section 5.6.3**, the assessment year for road traffic noise assessment is Year 2037. The predicted traffic flow in Year 2037 for the following two scenarios have been considered.

- With Project during normal days (With\_N); and
- With Project during festive days (With\_F).

**5.6.4.4** The traffic flow prediction adopted in the EIA study has been endorsed by the Transport Department (see **Appendix 5.10a**).

## 5.6.5 Prediction and Evaluation of Environmental Impacts at representative NSRs

- 5.6.5.1** Road traffic noise calculations have been conducted for the 2 scenarios as discussed in **Section 5.6.4**, before any mitigation measures are implemented. Computer plots of the 2 scenarios are shown in **Appendix 5.11**.
- 5.6.5.2** In order to determine the road traffic noise impact on representative NSRs in the vicinity, results for With Project scenario during both normal and festive days' are calculated (see **Appendix 5.12**). As the Project involves modification of Sha Ling Road and widening of the western section of Lin Ma Hang Road, these two sections of roads are classified as Project Roads in the road traffic noise impact assessment. Major existing roads in the assessment area include Lo Wu Station Road and Man Kam To Road.
- 5.6.5.3** Detailed road traffic noise impact assessment results for different floor levels and façade directions of each NSR for the unmitigated case are shown in **Appendix 5.12**.
- 5.6.5.4** For the purpose of presentation, the overall noise level of each NSR (considering all assessment façade directions/floor for that NSR) will be presented. In case the overall noise level under With Project scenario meet the respective noise criterion (i.e. 70 dB(A)), the maximum overall noise level is presented.
- 5.6.5.5** On the other hand, if the overall noise level of the NSR (considering all assessment façade directions/floor for that NSR) exceeds the respective noise criterion (i.e. 70 dB(A)), this assessment point is considered to be potentially impacted by the Project or existing traffic. **Table 5.14a** and **5.14b** summarise the unmitigated assessment results during normal days and festive days respectively.

### Existing NSRs – Normal days

- 5.6.5.6** According to **Table 5.14a**, with the Project implemented, the overall noise levels of N5-5, N5-6, N9-1, N18-1 to N18-6 and N19-1 would exceed the criterion of 70dB(A), in the range of 72 – 76dB(A).
- 5.6.5.7** For the remaining NSRs, the noise levels are within the 70dB(A) criterion.

### Existing NSRs - Festive days

- 5.6.5.8** According to **Table 5.14b**, with the Project implemented, the overall noise levels on NSRs N5-2, N5-5, N5-6, N9-1, N18-1 to N18-6 and N19-1, would exceed the noise criterion of 70dB(A), in the range of 72 -76dB(A).
- 5.6.5.9** For the remaining NSRs, the noise levels are within the 70dB(A) criterion.

### Planned NSRs – Normal days

- 5.6.5.10** As seen from **Table 5.14a**, with the Project implemented, the overall noise levels of all planned receivers N23-P1 to N23-P5 exceeded the criterion of 70dB(A), in the range of 71 – 72dB(A).

**Planned NSRs – Festive days**

- 5.6.5.11** As seen from **Table 5.14b**, with the Project implemented, the overall noise levels of all planned receivers N23-P1 to N23-P5 would exceed the criterion of 70dB(A) at 75dB(A).

**Summary**

- 5.6.5.12** To conclude, according to the unmitigated assessment results, for NSRs N5-2, N5-5, N5-6, N9-1, N18-1 to N18-6, N19-1 and N23-P1 to N23-P5, the road traffic noise levels at these NSRS would exceed the criterion of 70dB(A).

**Table 5.14a** Unmitigated results of NSRs affected by Project Road during normal days (Year 2037)

NSR	Location <sup>[1,2]</sup>	NSR ID	Uses <sup>[3]</sup>	Criterion L <sub>10</sub> (1 hr), dB(A)	Predicted L <sub>10</sub> (1 hr), dB(A) <sup>[4][6]</sup>
N5	Village houses to the west of Sha Ling Road	N5-1	R	70	59
		N5-2			66
		N5-3			70
		N5-4			62
		N5-5			72
		N5-6			73
N9	Village house to the north of Man Kam To Road	N9-1	R	70	74
N10	Village houses to the east of Sha Ling Road	N10-1	R	70	63
		N10-4			60
		N10-5			62
		N18-1			74
		N18-2			75
N18	Village houses near San Uk Ling	N18-3	R	70	76
		N18-4			75
		N18-5			76
		N18-6			72
		N18-7			70
		N18-8			64
		N18-9			69
		N19-1			73
		N19-2			70
N19-3	69				
N19	Village houses opposite to San Uk Ling	N19-1	R	70	73
		N19-2			70
		N19-3			69
N20	Village houses to the northeast of San Uk Ling	N20-1	R	70	65
		N20-2			69
		N20-3			69
N21	Village houses of Muk Wu	N21-1	R	70	66
		N21-2			65
		N21-3			62

NSR	Location <sup>[1,2]</sup>	NSR ID	Uses <sup>[3]</sup>	Criterion L <sub>10</sub> (1 hr), dB(A)	Predicted L <sub>10</sub> (1 hr), dB(A) <sup>[4][6]</sup>	
N23	Village houses of Muk Wu Nga Yiu <sup>[5]</sup>	N21-4			64	
		N23-1			64	
		N23-2			62	
		N23-3			61	
		N23-4			67	
		N23-5			65	
		N23-6			63	
		N23-7			64	
		N23-P1		R	70	71
		N23-P2				71
		N23-P3				72
		N23-P4				71
		N23-P5				71

Note:

- [1] The assessment will only include NSRs which rely on opened windows for ventilation.
- [2] The first layer of NSRs which are most affected by the project within 300m from Project boundary is included.
- [3] R – Residential Premises.
- [4] Noise levels presented are rounded to the nearest dB(A). Bold value denotes non-compliance TM-EIAO's criteria.
- [5] Planned NSRs are assigned within the "V" zone in N23.
- [6] The overall noise levels for each NSR presented in the above table are separately selected for unmitigated and mitigated scenario. (e.g. if overall noise level < 70dB(A), the facade with maximum noise level will be presented. If overall noise level > 70dB(A), the facade with maximum project road noise level / project road contribution will be presented.)

**Table 5.14b** Unmitigated results of NSRs affected by Project Road during festive days (Year 2037)

NSR	Location <sup>[1,2]</sup>	NSR ID	Uses <sup>[3]</sup>	Criterion L <sub>10</sub> (1 hr), dB(A)	Predicted L <sub>10</sub> (1 hr), dB(A) <sup>[4] [6]</sup>
N5	Village houses to the west of Sha Ling Road	N5-1	R	70	68
		N5-2			74
		N5-3			70
		N5-4			67
		N5-5			76
		N5-6			74
N9	Village house to the north of Man Kam To Road	N9-1	R	70	75
N10	Village houses to the east of Sha Ling Road	N10-1	R	70	65
		N10-4			66
		N10-5			64
		N18-1			73
N18	Village houses near San Uk Ling	N18-2	R	70	73
		N18-3			75
		N18-4			74
		N18-5			76
		N18-6			72
		N18-7			69
		N18-8			63
		N18-9			69
		N19-1			73
N19	Village houses opposite to San Uk Ling	N19-2	R	70	70
		N19-3			69
		N20-1			64
N20	Village houses to the northeast of San Uk Ling	N20-2	R	70	69
		N20-3			70
		N21-1			67
N21	Village houses of Muk Wu	N21-2	R	70	66
		N21-3			64

NSR	Location <sup>[1,2]</sup>	NSR ID	Uses <sup>[3]</sup>	Criterion L <sub>10</sub> (1 hr), dB(A)	Predicted L <sub>10</sub> (1 hr), dB(A) <sup>[4] [6]</sup>	
N23	Village houses of Muk Wu Nga Yiu <sup>[5]</sup>	N21-4			65	
		N23-1			65	
		N23-2			63	
		N23-3			64	
		N23-4			70	
		N23-5			69	
		N23-6			67	
		N23-7			67	
		N23-P1		R	70	<b>75</b>
		N23-P2				<b>75</b>
		N23-P3				<b>75</b>
		N23-P4				<b>75</b>
		N23-P5				<b>75</b>

Note:

- [1] The assessment will only include NSRs which rely on opened windows for ventilation.
- [2] The first layer of NSRs which are most affected by the project within 300m from Project boundary is included.
- [3] R – Residential Premises.
- [4] Noise levels presented are rounded to the nearest dB(A). Bold value denotes non-compliance TM-EIAO's criteria.
- [5] Planned NSRs are assigned within the "V" zone in N23.
- [6] The overall noise levels for each NSR presented in the above table are separately selected for unmitigated and mitigated scenario. (e.g. if overall noise level < 70dB(A), the facade with maximum noise level will be presented. If overall noise level > 70dB(A), the facade with maximum project road noise level / project road contribution will be presented.)

## 5.6.6 Mitigation Measures

### Direct Mitigation Measures

- 5.6.6.1** Exceedance of noise criteria as set in Table 1A of Annex 5, TM-EIAO are found in various existing and planned NSRs and direct noise mitigation measures should therefore be recommended. The consideration of noise mitigation measures has followed Annex 13 of TM-EIAO and EIAO Guidance Note “Road Traffic Noise Impact Assessment under the Environmental Impact Assessment Ordinance” [GN 12/2010] <sup>[5-2]</sup>.
- 5.6.6.2** As mentioned in **Section 5.6.5**, a number of existing NSRs (N5-2, N5-5, N5-6, N9-1, N18-1 to N18-6, N19-1) and planned NSRs (N23-P1 to N23-P5) would require mitigation measures according to the justifications mentioned. In order to alleviate the noise impacts as far as practicable, absorptive noise barriers (ANB) as defined in the *Guidelines on Design of Noise Barriers* <sup>[5-3]</sup> and low noise surfacing materials have been considered and investigated as direct at-source mitigation measures.
- 5.6.6.3** In view of practicability, the use of permanent noise mitigation measures in form of noise barriers along Sha Ling Road and Lin Ma Hang Road, as well as low noise surfacing materials on sections of Lin Ma Hang Road are considered as effective mitigation measures. Issues and concerns such as user accessibility, road gradient, line of sight at road junctions, construction practicability and engineering matters have been considered during the configuration of the recommended noise mitigation measures. These have all been confirmed by Engineers.
- 5.6.6.4** The recommended noise barriers and low noise surfacing materials for affected existing NSRs and planned NSRs are shown in **Figure 5.6.9** to **Figure 5.6.11** and **Figure 5.6.12** to **Figure 5.6.13** respectively. Details are summarised in the tables below.

**Table 5.15a** Summary of mitigation measures for road traffic noise impact (Existing NSRs)

Mitigation Measure ID	Location	Type of Noise Barrier <sup>(1)</sup>	Key NSRs Protected
MM1	Along Sha Ling Road	Approx. 12m long, 2.5m high ANB	N5-2
MM2	Along Sha Ling Road	Approx. 92m long, 2.5m high ANB	N5-5 and N5-6
MM3	Along Project Road near Sha Ling Road	Approx. 28m long, 3m high ANB	N9-1
MM4	Along Project Road near Sha Ling Road	Approx. 51m long, 3m high ANB	N9-1
MM5	Along Lin Ma Hang Road near San Uk Ling	Approx. 25m long, 4m high ANB	N18-1, N18-2, N18-3, N18-4, N18-5, N18-6
MM6	Along Lin Ma Hang Road near San Uk Ling	Approx. 21m long, 4m high ANB	N18-1, N18-2, N18-3, N18-4, N18-5, N18-6



Mitigation Measure ID	Location	Type of Noise Barrier <sup>[1]</sup>	Key NSRs Protected
MM7	Along Lin Ma Hang Road near San Uk Ling	Approx. 14m long, 4m high ANB	N18-1, N18-2, N18-3, N18-4, N18-5, N18-6
MM8	Along Lin Ma Hang Road near San Uk Ling	Approx. 18m long, 3m high ANB	N18-5, N18-6
MM9	Along temporary pullover space opposite San Uk Ling	Approx. 42m long, 3m high ANB	N19-1
MM10	Along Lin Ma Hang Road opposite San Uk Ling	Approx. 93m long, 3m high ANB	N19-1
MM11	Along Lin Ma Hang Road near San Uk Ling	Approx. 185m long, Low Noise Surfacing Materials	N18-1, N18-2, N18-3, N18-4, N18-5, N18-6

Note:

[1] ANB – Absorptive noise barrier (About 1m of lower portion will be absorptive).

**Table 5.15b** Summary of mitigation measures for road traffic noise impact (Planned NSRs)

Mitigation Measure ID	Location	Type of Noise Barrier <sup>[1]</sup>	Key NSRs Protected
MM12	Along Lin Ma Hang Road near Muk Wu Nga Yiu <sup>[2]</sup>	Approx. 36m long, 5m high ANB	N23-P1, N23-P2
MM13	Along Lin Ma Hang Road near Muk Wu Nga Yiu <sup>[2]</sup>	Approx. 47m long, 5m high ANB	N23-P1, N23-P2, N23-P3
MM14	Along Lin Ma Hang Road near Muk Wu Nga Yiu <sup>[2]</sup>	Approx. 31m long, 5m high ANB	N23-P1, N23-P2, N23-P3
MM15	Along Lin Ma Hang Road near Muk Wu Nga Yiu <sup>[2]</sup>	Approx. 31m long, 5m high ANB	N23-P4
MM16	Along Lin Ma Hang Road near Muk Wu Nga Yiu <sup>[2]</sup>	Approx. 41m long, 5m high ANB	N23-P5
MM17	Along Lin Ma Hang Road near Muk Wu Nga Yiu <sup>[2]</sup>	Approx. 340m long, Low Noise Surfacing Materials	N23-P1, N23-P2, N23-P3, N23-P4, N23-P5

Note:

[1] ANB – Absorptive noise barrier (About 1m of lower portion will be absorptive).

[2] Planned NSRs are assigned within the "V" zone in N23.

**5.6.6.5** Other than the mitigation measures proposed in **Table 5.15**, an environmental review may be conducted to review latest available technology in due course to study on how the use of low noise surfacing materials could help reduce road traffic noise impacts and minimize the scale / extent of the proposed noise mitigation measures.

**5.6.6.6** With the implementation of recommended noise mitigation measures, the mitigated assessment results are shown in **Table 5.16a** and **5.16b**. Detailed mitigated assessment results for different façade directions/floors of each NSR for shown in **Appendix 5.13**.

**Existing NSRs – Normal Days**

**5.6.6.7** After the implementation of exhaustive and practicable mitigation measures with the Project in place (see **Table 5.16a**), N5-5, N18-5, N18-6 and N19-1 would comply with the noise criterion of 70dB(A).

**5.6.6.8** For N5-6, N9-1, N18-1, N18-2, N18-3 and N18-4, the overall noise level exceeded the noise criterion of 70dB(A), in the range of 71 – 77dB(A), and will have residual impacts.

**Existing NSRs – Festive Days**

**5.6.6.9** Amongst the NSRs that require mitigation measures, after the implementation of exhaustive and practicable mitigation measures with the Project in place (see **Table 5.16b**), N5-2, N5-5, N18-4, N18-5, N18-6 and N19-1, would comply with the noise criterion of 70dB(A).

**5.6.6.10** For N5-6, N9-1, N18-1, N18-2 and N18-3, the overall noise level exceeded the noise criterion of 70dB(A), in the range of 71 – 76dB(A), and will have residual impacts.

**Planned NSRs – Normal Days**

**5.6.6.11** As seen from **Table 5.16a**, after mitigation measures are implemented, all planned receivers N23-P1 to N23-P5 would comply with the criterion of 70dB(A).

**Planned NSRs – Festive Days**

**5.6.6.12** As seen from **Table 5.16b**, after mitigation measures are implemented, all planned receivers N23-P1 to N23-P5 would comply with the criterion of 70dB(A).

**Summary**

**5.6.6.13** To conclude, according to the mitigated assessment results, 6 NSRs (i.e. N5-6, N9-1, N18-1, N18-2, N18-3 and N18-4) will have residual impacts.

**5.6.6.14** After the implementation of recommended mitigation measures, the number of dwellings benefitted are about 30 during both normal days and festive days. On the other hand, the number of protected dwellings are about 25 during both normal days and festive days. The number of dwellings that would still exceed the noise criterion of 70dB(A) after the recommended mitigation measures is about 30. The summary of types of dwellings benefitted, protected and still exceed the noise criterion is tabulated in **Table 5.15c** below.

**Table 5.15c** Summary of type of dwellings after mitigation measures

Type of dwellings	Number
Benefitted	30
Protected	25
Still exceed noise criterion 70dB(A)	30

**Table 5.16a** Mitigated assessment results of NSRs during normal days (Year 2037)

NSR	Location <sup>[1,2]</sup>	NSR ID	Uses <sup>[3]</sup>	Criterion L <sub>10</sub> (1 hr), dB(A)	Predicted L <sub>10</sub> (1 hr), dB(A) [4] [6]	Project Road Noise Level, dB(A)	Project Road Contribution, dB(A)
N5	Village houses to the west of Sha Ling Road	N5-1	R	70	59	58	6.8
		N5-2			62	56	1.5
		N5-3			69	49	0.1
		N5-4			61	50	0.4
		N5-5			70	52	0.1
		N5-6			72	53	0.1
N9	Village house to the north of Man	N9-1	R	70	73	53	0.0
		N10-1			63	52	0.3
N10	Village houses to the east of Sha Ling Road	N10-4	R	70	60	54	1.6
		N10-5			62	52	0.4
		N18-1			77	63	0.2
N18	Village houses near San Uk Ling	N18-2			74	58	0.1
		N18-3			73	62	0.5
		N18-4			71	62	0.7
		N18-5	R	70	70	68	4.0
		N18-6			66	65	7.3
		N18-7			62	59	2.5
		N18-8			58	52	1.2
N19	Village houses opposite to San Uk Ling	N18-9			67	67	66.6
		N19-1			70	63	1.0
		N19-2	R	70	68	67	6.3
N20	Village houses to the northeast of San Uk Ling	N19-3			67	66	7.1
		N20-1			61	60	10.0
		N20-2	R	70	68	68	9.5
		N20-3			69	69	14.8
N21	Village houses of Muk Wu	N21-1			66	65	8.1
		N21-2			65	65	65.2
		N21-3	R	70	62	62	23.9
		N21-4			63	63	19.4

NSR	Location <sup>[1,2]</sup>	NSR ID	Uses <sup>[3]</sup>	Criterion L <sub>10</sub> (1 hr), dB(A)	Predicted L <sub>10</sub> (1 hr), dB(A) [4] [6]	Project Road Noise Level, dB(A)	Project Road Contribution, dB(A)
N23	Village houses of Muk Wu Nga Yiu <sup>[5]</sup>	N23-1	R	70	64	64	63.7
		N23-2			61	61	61.0
		N23-3			58	58	58.0
		N23-4			61	61	60.6
		N23-5			59	59	59.1
		N23-6			55	55	55.1
		N23-7			61	61	60.9
		N23-P1			63	63	63.2
		N23-P2			64	64	64.3
		N23-P3			65	65	64.8
		N23-P4			63	63	62.7
N23-P5	61	61	61.3				

**Note:**

[1] The assessment will only include NSRs which rely on opened windows for ventilation.

[2] NSRs that require mitigation measures are included.

[3] R – Residential Premises.

[4] Noise levels presented are rounded to the nearest dB(A). Bold value denotes non-compliance TM-EIAO's criteria.

[5] Planned NSRs are assigned within the "V" zone in N23.

[6] The overall noise levels for each NSR presented in the above table are separately selected for unmitigated and mitigated scenario. (e.g. if overall noise level < 70dB(A), the facade with maximum noise level will be presented. If overall noise level > 70dB(A), the facade with maximum project road noise level / project road contribution will be presented.)

**Table 5.16b** Mitigated assessment results of NSRs during festive days (Year 2037)

NSR	Location <sup>[1,2]</sup>	NSR ID	Uses <sup>[3]</sup>	Criterion L <sub>10</sub> (1 hr), dB(A)	Predicted L <sub>10</sub> (1 hr), dB(A) [4] [6]	Project Road Noise Level, dB(A)	Project Road Contribution, dB(A)
N5	Village houses to the west of Sha Ling Road	N5-1	R	70	68	68	17.7
		N5-2			67	67	8.8
		N5-3			68	59	0.6
		N5-4			63	60	3.8
		N5-5			70	63	0.9
		N5-6			71	63	0.7
N9	Village house to the north of	N9-1	R	70	72	64	0.8
N10	Village houses to the east of Sha Ling Road	N10-1	R	70	65	63	4.1
		N10-4			66	66	9.9
		N10-5			64	62	4.4
		N18-1			76	63	0.2
N18	Village houses near San Uk Ling	N18-2	R	70	73	58	0.2
		N18-3			71	62	0.6
		N18-4			68	62	1.2
		N18-5			69	68	6.0
		N18-6			66	65	11.6
		N18-7			61	59	4.3
		N18-8			56	52	2.3
		N18-9			67	67	67.0
		N19-1			67	63	2.3
		N19-2			68	68	10.0
N19-3	67	67	10.5				
N19	Village houses opposite to San Uk Ling	N19-1	R	70	61	60	12.9
N19-2	69	69			14.2		
N19-3	70	70			19.7		
N20	Village houses to the northeast of San Uk Ling	N20-1	R	70	66	66	13.0
		N20-2			66	66	66.5
		N20-3			64	63	26.1
		N21-1			65	64	21.8
N21	Village houses of Muk Wu	N21-2	R	70	66	66	66.5
		N21-3			64	63	26.1
		N21-4			65	64	21.8

NSR	Location <sup>[1,2]</sup>	NSR ID	Uses <sup>[3]</sup>	Criterion L <sub>10</sub> (1 hr), dB(A)	Predicted L <sub>10</sub> (1 hr), dB(A) [4] [6]	Project Road Noise Level, dB(A)	Project Road Contribution, dB(A)
N23	Village houses of Muk Wu Nga Yiu <sup>[5]</sup>	N23-1	R	70	65	65	65.1
		N23-2			63	63	62.5
		N23-3			60	60	59.9
		N23-4			63	63	63.3
		N23-5			62	62	62.0
		N23-6			59	59	58.6
		N23-7			65	65	64.5
		N23-P1			66	66	66.4
		N23-P2			68	68	67.9
		N23-P3			68	68	68.3
		N23-P4			66	66	66.2
		N23-P5			65	65	64.8

**Note:**

[1] The assessment will only include NSRs which rely on opened windows for ventilation.

[2] NSRs that require mitigation measures are included.

[3] R – Residential Premises.

[4] Noise levels presented are rounded to the nearest dB(A). Bold value denotes non-compliance TM-EIAO's criteria.

[5] Planned NSRs are assigned within the "V" zone in N23.

[6] The overall noise levels for each NSR presented in the above table are separately selected for unmitigated and mitigated scenario. (e.g. if overall noise level < 70dB(A), the facade with maximum noise level will be presented. If overall noise level > 70dB(A), the facade with maximum project road noise level / project road contribution will be presented.)

## 5.6.7 Indirect Mitigation Measures

**5.6.7.1** As mentioned in **Section 5.6.6**, all possible direct noise mitigation measures, including the use of absorptive noise barriers (ANB) and low noise surfacing materials, have been exhausted. It has considered the engineering feasibility, operational practicability and site constraints during the formulation of direct noise mitigation measures. The detailed assessment for indirect mitigation measures is shown in **Appendix 5.14**. In summary, indirect mitigation measures at the concerned NSRs are not required.

## 5.6.8 Residual Environmental Impacts

**5.6.8.1** During the operational phase, the road traffic noise impact arising from the Project are recommended to be mitigated by implementing the noise barriers and low noise surfacing materials at the suggested locations shown in **Figure 5.6.9** to **Figure 5.6.13**. After exhausting all practicable mitigation measures, all NSRs except N5-6, N9-1, N18-1, N18-2, N18-3 and N18-4 would comply with the noise criterion of 70dB(A).

**5.6.8.2** For the above NSRs with residual traffic noise impacts, the contribution of traffic noise from the project roads are insignificant (i.e. smaller than 1.0dB(A)) as shown in **Appendix 5.14**. Exceedances at these concerned NSRs are due to traffic noise from the existing Man Kam To Road. Besides, the mitigated noise impacts with Project in place would be less than that in prevailing scenario at Year 2016. Hence, it is anticipated that traffic noise impacts of the Project (with mitigation measures in place) would be less than that of without the Project.

**5.6.8.3** Upon exhaust of all practicable direct mitigation measures, evaluation of the residual impacts for the concerned NSRs has been carried out in accordance with Section 4.4.3 of the TM-EIAO in the **Appendix 5.15**.

**5.6.8.4** Residual traffic noise impacts are observed at some of the NSRs as shown **Appendix 5.14**, it is considered that the project roads are within the noise criteria of 70dB(A) at all NSRs. Exceedances are due to traffic noise from the major existing road Man Kam To Road. In addition, with the implementation of the recommended mitigation measures, the mitigated noise impacts with Project in place is less than that in prevailing scenario at Year 2016 according to **Appendix 5.14**. Hence, it is anticipated that traffic noise impacts of the Project (with mitigation measures in place) would be less than that of without the Project. In summary, with the implementation of the direct mitigation measures recommended in **Section 5.6.6**, the project would help to alleviate the traffic noise at the concerned NSRs in long run. Therefore, the residual impacts are not significant as assessed against the criteria indicated in **Appendix 5.15**.

## 5.7 Conclusion

**5.7.1.1** For construction phase, construction noise assessment has been conducted. All the practicable mitigation measures including use of quiet plant, acoustic mat, movable noise barrier, full enclosure and scheduling of works have already been applied and exhausted on these construction activity. All NSRs have been mitigated to within the criterion.

**5.7.1.2** For operational phase, the road traffic noise impact arising from the Project could be mitigated by implementing the recommended noise barriers and low noise surfacing materials at the suggested locations shown in **Figure 5.6.9** to **Figure 5.6.13**. Although exceedance is still found in a few NSRs after the exhaustion of direct mitigation measures, the concerned NSRs do not fulfil the testing criteria and are not eligible for indirect mitigation measure.

**5.7.1.3** Residual traffic noise impact at the concerned NSRs has been evaluated. It is considered that the project roads have met the noise criterion of 70dB(A) at all NSRs. Exceedances are due to traffic noise from the existing Man Kam To Road. In addition, with the implementation of recommended mitigation measures, the road traffic noise impacts of the Project would be less than that of without the Project. With the implementation of the direct mitigation measures recommended in **Section 5.6.6**, the project would help to alleviate the traffic noise in long run. Therefore, the residual impacts are not significant.

## 5.8 References

- [5-1] EPD (2010), EIAO Guidance Note No. 9/2010 on “Preparation of Construction Noise Impact Assessment – Under the Environmental Impact Assessment Ordinance”.
- [5-2] EPD (2010), EIAO Guidance Note No. 12/2010 on “Road Traffic Noise Impact Under the Environmental Impact Assessment Ordinance”.
- [5-3] EPD and HyD (2003), Guidelines on Design of Noise Barriers.