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## 4. Noise Impact

### 4.1 Legislation, Standards and Guidelines

#### 4.1.1 General

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

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

#### 4.1.2 Construction Noise

##### Airborne Construction Noise During Non-restricted Hours

4.1.2.1 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.

4.1.2.2 For general construction works other than percussive piling works using Powered Mechanical Equipment (PME), there is no statutory limit on construction noise during non-restricted hours (i.e 07:00 – 19:00 on any day not being a Sunday or general holiday), under the NCO and related TMs. There is statutory control on construction noise between the hours 1900 and 0700 from Monday to Saturday and at any time on general holidays (including Sundays), i.e. restricted hours, under the NCO. To ensure a better environment, the EIAO-TM promulgated under the EIAO has imposed more stringent criteria. Daytime general construction works (excluding percussive piling) between the hours 0700 and 1900 on weekdays, i.e. non-restricted hours, is controlled under the EIAO. The EIAO-TM stipulates criteria of 65 – 75dB(A) for daytime construction activities, as shown in **Table 4.1**.

**Table 4.1 Noise standards for daytime construction activities**

Uses	Noise Standards <sup>[1], [2]</sup> , $L_{eq(30min)}$ dB(A)
	0700 – 1900 hours on any day not being a Sunday or general holiday
<ul style="list-style-type: none"><li>• All domestic premises;</li><li>• Temporary housing accommodation;</li><li>• Hostels</li></ul>	75

Uses	Noise Standards <sup>[1], [2]</sup> , $L_{eq(30min)}$ dB(A)
	0700 – 1900 hours on any day not being a Sunday or general holiday
<ul style="list-style-type: none"> <li>• Convalescent homes; and</li> <li>• Homes for the aged</li> </ul>	
<ul style="list-style-type: none"> <li>• Places of public worship;</li> <li>• Courts of law; and</li> <li>• Hospitals and medical clinics</li> </ul>	70
Educational institutions (including kindergartens and nurseries)	70 65 (During examination)

Notes:

[1] The above standards apply to uses that rely on opened windows for ventilation and are assessed at 1m from the external facade.

[2] A Construction Noise Permit (CNP) shall be required for the carrying out of the construction work during restricted hours under the Noise Control Ordinance (NCO). In case the applicant would like to evaluate whether construction works in restricted hours as defined under the NCO is feasible or not in the context of programming construction works, reference should be made to relevant technical memoranda issued under the NCO.

4.1.2.3 In addition, reference has been made to EIAO Guidance Note No. 09/2010 on “Preparation of Construction Noise Impact Assessment under the Environmental Impact Assessment Ordinance”.

#### Airborne Construction Noise during Restricted Hours

4.1.2.4 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 PME for construction works during restricted hours would require a Construction Noise Permit (CNP). The GW–TM details the procedures adopted by the Noise Control Authority 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.

4.1.2.5 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 also controlled by the DA–TM. Construction plant or equipment classified as SPME under the DA–TM 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, loading, unloading or handling of rubble, wooden boards, steel bars, wood or scaffolding material.

4.1.2.6 The DA–TM details the procedures that are adopted by the Noise Control Authority for assessing the use of SPME during restricted hours and for determining whether a CNP would be issued.

4.1.2.7 Noise from construction activities during restricted hours at affected Noise Sensitive Receivers (NSRs) are controlled under the TMs and shall not generally exceed the specified Acceptable Noise Levels (ANLs). These ANLs are obtained with corrections for

the duration of the CNP and multiple permit situations, if applicable, to the Basic Noise Levels (BNLs). The BNLs are stipulated in accordance with the Area Sensitivity Ratings established for the NSRs. The BNLs for construction works in Designated Areas are more stringent than those given in the GW–TM and summarised in **Table 4.2**.

**Table 4.2 BNLs for construction during restricted hours**

Time Period	BNLs for Area Sensitive Ratings [1], 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:*

[1] Figures in brackets are BNLs for SPME construction work in designated areas.

4.1.2.8 As defined in the Noise Control (Construction Work Designated Areas) Notice Plan No. EPD/AN/NT–01 & EPD/AN/NT–03, Lam Tei areas such as Tsoi Yuen Tsuen, Fuk Hang Tsuen; Tuen Mun area such as Kam Fai Garden, Sam Shing Hui, Siu Shan Court, Wu King Estate, etc; are within the Designated Area (DA).

4.1.2.9 Despite any description made in this 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 in it any conditions as appropriate. Failure to comply with any such conditions will lead to cancellation of the CNP and prosecution under the NCO.

### Blasting

4.1.2.10 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 Mining Ordinance (Cap. 285) / Dangerous Goods Ordinance (Cap. 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 EIAO–TM.

### Groundborne Construction Noise during Non-restricted Hours

4.1.2.11 Noise arising from general construction works that may generate groundborne noise during normal hours is governed by the EIAO–TM under the EIAO and summarized in **Table 4.1**. The IND–TM 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.

4.1.2.12 Based on the same principle for the groundborne noise criteria (i.e. ANL–10 dB(A) under the IND–TM), the groundborne construction noise levels inside domestic premises and schools shall be limited to 65 dB(A) and 60 dB(A) respectively when compared to the EIAO–TM. A summary of groundborne construction noise criteria during normal working days is given in **Table 4.3**.

**Table 4.3 Groundborne construction noise criteria**

Uses	Noise Criteria, dB(A)		
	0700 to 1900 hours on any day not being a Sunday or general holiday		
<ul style="list-style-type: none"> <li>All domestic premises;</li> <li>Temporary housing accommodation;</li> <li>Hostels;</li> <li>Convalescent homes; and</li> <li>Homes for the aged</li> </ul>	65		
<ul style="list-style-type: none"> <li>Places of public worship;</li> <li>Courts of law; and</li> <li>Hospitals and medical clinics</li> </ul>	60		
Educational institutions (including kindergartens and nurseries)	60 55 (During examination)		

#### Groundborne Construction Noise During Restricted Hours

4.1.2.13 Similar to airborne construction noise during restricted hours, NCO also provides statutory control of construction work for groundborne noise during restricted hours. As discussed in the above section, same principle for groundborne noise criteria (i.e. ANL–10dB(A) under the IND–TM) shall be adopted. Therefore, table below summarizes the groundborne construction noise criteria during restricted hours.

**Table 4.4 Construction groundborne noise criteria during restricted hours**

Time Period	Noise Criteria, dB(A) 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)	50	55	60
All days during the night–time (2300 to 0700 hours)	35	40	45

### 4.1.3 Operational Noise

4.1.3.1 The EIAO–TM (Annex 5 of TM) has stipulated the noise standards for various noise sources as shown in the following **Table 4.5**. It should, however, be noted that the following noise criteria are only applicable to uses that rely on opened windows for ventilation.

**Table 4.5 Noise standards for operational phase**

Common Uses	Noise Standards <sup>[1]</sup>	
	Road Traffic Noise L10 (1hour) dB(A)	Fixed Noise Sources
<ul style="list-style-type: none"> <li>All domestic premises;</li> <li>Temporary housing accommodation;</li> <li>Hostels;</li> <li>Convalescent homes; and</li> <li>Homes for the aged</li> </ul>	70	(a) 5dB(A) below the appropriate ANLs shown in the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites, or
<ul style="list-style-type: none"> <li>Educational institutions (including kindergartens and nurseries)</li> <li>Places of public worship;</li> <li>Courts of law</li> </ul>	65	(b) the prevailing background noise levels (For quiet areas with noise level 5 dB(A) below the ANL)
Hospitals and medical clinics	55	

Notes:

[1] The above standards, or equivalent, apply to uses which rely on opened windows for ventilation and are assessed at 1m from the external facade.

### Road Traffic Noise

4.1.3.2 The criteria for assessing road traffic noise are given in the EIAO–TM and tabulated in **Table 4.5**. For domestic premises, temporary housing accommodation, hostels, convalescent homes and homes for the aged, the criterion is 70dB(A). For educational institutes, places of worship and courts of law, the criterion is 65dB(A). For hospitals and medical clinics, a more stringent criterion of 55dB(A) is stipulated. It should be noted that all these criteria only apply to NSRs that rely on opened windows for ventilation. In addition, reference has been made on EIAO Guidance Note No. 12/2010 on “Road Traffic Noise Impact Assessment under the Environmental Impact Assessment Ordinance”.

### Fixed Noise Sources

4.1.3.3 Operational noise from fixed noise sources is controlled under the IND–TM. To plan for a better environment, the EIAO–TM has specified the following requirements for the planned fixed noise sources, whichever is more stringent.

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

4.1.3.4 The ANLs for different Area Sensitivity Ratings during different periods are summarised in the **Table 4.6**.

**Table 4.6 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

4.1.3.5 For assessing fixed noise sources, the Area Sensitivity Ratings at the NSRs are defined in accordance with the IND-TM.

## 4.2 Baseline Conditions

### 4.2.1 Description of Noise Environment

4.2.1.1 The Project is an approximately 10km connection roads with open roads, tunnel and viaducts to enhance the connectivity between Lam Tei, Tuen Mun Area 40 and Pillar Point. The Project covers Lam Tei, Tai Lam Country Park, Tuen Mun Area 40 and Pillar Point.

4.2.1.2 An interchange and tunnel will be constructed at Lam Tei. The areas are mainly villages and greenbelts. The noise climate at Lam Tei is dictated by the road traffic noise from Yuen Long Highway (YLH), Kong Sham Western Highway (KSWH) and noise from the existing Lam Tei Quarry.

4.2.1.3 A tunnel will be constructed from Lam Tei to Tuen Mun Area 40, which will pass through Tai Lam Country Park. The areas which tunnel passed through are mainly country park, Government Institution or Community (GIC), residential area and greenbelt. The noise climate at these area is dictated by Tuen Mun Road (TMR) and local roads.

4.2.1.4 An open road section will be constructed at Tuen Mun Area 40. The areas are mainly industrial area “I”, GIC, Other Specified Uses” (OU) and greenbelt. The noise climate at Tuen Mun Area 40 is dictated by Lung Mun Road and the industrial operations nearby.

### 4.2.2 Prevailing Noise Measurements

4.2.2.1 Prevailing noise measurements have been conducted at Lam Tei and Tuen Mun in order to capture the existing noise environment near ventilation shaft for tunnel. The prevailing noise measurements were conducted in October 2022 and the measurements locations are shown in **Figure 4.1**.  $L_{90(1hr)}$  was used as the parameter to establish the corresponding noise criteria according to HKPSG. A summary of the results is given in **Table 4.7**. These prevailing noise measurement results are adopted to identify the fixed noise sources impact assessment criteria for conservative assessment. **Appendix 4.1** shows the detailed prevailing noise measurement results.

**Table 4.7 Prevailing Noise Level Measurements**

Measurement Points		Prevailing Noise Levels (L <sub>90(1hr)</sub> ) <sup>[1]</sup> , dB(A)		
ID	Location	Day <sup>[2]</sup>	Evening <sup>[2]</sup>	Night <sup>[2]</sup>
PNM-LT	Fu Tei Ha Tsuen, Lam Tei	52 – 58	50 – 55	45 – 53
PNM-TMC	Wah Fat Street, Tuen Mun Centre	53 – 59	53 – 54	49 – 52

Notes:

[1] Noise level with 3dB(A) façade correction

[2] Day: 0700 – 1900 hours, Evening: 1900 – 2300 hours, Night: 2300 – 0700 hours.

### 4.2.3 Noise Sensitive Receivers

#### Identification of Noise Sensitive Receivers

4.2.3.1 With reference to Annex 13 of the EIAO–TM, Noise Sensitive Receivers (NSRs) include residential uses (all domestic premises including temporary housing accommodation), hostels, convalescent homes, homes for the aged, educational institutional uses (including kindergarten and nurseries), hospitals, medical clinics, places of public worship, court of law; and any other premises or places that are considered by the Director to have similar sensitivity to noise as the above.

4.2.3.2 Noise sensitive areas are identified and hatched in **Figure 4.2**. Representative NSRs within the assessment area have been then selected with the most affected layer of NSRs selected as Noise Assessment Points (NAPs) for assessment. These NSRs cover all existing sensitive developments, committed and planned NSRs during construction and operational phases of the Project.

4.2.3.3 The existing NSRs are identified by means of topographic maps, aerial photos, land status plans and site inspections. Planned / committed NSRs within the Assessment Area are identified by making reference to relevant documents as listed:

- Lam Tei and Yick Yuen Outline Zoning Plan (OZP) (No. S/TM-LTYYY/12 dated on 18 November 2022);
- Tuen Mun OZP (No. S/TM/37 dated 12 May 2023);
- So Kwun Wat OZP (No. S/TM-SKW/14 dated 30 September 2022);
- Planning Applications under S.16 / S.12a Town Planning Ordinance;
- Development Permission Area Plans and Outline Development Plans by the Planning Department (PlanD);
- Land Sale Programme published by the Lands Department (LandsD); and
- Other relevant published plans, including plans, drawings and applications by the correspondent project proponents.

4.2.3.4 Assessment area and locations of NSRs are shown in **Figure 4.2**. Identified representative NSRs within 300m assessment area for construction noise, road traffic noise and fixed noise sources impact are listed in **Table 4.8** below. Discussion on the assessment area for construction noise, road traffic noise, and fixed noise sources impact is given in **Section**

**4.3, Section 4.4 and Section 4.5** respectively. Photos of the representative existing NSRs are presented in **Appendix 4.2**.

- 4.2.3.5 For those noise sensitive areas with future potential developments without any planning information or committed site layout or intention at the time of this Study, the requirements of noise mitigation measures for addressing the potential noise issues raised by the Project should be considered under the land administration regime and where appropriate, the planning approval mechanism. Therefore, these areas are not reflected in **Table 4.8**.

**Table 4.8 NSRs within 300m Assessment Area for Construction Noise, Road Traffic Noise and Fixed Noise Sources Impact**

NSR ID	Description	Uses <sup>[1]</sup>	Number of Storeys	Construction Noise	Road Traffic Noise	Fixed Noise Sources
Existing NSR						
a. Lam Tei						
LT01	Area at/near Lo Fu Hang	R	1–3	✓	✓	✗
LT02	Area at/near Fu Tei Ha Tsuen	R	1–3	✓	✓	✓
	Temples at Fu Tei Ha Tsuen	W	1	✓	✓	✓
LT03	Village Houses near Fuk Hang Tsuen Road	R	1–3	✓	✗	✗
b. Tuen Mun West						
TMS01	Harvest Garden	R	17	✓	✗	✓
TMS02	Kam Fai Garden	R	15	✓	✗	✓
TMS03	Saint Temple at Sam Shing Hui	W	1	✓	✗	✗
TMS04	Hanford Garden	R	26 – 27	✓	✗	✗
TMS05	Sam Shing Estate	R / C / E <sup>[4]</sup>	16 – 27	✓	✗	✗
TMS06	Palm Cove	R	13 – 14	✓	✗	✗
TMS07	Tsui Ning Garden	R	35	✓	✗	✗
TMS08	Goodview Garden	R	32	✓	✗	✗
TMS09	Tuen Mun Wu Hong Clinic	C	3	✓	✗	✗
TMS10	Siu Shan Court	R	20	✓	✗	✗

NSR ID	Description	Uses <sup>[1]</sup>	Number of Storeys	Construction Noise	Road Traffic Noise	Fixed Noise Sources
	Buddhist Leung Chik Wai College	E	6	✓	X	X
TMS11	Caritas Li Ka Shing Care and Attention Home	C	4	✓	X	X
TMS12	Castle Peak Sam Chau Ma Temple	W	1	✓	X	X
TMS13	Yan Chai Hospital Ho Sik Nam Primary School	E	7	✓	X	X
c. Siu Lam						
SL01	Grandview Terrace	R	3	✓	X	X
d. Pillar Point						
_ [2]	Area near Tuen Mun West No. 2 Fresh Water Service Reservoir	NA <sup>[3]</sup>	NA <sup>[3]</sup>	X	X	X
Planned NSR						
a. Lam Tei						
_ [6]	Lam Tei North East Development (population intake is not yet available)	[6]	[6]	X	X	X
b. Tuen Mun West						
P01	Social welfare / Education facilities for Public Housing Development at Wu Shan Road	C / E <sup>[5]</sup>	2 – 3	✓	X	X

Notes:

[1] R – Residential, E – Educational Institutions, W – Place of Public Worship; C – Clinic.

[2] No sensitive use buildings that rely on opened window/door for ventilation within 300m assessment area.

[3] NA – Not Applicable

[4] As there are social welfare facilities, such as kindergarten, elderly centre, etc., located at the lower floors of the Sam Shing Estate, the uses and the relevant noise criteria are subject to the type of social welfare facilities.

[5] Social welfare facilities, such as Residential Care Home for the Elderly (RCHE), Special Child Care Centre (SCCC) etc., are provided in the non-domestic facilities of the Public Housing Development at Wu Shan Road, the uses and the relevant noise criteria are subject to the type of social welfare facilities.

[6] Lam Tei North East Development is still under Early Feasibility Study Stage, details of the Development are not yet available. As communicated with CEDD, assessments on Planned Lam Tei North East Development will be covered in its separate study.

## 4.3 Construction Noise Impact Assessment

### 4.3.1 Construction Noise Impact Assessment Methodology

4.3.1.1 As set out in Appendix C Clause 2.1.2 of the EIA SB, a qualitative assessment is required to identify the major noise sources / activities, and propose corresponding quieter construction method and equipment adopted to demonstrate that no adverse construction noise impact will be associated with the Project. A summary of key steps for this qualitative construction noise assessment that has been conducted is:

- Determine 300m from the boundary of the Project Site and associated works and temporary work site / works area;
- Identify NSRs and locate representative assessment points that may be affected by the works;
- Summarize the construction method for the key construction work;
- Collate the construction plant inventory for the key construction work;
- Evaluate the potential impact on the NSRs qualitatively;
- Examine and recommend all practical mitigation measures such as alternative construction methodology, quiet plant, silencer, enclosure, etc, to alleviate any potential noise impacts as much as practicable; and
- Consideration of noise mitigation measures will follow Annex 13 of EIAO–TM and EIAO Guidance Note “Preparation of Construction Noise Impact Assessment under the Environmental Impact Assessment Ordinance” [GN 9/2010].

### 4.3.2 Identification of Construction Noise Impact

#### Identification of Assessment Area and Noise Sensitive Receiver

4.3.2.1 The assessment area for construction noise includes an area within 300m from the gazette boundary of the Project and the work site / work areas of the Project. Representative NSRs and Noise Assessment Points (NAPs) that would be affected by the construction activities have been identified and presented in **Table 4.8** and are summarised in **Table 4.9** below. Locations of Representative NSRs and NAPs for construction noise impact assessment are shown in **Figure 4.3**.

**Table 4.9 Identified NSRs and NAPs within 300m of Construction Noise Assessment Area**

NSR ID	Description	Uses <sup>[1]</sup>	Number of Storeys	NAP ID
Existing NSR				
a. Lam Tei				
LT01	Area at/near Lo Fu Hang	R	1–3	LFH-01
LT02	Area at/near Fu Tei Ha Tsuen	R	1–3	FTT-01 – FTT-03
	Temples at Fu Tei Ha Tsuen	W	1	Te-06

NSR ID	Description	Uses <sup>[1]</sup>	Number of Storeys	NAP ID
LT03	Village Houses near Fuk Hang Tsuen Road	R	1–3	VH–13
b. Tuen Mun West				
TMS01	Harvest Garden	R	17	HAR–01
TMS02	Kam Fai Garden	R	15	KAM–01 – KAM–02
TMS03	Saint Temple at Sam Shing Hui	W	1	Te–101
TMS04	Hanford Garden	R	26 – 27	HAN–01 – HAN–02
TMS05	Sam Shing Estate	R / C / E <sup>[2]</sup>	16 – 27	SSE–01
TMS06	Palm Cove	R	13 – 14	PAC–01
TMS07	Tsui Ning Garden	R	35	TNG–01
TMS08	Goodview Garden	R	32	GOG–01
TMS09	Tuen Mun Wu Hong Clinic	C	3	cTMW–01
TMS10	Siu Shan Court	R	20	SSC–01
	Buddhist Leung Chik Wai College	E	6	eLCW–01
TMS11	Caritas Li Ka Shing Care and Attention Home	C	4	CLKS-01
TMS12	Castle Peak Sam Chau Ma Temple	W	1	Te-201
TMS13	Yan Chai Hospital Ho Sik Nam Primary School	E	7	eYCH-01
c. Siu Lam				
SL01	Grandview Terrace	R	3	GRT–03
Planned NSR				
b. Tuen Mun West				
P01	Social welfare / Education facilities for Public Housing Development at Wu Shan Road	C / E <sup>[3]</sup>	2 – 3	PTMW-01

Note:

[1] R – Residential, E – Educational Institutions, W – Place of Public Worship; C – Clinic.

[2] As there are social welfare facilities, such as kindergarten, elderly centre, etc., located at the lower floors of the Sam Shing Estate, the uses and the relevant noise criteria are subject to the type of social welfare facilities.

[3] Social welfare facilities, such as Residential Care Home for the Elderly (RCHE), Special Child Care Centre (SCCC) etc., are provided in the non-domestic facilities of the Public Housing Development at Wu Shan Road.

### Inventory of Noise Sources

4.3.2.2 **Section 2** has described the key project elements and the associated construction methodology. The potential sources of noise impact during the construction of the Project would be the use of PME for various construction activities. The key construction works would include the following:

- Construction of road tunnels at Lam Tei and Tuen Mun West;
- Construction of open roads, interchanges, flyovers and slip roads at Lam Tei and Tuen Mun West;
- Site formation, construction and decommission of explosive magazines;
- Ancillary works including slope works/formation, administration buildings, ventilation buildings, other tunnel operation area, adits and associated connection with existing roads, barging facilities, re-provision of existing facilities, landscaping works, road lighting, etc.; and
- Ground Investigation (GI) works.

4.3.2.3 The currently envisaged construction programme would not require percussive piling works. Review on the application of typical quieter construction methods have been conducted and summarized in **Appendix 4.3**. With due consideration of the EPD's list of good practices and state-of-the-art technologies with the industry, the followings are examples of quieter construction methods / equipment that are found applicable to this Project.

- Quieter type saw and hydraulic crusher can be adopted for concrete removal for site clearance and road realignment works;
- Press-in piling method for the building works; and
- Prefabricated segments can be widely used in viaduct construction to replace in-situ construction.

4.3.2.4 Using Tunnel Boring Machine (TBM) has also been considered for construction of tunnels as a quieter construction method.

4.3.2.5 According to the construction methodology envisaged at this stage, the construction activities and its associated tentative PME's has been identified in the following **Table 4.10**. The plant inventory adopted for the assessment have been confirmed by Project Engineer. It is noted that the Contractor would consider the engineering data available at that time and review and update this tentative construction plant inventory.

**Table 4.10 Tentative Plant inventory for key construction activities**

Activities	Possible PME's Required <sup>[1]</sup>		
Site clearance and formation	<ul style="list-style-type: none"> <li>• Backhoe</li> <li>• Breaker</li> <li>• Compactor</li> <li>• Crane</li> <li>• Drilling plant</li> </ul>	<ul style="list-style-type: none"> <li>• Dump truck</li> <li>• Excavator</li> <li>• Generator</li> <li>• Hand-held breaker</li> </ul>	<ul style="list-style-type: none"> <li>• Hydraulic crusher</li> <li>• Mechanical breaker</li> <li>• Piling machine</li> <li>• Saw</li> </ul>
Construction of the temporary noise enclosure	<ul style="list-style-type: none"> <li>• Crane</li> </ul>	<ul style="list-style-type: none"> <li>• Generator</li> </ul>	<ul style="list-style-type: none"> <li>• Hydraulic crusher</li> </ul>
Construction of administration building / satellite control building	<ul style="list-style-type: none"> <li>• Air compressor</li> <li>• Bar bender and cutter</li> <li>• Concrete lorry mixer</li> <li>• Concrete pump</li> <li>• Crane</li> </ul>	<ul style="list-style-type: none"> <li>• Dump truck</li> <li>• Excavator</li> <li>• Generator</li> <li>• Grout mixer</li> <li>• Grout pump</li> </ul>	<ul style="list-style-type: none"> <li>• Lorry</li> <li>• Piling machine</li> <li>• Vibrating hammer</li> <li>• Vibratory poker</li> <li>• Water pump</li> </ul>
Construction of ventilation buildings	<ul style="list-style-type: none"> <li>• Air compressor</li> <li>• Bar bender and cutter</li> <li>• Concrete lorry mixer</li> <li>• Concrete pump</li> <li>• Crane</li> </ul>	<ul style="list-style-type: none"> <li>• Excavator</li> <li>• Generator</li> <li>• Grout mixer</li> <li>• Grout pump</li> <li>• Lorry</li> </ul>	<ul style="list-style-type: none"> <li>• Piling machine</li> <li>• Raised boring machine</li> <li>• Vibrating hammer</li> <li>• Vibratory poker</li> <li>• Water pump</li> </ul>

Activities	Possible PME's Required <sup>[1]</sup>		
	<ul style="list-style-type: none"> <li>• Dump truck</li> </ul>		
Construction of the Slurry Treatment Plant	<ul style="list-style-type: none"> <li>• Crane</li> <li>• Conveyor Belt</li> </ul>	<ul style="list-style-type: none"> <li>• Generator</li> <li>• Lorry</li> </ul>	<ul style="list-style-type: none"> <li>• Hydraulic crusher</li> <li>• Bar bender and cutter</li> </ul>
Tunnel Construction by TBM	<ul style="list-style-type: none"> <li>• Air compressor</li> <li>• Batching plant</li> <li>• Breaker</li> <li>• Compactor</li> <li>• Conveyor belt</li> <li>• Dump truck</li> </ul>	<ul style="list-style-type: none"> <li>• Dumper</li> <li>• Excavator</li> <li>• Generator</li> <li>• Grader</li> <li>• Lorry</li> </ul>	<ul style="list-style-type: none"> <li>• Mobile crane</li> <li>• TBM</li> <li>• Ventilation fan</li> <li>• Water pump</li> <li>• Water treatment plant</li> </ul>
Tunnel Construction by drill-and-blast / drill-and-break	<ul style="list-style-type: none"> <li>• Batching plant</li> <li>• Breaker</li> <li>• Concrete lorry mixer</li> <li>• Concrete mixer</li> <li>• Concrete pump</li> <li>• Conveyor belt</li> <li>• Crane</li> </ul>	<ul style="list-style-type: none"> <li>• Drill</li> <li>• Drill Rig</li> <li>• Dump truck</li> <li>• Dumper</li> <li>• Excavator</li> <li>• Generator</li> <li>• Grader</li> </ul>	<ul style="list-style-type: none"> <li>• Grinder</li> <li>• Lorry</li> <li>• Rock drill</li> <li>• Ventilation fan</li> <li>• Shotcrete machine</li> <li>• Tunnelling Jumbo</li> </ul>
Construction of portal structure	<ul style="list-style-type: none"> <li>• Air compressor</li> <li>• Asphalt paver</li> <li>• Bar bender and cutter</li> <li>• Compactor</li> <li>• Concrete lorry mixer</li> </ul>	<ul style="list-style-type: none"> <li>• Concrete pump</li> <li>• Crane</li> <li>• Dump truck</li> <li>• Excavator</li> </ul>	<ul style="list-style-type: none"> <li>• Generator</li> <li>• Roller</li> <li>• Vibratory poker</li> <li>• Water Pump</li> </ul>
Road works <sup>[2]</sup>	<ul style="list-style-type: none"> <li>• Air compressor</li> <li>• Asphalt paver</li> <li>• Bar bender and cutter</li> <li>• Compactor</li> <li>• Concrete lorry mixer</li> <li>• Concrete pump</li> </ul>	<ul style="list-style-type: none"> <li>• Crane</li> <li>• Dump truck</li> <li>• Excavator</li> <li>• Generator</li> <li>• Launching girder</li> <li>• Paint liner marker</li> </ul>	<ul style="list-style-type: none"> <li>• Piling machine</li> <li>• Roller</li> <li>• Trailer truck</li> <li>• Vibratory poker</li> <li>• Water Pump</li> </ul>
Construction work for explosive magazines	<ul style="list-style-type: none"> <li>• Breaker</li> <li>• Crane</li> <li>• Drill</li> <li>• Dump truck</li> <li>• Dumper</li> </ul>	<ul style="list-style-type: none"> <li>• Excavator</li> <li>• Generator</li> <li>• Grader</li> <li>• Grinder</li> <li>• Lorry</li> </ul>	<ul style="list-style-type: none"> <li>• Road miller</li> <li>• Road roller</li> <li>• Roller</li> <li>• Ventilation fan</li> </ul>
Demolition work for explosive magazines	<ul style="list-style-type: none"> <li>• Air compressor</li> <li>• Bulldozer</li> <li>• Breaker</li> <li>• Concrete crusher</li> </ul>	<ul style="list-style-type: none"> <li>• Crane</li> <li>• Dump truck</li> <li>• Excavator</li> </ul>	<ul style="list-style-type: none"> <li>• Generator</li> <li>• Lorry</li> <li>• Saw</li> </ul>
Construction of Barging facility	<ul style="list-style-type: none"> <li>• Conveyor belt</li> <li>• Derrick Barge</li> </ul>	<ul style="list-style-type: none"> <li>• Crane</li> <li>• Excavator</li> </ul>	<ul style="list-style-type: none"> <li>• Tug boat</li> <li>• Welding set</li> </ul>
Construction of conveyor belt	<ul style="list-style-type: none"> <li>• Concrete lorry mixer</li> <li>• Crane</li> </ul>	<ul style="list-style-type: none"> <li>• Excavator</li> <li>• Generator</li> </ul>	<ul style="list-style-type: none"> <li>• Loader</li> </ul>
Construction of temporary adit at Wah Fat Playground	<ul style="list-style-type: none"> <li>• Breaker</li> <li>• Concrete lorry mixer</li> <li>• Concrete mixer</li> <li>• Concrete pump</li> <li>• Conveyor belt</li> <li>• Drill</li> </ul>	<ul style="list-style-type: none"> <li>• Dump truck</li> <li>• Dumper</li> <li>• Excavator</li> <li>• Generator</li> <li>• Grader</li> </ul>	<ul style="list-style-type: none"> <li>• Grinder</li> <li>• Lorry</li> <li>• Crane</li> <li>• Rock drill</li> <li>• Ventilation fan</li> </ul>
Reprovisioning & Reinstatement Works	<ul style="list-style-type: none"> <li>• Air compressor</li> <li>• Asphalt paver</li> <li>• Bar bender and cutter</li> <li>• Compactor</li> <li>• Concrete lorry mixer</li> <li>• Concrete pump</li> <li>• Crane</li> </ul>	<ul style="list-style-type: none"> <li>• Dump truck</li> <li>• Excavator</li> <li>• Generator</li> <li>• Grout mixer</li> <li>• Grout pump</li> <li>• Paint liner marker</li> </ul>	<ul style="list-style-type: none"> <li>• Piling machine</li> <li>• Roller</li> <li>• Trailer truck</li> <li>• Vibrating hammer</li> <li>• Vibratory poker</li> <li>• Water Pump</li> </ul>

Activities	Possible PME's Required <sup>[1]</sup>
Ancillary works (such as training ground and tunnel operation area)	<ul style="list-style-type: none"> <li>• Air compressor</li> <li>• Asphalt paver</li> <li>• Bar bender and cutter</li> <li>• Compactor</li> <li>• Concrete lorry mixer</li> <li>• Concrete pump</li> <li>• Crane</li> <li>• Dump truck</li> <li>• Excavator</li> <li>• Generator</li> <li>• Roller</li> <li>• Trailer truck</li> <li>• Vibratory poker</li> <li>• Water Pump</li> </ul>
Slope works	<ul style="list-style-type: none"> <li>• Breaker</li> <li>• Concrete lorry mixer</li> <li>• Compactor</li> <li>• Drill</li> <li>• Drill rig</li> <li>• Dump truck</li> <li>• Excavator</li> <li>• Generator</li> <li>• Grout mixer</li> <li>• Grout pump</li> <li>• Hydraulic crusher</li> <li>• Lorry</li> <li>• Saw</li> <li>• Vibratory poker</li> <li>• Water pump</li> </ul>
GI works	<ul style="list-style-type: none"> <li>• Crane</li> <li>• Drilling rig</li> <li>• Generator</li> </ul>
Landscape works	<ul style="list-style-type: none"> <li>• Breaker</li> <li>• Crane</li> <li>• Dump Truck</li> <li>• Excavator</li> <li>• Generator</li> <li>• Lorry</li> <li>• Saw</li> </ul>

Notes:

[1] Quiet equipment or QPME would be adopted where applicable and practicable.

[2] Includes pavement, lighting, signage, drainage.

### 4.3.3 Evaluation of Construction Noise Impact

#### Lam Tei Area

4.3.3.1 Key construction work sites in Lam Tei area include those within Lam Tei Quarry area. Key construction activities include site formation, slope cutting, construction of portals and tunnel section, construction of columns and deck for viaduct sections, construction of at-grade roads, construction of ventilation building and construction of an underground magazine site. Existing NSRs in the vicinity include Lo Fu Hang, Fu Tei Ha Tsuen, and village houses along Fuk Hang Tsuen Road. All these NSRs are village houses or temples with 1–3 storeys. Their ranges of separation distances are approximately  $\leq 20\text{m}$  from the nearest gazette boundary and approximately 125m – 480m from underground magazine site. Based on the PME anticipated at this stage (see **Section 4.3.2**), it is considered that the mitigation measures and good site practices including use of QPME, quieter construction methods, noise barriers, noise enclosures and locating mobile plant as far away from NSRs as possible and practicable etc as discussed in **Section 4.3.4** would be required to control the associated construction noise impacts. However, as the NSRs near Lo Fu Hang and Fu Tei Ha Tsuen would be relatively closer to the site formation work (i.e. approximately  $\leq 20\text{m}$ ) and noise exceedance maybe anticipated without the adoption of noise mitigation measures, there would be a need for a site hoarding with higher surface density and height to provide extra noise attenuation for the PME as mitigation measures.

4.3.3.2 Construction vehicles would also be required to transport various materials to and from the construction sites as necessary. In order to minimise the loading on existing roads (e.g. Fuk Hang Tsuen Road and Castle Peak Road, etc.), the Contractor will implement measures to ensure construction traffic would avoid the peak hours where practicable. This would largely help to minimise the nuisance from both traffic and environmental perspectives. It is also noted that the traffic induced by various construction works in Lam Tei Area including tunnelling, stockpiling, slope works, satellite control building and ventilation buildings, etc would vary as the construction progresses. For example, the construction traffic generated during the initial and later stages would likely be less than those during the peak construction period which would constitute a relatively shorter period. The Detailed Designer and the Contractor shall review all the contemporary issues (e.g. constructability, site constraints, detailed GI information, etc.) to optimise the construction methodology and the generation of construction vehicles. For Lam Tei Area in particular, the latest available information at this stage suggests that the construction

traffic generated along Fuk Hang Tsuen Road and Castle Peak Road would be typically in the order of 12 construction vehicles per hour per direction during advance works / site formation activities. During the drill-and-blast / drill-and-break excavation activities, the construction traffic generated may increase to 24 construction vehicles per hour per direction. As explained above, there will be proper traffic control for construction vehicle and careful coordination with the concurrent projects to avoid concurrent uses of the same travelling routes and to minimize the number of induced traffic, noise nuisance from construction vehicle movement outside construction sites is unlikely to be significant.

#### Construction of Underground Tunnel from Lam Tei to Sam Shing Hui

- 4.3.3.3 As discussed in **Section 2**, the underground tunnel section from Lam Tei to Sham Shing Hui would be constructed by drill-and-blast or drill-and-break. The drill-and-blast / drill-and-break method is adopted for the section underneath Tai Lam Country Park as it is a more efficient underground tunnelling method in hard rock conditions as expected in Tai Lam Country Park. TBM method is suitable for fractured rock / mixed ground condition, therefore, it is not recommended for tunnelling in hard rock granite at Tai Lam Country Park. The initial excavation of the tunnel sections will be conducted by mechanical methods. Drill-and-blast / drill-and-break excavation will then be adopted for the section approximately 50m behind the portal. The drill-and-blast / drill-and-break would possibly be conducted throughout a 24-hour cycle on a daily basis to avoid programme delay and as the worst case scenario. For safety reason, an acoustic tunnel door would be installed at the portal and this door would be closed during the blasting. For the blasting activities, it will further be restricted to be conducted from 0700 to 1900 on weekdays other than general holidays only to minimize the construction impact.
- 4.3.3.4 As discussed in **Section 4.1**, a CNP would be required for constructions works during restricted hours. In case the Contractor considers there is a need for work within restricted hours, they will submit an application for CNP to demonstrate the compliance of relevant criteria.
- 4.3.3.5 While most of this tunnel section would pass underneath the Tai Lam Country Park in which there are no NSRs, the south end of this underground tunnel section would terminate at Sam Shing Hui. At this section, the horizontal separation distances from the tunnel center to the nearest existing NSRs would be approximately 10m from Kam Fai Garden.
- 4.3.3.6 According to the latest construction methodology, the blasting will only be conducted once per day and the blasting will be subject to Mines Division's agreement. As the blasting will last for very short duration and be infrequent, it will not cause adverse groundborne construction noise impacts to NSRs in the vicinity.
- 4.3.3.7 Besides, the Contractor will be required to post highly visible warning notices/signs at suitable locations to warn the public that blasting will take place. These warning signs will be posted near the intended blasting location, even though all blasts will be conducted underground. The Contractor is required to state the blasting date and time on the notice.
- 4.3.3.8 For drill-and-blast / drill-and-break tunnelling, only breaker and excavator would be adopted for the initial excavation above-ground at Lam Tei while other PME's would be operated underground. Given the limited PME used underground, it will not cause adverse groundborne construction noise impacts to NSRs in the vicinity.

4.3.3.9 According to current design as stated in **Section 2.6.1.8**, site formation or rock excavation by means of non-percussive quieter construction method such as chemical expansion agent or pulse plasma rock fragmentation would be considered as far as practicable, and the use of excavator-mounted breakers and blasting with explosives have been minimized. All of the noisier works will only be conducted within the normal working hours, i.e. non-restricted hours. On-surface blasting works will also only be done in Lam Tei Quarry. Other than Lam Tei Quarry, all the blasting works with explosives will only be conducted underground.

#### Construction of Underground Tunnel from Sam Shing Hui to Pillar Point

4.3.3.10 As discussed in **Section 2**, the underground tunnel section from Sam Shing Hui to Pillar Point would be constructed by TBM methodology, and would possibly be conducted throughout a 24-hour cycle on a daily basis to avoid settlement issue and as the worst case scenario. As discussed in **Section 4.1**, a CNP would be required for constructions works during restricted hours. In case the Contractor considers there is a need for work within restricted hours, they will submit an application for CNP to demonstrate the compliance of relevant criteria.

4.3.3.11 The TBM at Southern Portal will perform its break-in through a vertical surface (25m (H) x 50m (W)) prepared beforehand as part of the Southern Portal site formation. The TBM will be dismantled at the underground dismantling chamber (16m (H) x 16m (W) x 25m(L)) at east of Sam Shing Estate excavated by drill-and-blast / drill-and-break method. The dismantled parts will be transported through the interfacing tunnel section of approximately 250m long, formed by drill-and-break or reduced drill-and-blast, and then to ground level through temporary adit of approximately 570m long. The portal of temporary adit (10m (H) x 10m (W)) is located within Wah Fat Playground worksite. For the temporary adit portal, the temporary full noise enclosure would be installed prior to the construction of the adit. The entrance of this temporary full noise enclosure would be designed with acoustic seals or the equivalent and should be normally closed unless for lorries entering or leaving this temporary noise enclosure for mucking out (conveying spoil/transporting machinery) during daytime period.

4.3.3.12 For the NSR near Sam Shing Hui, the nearest existing NSR are Castle Peak Sam Chau Ma Temple (TMS12) and Sam Shing Estate (TMS05) which are directly located on the tunnel. The groundborne construction noise impact on these receivers especially during restricted hours would require special attention. However, as the type and design of the TBM to be deployed would be contractor specific, it is recommended that the Contractor shall review the groundborne noise impacts that would be caused by their TBM and recommend specific mitigation measures to ensure compliance with the legislative requirements.

4.3.3.13 It is noted that a large portion of the TBM tunnelling section would be underneath the seabed within the Tuen Mun Typhoon Shelter in which there are no NSRs. Hence, this portion of the TBM tunnelling would not cause any adverse noise impacts.

4.3.3.14 Having said that, there are some NSRs along the landbased section near Tuen Mun West. These NSRs include Tuen Mun Wu Hong Clinic, Siu Shan Court and the planned Public Housing Development and its associated social welfare and education facilities at Wu Shan Road. At this section, the tunnel alignment would be approximately 25m below local ground and the slant separation distances from the tunnel center to the nearest NSRs would be approximately 30m from Siu Shan Court and Buddhist Leung Chik Wai College,

approximately 45m from Tuen Mun Wu Hong Clinic and approximately less than 25m from planned Public Housing Development facilities at Wu Shan Road. According to the geological profile in this area, the strata which the TBM drives through is bedrock. These NSRs in the vicinity are buildings on piles which would have high attenuation due to building coupling factors. Nonetheless, the groundborne construction noise impact on these receivers especially during restricted hours would require special attention. However, as the type and design of the TBM to be deployed would be contractor specific, it is recommended that the Contractor shall review the groundborne noise impacts that would be caused by their TBM and recommend specific mitigation measures to ensure compliance with the legislative requirements.

- 4.3.3.15 To further reduce the impact on the NSRs, e.g Sam Shing Estate, Castle Peak Sam Chau Ma Temple, Siu Shan Court and Buddhist Leung Chik Wai College, etc., TBM maintenance will be planned for night-time shift and full day maintenance on Sunday for these areas if the TBM is running 7days a week. Contingency measures, such as reducing TBM thrust force and cutterhead rotation speed for these area, would be considered to further reduce the groundborne noise impact if it reached statutory limits.
- 4.3.3.16 For the TBM launching portal located at Southern Portal, there are no existing NSRs in the vicinity and hence the construction and operation of this launching portal would not cause adverse construction noise impacts.
- 4.3.3.17 Construction vehicles would be required to transport various materials to and from the construction sites as necessary. In order to minimise the loading on existing roads (e.g. Lung Mun Road etc), the Contractor will implement measures to ensure construction traffic would avoid the peak hours where practicable. This would largely help to minimise the nuisance from both traffic and environmental perspectives. It is also noted that the traffic induced by various construction works in Pillar Point Area tunnelling, slope works and ventilation building, etc. would vary as the construction progresses. For example, the construction traffic generated during the initial and later stages would likely be less than those during the peak construction period which would constitute a relatively shorter period. The Detailed Designer and the Contractor shall review all the contemporary issues (e.g. constructability, site constraints, detailed GI information, etc.) to optimise the construction methodology and the generation of construction vehicles. For Pillar Point in particular, the latest available information at this stage suggests that the construction traffic generated along Lung Mun Road would be typically in the order of 14 construction vehicles per hour per direction during advance works / site formation activities. During the excavation activities by tunnel boring machine, the construction traffic generated may increase to 62 construction vehicles per hour per direction. As explained above, there will be proper traffic control for construction vehicle and careful coordination with the concurrent projects to avoid concurrent uses of the same travelling routes and to minimize the number of induced traffic, noise nuisance from construction vehicle movement outside construction sites is unlikely to be significant.

#### Construction of Middle Ventilation Building and Southern Ventilation Building

- 4.3.3.18 As discussed in **Section 2**, a Middle Ventilation Building (MVB) is required for tunnel ventilation and the location of this MVB is located at Wah Fat Playground. NSRs in the vicinity include Harvest Garden (TMS01), Kam Fai Garden (TMS02) and Caritas Li Ka Shing Care and Attention Home (TMS11). The horizontal separation distances from the gazette boundary are approximately <20m for Kam Fai Garden, approximately 45m for Harvest Garden and <20m from Caritas Li Ka Shing Care and Attention Home.

- 4.3.3.19 The construction site of the ventilation building will generate excavated materials and the temporary adit at Wah Fat Playground works area would also be adopted as the mucking out for the underground tunnel sections connecting to Lam Tei and Sam Shing Estate. In order to reduce the dispersion of construction noise, the current design has allowed for 2 temporary noise enclosures, with one covering the temporary adit portal and spoil storage area, and with the other one covering the excavation area for the ventilation building. For the temporary adit portal and the spoil storage area, the temporary full noise enclosure would be installed prior to the construction of the adit and spoil storage area. The entrance of this temporary full noise enclosure would be designed with acoustic seals or the equivalent and should be normally closed unless for lorries entering or leaving this temporary noise enclosure for mucking out (conveying spoil/transporting machinery) during daytime period.
- 4.3.3.20 For the construction of the ventilation building, another temporary full noise enclosure is proposed to be installed prior to the bulk excavation of the basement, which would help alleviating the construction noise impact from the excavation activities. This temporary full noise enclosure should be decommissioned only when most of the back filling works are completed. In case mucking outs are required for conveying spoil / transporting machinery etc during daytime period, the openings of these mucking outs should be facing towards existing terrain instead of the existing NSRs. The mucking outs should also be closed during evening, night-time and restricted hours to minimise noise emanating out.
- 4.3.3.21 The subsequent detailed design should also explore the practicability of locating the community liaison centre between the construction site and Kam Fai Garden, which would provide a buffer between the construction site and Kam Fai Garden, and hence further alleviate the construction noise nuisance.
- 4.3.3.22 The Contractor shall plan to commence the construction of these full noise enclosures for the temporary adit portal, spoil storage area and excavation area for the MVB as early as possible. It is recommended to complete the installation of the temporary full noise enclosure for the MVB prior to the bulk excavation of the ventilation building so that most of the noise generated by the bulk excavation would be well contained. This temporary noise enclosure should be decommissioned only when most of the back filling works are completed. Nevertheless, based on the PME anticipated at this stage (see **Section 4.3.2**), it is considered that the mitigation measures and good practices including use of QPME, quieter construction methods, noise barrier, noise enclosure and mobile plant should be sited as far away from NSRs as possible and practicable, etc as discussed in **Section 4.3.4** would be required to control the associated construction noise impacts.
- 4.3.3.23 After the decommissioning of this temporary full noise enclosure, the superstructure works for the MVB could commence. The mitigation measures and good practices including use of QPME, quieter construction methods, noise barrier, noise enclosure and mobile plant should be sited as far away from NSRs as possible and practicable, etc as discussed in **Section 4.3.4** would be required to control the associated construction noise impacts.
- 4.3.3.24 Construction vehicles would be required to transport various materials to and from the construction sites as necessary. In order to minimise the loading on existing roads (e.g. Castle Peak Road - Castle Peak Bay, etc.), the Contractor will implement measures to ensure construction traffic would avoid the peak hours where practicable. This would largely help to minimise the nuisance from both traffic and environmental perspectives. It is also noted that the traffic induced by various construction works in area near Wah Fat

Playground including slope works, ventilation buildings, stockpiling etc. would vary as the construction progresses. For example, the construction traffic generated during the initial and later stages would likely be less than those during the peak construction period which would constitute a relatively shorter period. The Detailed Designer and the Contractor shall review all the contemporary issues (e.g. constructability, site constraints, detailed GI information, etc.) to optimise the construction methodology and the generation of construction vehicles. For area near Wah Fat Playground in particular, the latest available information at this stage suggests that the construction traffic generated along Castle Peak Road – Castle Peak Bay would be typically in the order of 23 construction vehicles per hour per direction during advance works / site formation activities. During the drill-and-blast / drill-and-break excavation activities, the construction traffic generated may increase to an average of 47 construction vehicles per hour per direction. With the proper traffic control for construction vehicle and careful coordination with the concurrent projects to avoid concurrent uses of the same travelling routes and to minimize the number of induced traffic, noise nuisance from construction vehicle movement outside construction sites is unlikely to be significant.

- 4.3.3.25 A Southern Ventilation Building (SVB) is also required at Pillar Point (right above the TM-CLKT). As there is no NSR identified within 300m assessment area from SVB, adverse construction noise impact near SVB is not anticipated.

#### Explosive Magazine Sites at Lam Tei Quarry, Siu Lam and Pillar Point

- 4.3.3.26 The explosive magazine site at Lam Tai Quarry would be an underground construction and would be constructed by a combination of excavation and drill-and-break methodology. Key construction activities include site formation and construction of the explosive storage. The nearest NSRs in the vicinity of the explosive magazine site at Lam Tei is the village houses near Fuk Hang Tsuen Road (LT03) which is located at approximately 125m away. Based on the PME anticipated at this stage (see **Section 4.3.2**), it is considered that the mitigation measures and good practices including use of QPME, quieter construction methods, noise barriers, noise enclosures and locating mobile plant as far away from NSRs as possible and practicable etc as discussed in **Section 4.3.4** would be required to control the associated construction noise impacts.
- 4.3.3.27 For the surface explosive magazine site at Siu Lam, the nearest NSR is Grandview Terrace (SL01) at approximately 200m away. It is considered that the mitigation measures and good practices including use of QPME, quieter construction methods, noise barriers, noise enclosures and locating mobile plant as far away from NSRs as possible and practicable etc as discussed in **Section 4.3.4** would be required to control the associated construction noise impacts.
- 4.3.3.28 For the surface explosive magazine site at Pillar Point, there are no existing NSRs within 300m and hence adverse construction noise impact is not anticipated to the nearby NSRs.
- 4.3.3.29 The construction work required for the decommissioning of these explosive magazine sites is not anticipated to be significant. Hence, the construction noise is also not considered to be significant provided that suitable mitigation measures are implemented.

### Portal Opening and Open Road Near Pillar Point

- 4.3.3.30 As there is no existing NSR identified for Pillar Point within 300m assessment area, adverse construction noise impact near Pillar Point is not anticipated.

### Slurry Treatment Plant at Pillar Point

- 4.3.3.31 As there is no existing NSR identified for Pillar Point within 300m assessment area, adverse construction noise impact near Pillar Point is not anticipated. Also, Slurry Treatment Plant (STP), its conveyor belts and slurry pipes will be fully enclosed with noise enclosure, adverse construction noise impact is not anticipated.

### The Ancillary Works at Pillar Point

- 4.3.3.32 As there is no existing NSR identified for Pillar Point within 300m assessment area, adverse construction noise impact from the Ancillary Works (e.g. administrative building, training ground and supporting area, recovery area and maintenance compound) is not anticipated.

### Others

- 4.3.3.33 As discussed in **Section 2**, there are barging points and facilities and delivery point at Pillar Point near River Trade Terminal. As there is no existing NSRs identified within 300m assessment area, adverse construction noise impact from the barging point is not anticipated.
- 4.3.3.34 As there is no civil works or demolition of at the former Girl Guide Association (GGA) Campsite and only small scale of renovation for site office or other project uses is required. Given the construction works are relatively minor and hence the construction noise impacts would be relatively minor provided good practices and standard mitigation measures are implemented.

### Reprovision & Reinstatement of Existing Facilities

- 4.3.3.35 As discussed in **Section 2**, reprovision is required for some existing facilities at Tuen Mun West including reprovision of basketball court and public toilet at the existing carpark near Sam Shing Hui and reprovision of carpark at the existing parking lots and amenity area on Fung On Street. These construction works are relatively minor and hence the construction noise impacts would be relatively minor provided good practices and standard mitigation measures are implemented.
- 4.3.3.36 For the reprovision works near Sam Shing Hui (i.e. Temporary reprovisioning of basketball court and public toilet and re-instatement at KW carpark and re-instatement of Wah Fat Playground), NSRs in the vicinity include Kam Fai Garden, Harvest Garden, Hanford Garden and Saint Temple at Sam Shing Hui with horizontal separation distances between NSRs and these works area in approximately 20m–70m. As for the reprovision works near Fung On Street, NSRs in the vicinity include Tsui Ning Garden and Goodview Garden near Fung On Street, with horizontal separation distances between NSRs and the works area are 25m – 35m. Based on the PME anticipated at this stage (see **Section 4.3.2**), it is considered that the mitigation measures and good practices including use of QPME, quieter construction methods, noise barrier, noise enclosure and mobile plant should be

sited as far away from NSRs as possible and practicable, etc as discussed in **Section 4.3.4** would be required to control the associated construction noise impacts.

- 4.3.3.37 Besides, EMSD will relocate the existing Tuen Mun Vehicle Servicing Station to a suitable location to be separately determined by EMSD. The site vacated will be used by the Project as one of the construction sites. Where necessary, there would be a temporary reprovision of this facility at the former TM–CLKT Site Office at Pillar Point. In such a case, this temporary reprovision would only last during the construction of the Project and the permanent reprovision by EMSD would be completed before the commissioning year for the operation of the Project. Nevertheless, since there is no existing NSR in the vicinity of the temporary EMSD vehicle servicing centre, adverse construction noise impact is not anticipated.

#### Consideration of Cumulative Impacts

- 4.3.3.38 **Section 2.10** has identified a list of concurrent projects that would have to be considered in this EIA to address any significant cumulative impacts. The following sections discuss the cumulative impacts for each area.
- 4.3.3.39 For Lam Tei Area, concurrent projects include Route 11 (R11), Widening of Yuen Long Highway (Section between Lam Tei Quarry and Tong Yan San Tsuen Interchange), Widening of Fuk Hang Tsuen Road (Between Castle Peak Road – Lam Tei and Fuk Hang Tsuen Lane), Underground Quarrying at Lam Tei, Relocation of Tuen Mun Water Treatment Works to Caverns, Tuen Mun and Development at Lam Tei North East. For R11, although the works area in Lam Tei Area would be larger than that of the Project, the project proponent of R11 is the same as the Project and would implement the equivalent set of construction noise control measures as the Project. Adverse cumulative construction noise impacts from R11 are therefore not anticipated.
- 4.3.3.40 For Widening of Yuen Long Highway (Section between Lam Tei Quarry and Tong Yan San Tsuen Interchange), it is located more than 500m from the Project, adverse cumulative construction noise impacts are therefore not anticipated.
- 4.3.3.41 For Widening of Fuk Hang Tsuen Road (Between Castle Peak Road – Lam Tei and Fuk Hang Tsuen Lane), as there is no overlap of construction period, the cumulative impact during construction phase is not anticipated.
- 4.3.3.42 The Planning Study for the Underground Quarrying at Lam Tei, Tuen Mun, Relocation of Tuen Mun Water Treatment Works to Caverns and Development at Lam Tei North East are still on-going and there are no definitive design information at the time of preparing this EIA. Nevertheless, it is anticipated that their studies would consider all committed projects in the vicinity, including but not limited to Project during their subsequent study. As any other studies by government, it is anticipated that they will also implement all the best practices to abate construction noise impacts where practicable. On this basis, adverse cumulative construction noise impacts from these projects are therefore not anticipated.
- 4.3.3.43 For area near Wah Fat Playground, the concurrent projects include the Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat Section), Cycle Track between Bayview Garden and So Kwun Wat, Widening of Castle Peak Road – Castle Peak Bay, and Traffic Improvement Scheme in Tuen Mun– Widening and Addition of

Slip roads at Lung Fu Road/ Tuen Mun Road/ Wong Chu Road/ Hoi Wing Road. For Cycle Track between Tsuen Wan and Tuen Mun and Cycle Track between Bayview Garden and So Kwun Wat, given the relatively small scale of the cycle track, together with the good practices that they would implement, adverse cumulative construction noise impacts are therefore not anticipated. For Traffic Improvement Scheme in Tuen Mun – Widening and Addition of Slip roads at Lung Fu Road/ Tuen Mun Road/ Wong Chu Road/ Hoi Wing Road, the additional Tuen Mun Road/ Hoi Wing Road Slip Road would be located in the vicinity. Nevertheless, the scale of road works is anticipated to be small and the potential construction noise impacts are anticipated to be limited. Adverse cumulative construction noise impacts are not anticipated with the good site practices that they would implement.

4.3.3.44 For Widening of Castle Peak Road – Castle Peak Bay, as there is no overlap of construction period, the cumulative impact during construction phase is not anticipated.

4.3.3.45 The concurrent projects in Tuen Mun, including Reprovision of Tuen Mun Swimming Pool and Tuen Mun centre Golf Centre Practice Green, Tuen Mun, Sports Ground and Open Space with Public Vehicle Park in Area 16, Tuen Mun and Site Formation and Infrastructure Works for Public Housing Developments at Tuen Mun Central – Wu Shan Road, are located outside 300m from the above ground construction area of the Project. As the construction activities would be carried out underground by TBM and no above-ground construction, no adverse cumulative construction noise impacts are therefore anticipated. For concurrent projects in Tuen Mun South Extension and Planned Property Development at Area 16, the nearest construction work area is reprovision works of carpark near Fung On Street. Based on the PME for reprovision works of carpark near Fung On Street anticipated at this stage (see **Section 4.3.2**) and construction works are relatively minor, it is considered that with adoption of mitigation measures and good practices, adverse cumulative construction noise impact is not anticipated.

4.3.3.46 For Pillar Point Area, the concurrent project includes Lung Kwu Tan Reclamation and the Replanning of Tuen Mun West Area. The project is still undergoing its respective studies and there is no definitive design information at the time of preparing this EIA. Nevertheless, it is anticipated that their study would consider all committed projects in the vicinity, including but not limited to the Project during their subsequent study and recommend mitigation measures and all the best practices to abate construction noise impacts where practicable. On this basis, adverse cumulative construction noise impact from the concurrent project is therefore not anticipated.

#### **4.3.4 Mitigation of Construction Noise Impact**

4.3.4.1 Due to the short separation from NSRs, noise exceedances are anticipated. The following mitigation measures have been considered and confirmed the practicality by the Project Engineers:

- Good site practices to limit noise emissions at the source;
- Use of quality powered mechanical equipment (QPME) and quieter construction methods;
- Use of site hoarding with higher surface density and height at the site boundary where adjacent to NSRs;

- Use of temporary noise barriers and noise enclosure to screen noise from relatively static PMEs;
- Noise Enclosure Mucking out at the Portal Opening for Tunnelling Activities;
- Install Acoustic Tunnel Door or Enclosure at the Portal Opening for Tunnelling Activities; and
- Alternative use of plant items within one worksite, wherever practicable.

4.3.4.2 The above mitigation measures and the EPD’s “Recommended Pollution Control Clauses for Construction Contracts” 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

4.3.4.3 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 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.

4.3.4.4 Additional mitigation measures such as rescheduling will be adopted. Mucking out and construction traffics will only be operating from 0700 to 1900 within the normal working hours, i.e. non-restricted hours. Other noisier tasks such as piling and mucking out works will also only be done within non-restricted hours.

4.3.4.5 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) and Quieter Construction Methods

4.3.4.6 The use of quiet plant associated with the construction works is made reference to the QPME (e.g. air compressor, asphalt paver, bulldozer, compactor, crane, excavator,

generator, etc) / other commonly used PME<sup>1</sup> listed in EPD web pages as far as possible which includes the SWLs for specific quiet PME, and the quiet construction method and equipment listed in EPD web page. It is generally known (supported by field measurement) that particular models of construction equipment are quieter than standard types given in the GW–TM. The quiet construction methods stated in **Section 4.3.2.3** and **Appendix 4.3** should be adopted where feasible.

#### Use of Site Hoarding with Higher Surface Density and Height at the Site Boundary where Adjacent to NSRs

- 4.3.4.7 Purpose-built temporary noise barriers located on the site boundaries between noisy construction activities and NSRs could generally reduce noise levels of NSRs at village houses 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 the barriers have no openings or gaps and have a superficial surface density of at least 14kg/m<sup>2</sup>. 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 and Full Enclosure for Relatively Fixed Plant Source

- 4.3.4.8 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 surface mass density no less than 14kg/m<sup>2</sup> on a skid footing with approximately 50mm thick internal sound absorptive lining. The noise barrier should have no gaps/openings at joints in the barrier material, and should have sufficient length (e.g., at least five times greater than its height or be bent around the noise sources) and height such that no part of the noise source will be visible from the NSR being protected. The Contractor shall critically review the contemporary conditions and develop the detailed design of the noise mitigation measures. 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. Schematic drawing for the noise barrier and full enclosure are given in **Appendix 4.4**.
- 4.3.4.9 Movable temporary noise 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 10dB(A) for stationary plant.
- 4.3.4.10 For the use of movable noise barrier for at-grade construction works, for example diaphragm wall installation, working space would be considered for their manoeuvrability and placement. Generally, sufficient separation between major plants during at-grade construction works is envisaged to cater for the use of temporary movable noise barriers onsite. Temporary movable noise barrier can be placed close to noise source locally as far as practicable.

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<sup>1</sup> Commonly used PME: [https://www.epd.gov.hk/epd/sites/default/files/epd/english/application\\_for\\_licences/guidance/files/OtherSWLe.pdf](https://www.epd.gov.hk/epd/sites/default/files/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf)

- 4.3.4.11 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.

Noise Enclosure Mucking out at Temporary Adit and Spoil Storage Area / Excavation Area For The Ventilation Building

- 4.3.4.12 Full noise enclosures would be required for the construction of temporary adit and spoil storage area / excavation area for ventilation building. The temporary full noise enclosure shall cover these adit portals, leaving only mucking outs for conveying spoil / transporting machinery etc during daytime period. Where practicable, the openings of these mucking outs should be facing towards existing terrain instead of the existing NSRs. The mucking outs should also be closed during evening, night-time and restricted hours to minimise noise emanating out.
- 4.3.4.13 The Contractor shall plan to commence the construction of this temporary full noise enclosure as early as possible. The temporary full enclosure for the Adit and spoil storage area should be installed prior to the construction of the adit and the spoil storage area. As for the full noise enclosure for the excavation area of the MVB, it is recommended to complete the installation of this full noise enclosure prior to the bulk excavation so that most of the noise generated by the bulk excavation would be well contained. This temporary noise enclosure should be decommissioned only when most of the back filling works are completed.

Install Acoustic Tunnel Door or Enclosure at Construction Shafts for Tunnelling Activities

- 4.3.4.14 It is considered that installation of acoustic tunnel door or enclosure at the tunnel portals is an effective mitigation measure for construction works to be conducted inside the tunnels during both the restricted hours and non-restricted hours. The acoustic tunnel door or enclosure should be made of acoustic panels and the ventilation openings of the tunnel door or enclosure should also be fitted with silencers. The Contractor should select a proper type of acoustic panel and silencer which can provide necessary noise reduction performance to achieve the full compliance with the EIAO-TM's requirements or ANLs under CNP application.

Alternative use of plant items within one worksite

- 4.3.4.15 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.

### **4.3.5 Construction Noise Management Plan**

- 4.3.5.1 A Construction Noise Management Plan (CNMP) containing a quantitative construction noise impact assessment, the adopted quieter construction method(s) and equipment, noise mitigation measures and the construction noise impact monitoring and audit programme will be submitted to the EPD with reference to the updated and identified plant inventories

once available and in any case before tendering and commencement of the project construction, and if there is any change to the construction noise mitigation measures recommended in the CNMP, an updated CNMP shall be submitted one month before the implementation of such change.

4.3.5.2 A summary of key steps for quantitative construction noise assessment in a CNMP will be conducted:

- Determine 300m from the boundary of the Project Site and associated works and temporary work site / works area;
- Identify NSRs and locate representative assessment points that may be affected by the works;
- Update the construction method for the key construction;
- Update the construction plant inventory for the key construction work;
- Determine the SWLs of the plant items according to the information stated in the GW–TM 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;
- Predict construction noise levels at the NSRs;
- Quantify the level of impact at the NSRs, in accordance with GW–TM;
- Predict the cumulative noise impacts for any concurrent construction works in the vicinity of the proposed work;
- 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 EIAO–TM and EIAO Guidance Note “Preparation of Construction Noise Impact Assessment under the Environmental Impact Assessment Ordinance” [GN 9/2010].

4.3.5.3 The CNMP will include an implementation schedule to clearly list out the mitigation measures, the implementation party, construction noise impact monitoring and audit programme, locations, timing and environmental performance required for implementation of the mitigation measures. Mitigation measures recommended and requirement specified in the CNMP shall be fully implemented by the Contactor.

### **4.3.6 Evaluation of Residual Construction Noise Impact**

4.3.6.1 Construction noise impact arising from the Project will be within respective criteria. Adverse residual noise impacts are thus not anticipated.

4.3.6.2 The number of dwellings, classrooms and other sensitive elements that will be exposed to adverse residual noise impact exceeding the criteria set in Annex 5 in the TM is nil.

## 4.4 Road Traffic Noise Impact Assessment

### 4.4.1 Road Traffic Noise Impact Assessment Methodology

4.4.1.1 Road traffic noise calculation is based on the method of UK Department of Transport "Calculation of Road Traffic Noise (CRTN)". The predicted noise levels at the sensitive receivers include 2.5dB(A) facade reflection and correction factors of effects due to gradient, distance, view angle, road surface and barriers.

4.4.1.2 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 [i.e. L10(1hr) dB(A)].

4.4.1.3 Calculations of future road traffic noise are based on the peak hourly flow for the maximum traffic projected within a 15 years period upon full operation of the roadworks. The traffic projection has adopted the latest Task Force Planning Dataset of the Territorial Population and Employment Data Matrix (TPEDM) issued in June 2022, which has taken into account various committed projects.

4.4.1.4 As discussed in **Section 2**, the commissioning year of the Project would be in Year 2033. The assessment year with maximum traffic projections (morning peak hour traffic flows and vehicle compositions, which is generally higher traffic flows than afternoon peak) within 15 years upon operation of the Project would be Year 2048. Hence, Year 2048 was adopted as assessment year in road traffic noise assessment due to its peak traffic prediction in Traffic Impact Assessment of the Project. The traffic forecast for the prevailing year (i.e. 2025 without project) and the assessment year is presented in **Appendix 4.5**. The traffic flow forecast has been confirmed with Transport Department.

4.4.1.5 The following concurrent road projects have been identified and included in the traffic forecast and hence the road traffic noise assessment:

- R11;
- Widening of Fuk Hang Tsuen Road;
- Widening of YLH (Section between Lam Tei Quarry and Tong Yan San Tsuen Interchange);
- Widening of Castle Peak Road-Castle Peak Bay;
- Road P1 (Tai Ho-Sunny Bay Section);
- TYLL; and
- HKIW-NEL Link.

4.4.1.6 The following concurrent development projects have been identified and the induced traffic from the concurrent projects has been included in the traffic forecast, including but not limited to:

- Hung Shui Kiu / Ha Tsuen New Development Area;
- Proposed Public Housing Developments at Ping Shan South, Yuen Long, Lam Tei North and Nai Wai, Tuen Mun; and

- Public Housing Development near Tan Kwai Tsuen, Yuen Long.

4.4.1.7 In accordance with the EIAO Guidance Note “Road Traffic Noise Impact Assessment Under the Environmental Impact Assessment Ordinance” (12/2010), direct mitigation measures should be considered or proposed on the road project if there would be adverse environmental impact. Where the predicted noise impacts with the project exceed the noise criteria, direct mitigation measures shall be considered to reduce the noise from the project road to a level that:

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

4.4.1.8 In cases where direct noise mitigation measures alone are not adequate in mitigating noise to a level in compliance with the EIAO–TM noise criteria, indirect noise mitigation measures for existing NSRs may be adopted. Eligibility of the affected premises for indirect noise mitigation measures is determined with reference to EPD’s Guidance Note GN 12/2010, the following three criteria, all of which must be satisfied:

- The predicted overall noise level exceeds the noise standard in accordance with EIAO–TM;
- The predicted overall noise level is at least 1.0 dB(A) more than the prevailing traffic noise level, i.e. the total traffic noise level existing before the works to construct the road were commenced; and
- The contribution from the Project Road to the increase in the predicted overall noise level is at least 1.0 dB(A).

## 4.4.2 Identification of Road Traffic Noise Impact

### Identification of Project Road

4.4.2.1 The Project Road Extent includes the following items and shown in **Appendix 4.6** and summarized below:

- Road tunnel of about 7.5 km long running through Tuen Mun and Tai Lam Country Park, linking the Tuen Mun – Chek Lap Kok Link (TM–CLKT) and the YLH and Kong Sham Western Highway (KSWH);
- Viaducts / at–grade roads from the southern tunnel portal to the roads under planning near Lung Mun Road/Mong Fat Street, and TM–CLKT at Tuen Mun Area 40; and
- viaducts / at–grade roads from the northern tunnel portal to YLH and KSWH at Lam Tei East Interchange.

### Noise Assessment Points for Road Traffic Noise Impact Assessment

4.4.2.2 The assessment area for road traffic noise includes an area within 300m from the Project Road and highway / tunnel operation and maintenance facilities. Representative NSRs and NAPs that would be affected road traffic noise have been identified and presented in **Table**

4.8 and are summarised in **Table 4.11** below. Locations of Representative NSRs and NAPs for road traffic noise impact assessment are shown in **Figure 4.4**.

**Table 4.11 Identified NSRs and NAPs within 300m of Road Traffic Noise Assessment Area**

NSR ID <sup>[1]</sup>	Description	Uses <sup>[2]</sup>	Number of Storeys	NAP ID
Lam Tei				
LT01	Area at/near Lo Fu Hang	R	1-3	LFH-01 – LFH-08
LT02	Area at/near Fu Tei Ha Tsuen	R	1-3	FTT-01 – FTT-04
	Temples at Fu Tei Ha Tsuen	W	1	Te-06

Notes:

[1] The assessment will only include NSRs which rely on opened windows for ventilation and within 300m assessment area.

[2] R – Residential, W – Place of Public Worship.

### Inventory of Noise Sources

- 4.4.2.3 Road traffic noise will be generated from vehicular traffic on existing road network and the proposed open road network within the 300m assessment boundary from the Project Roads extent. The key road traffic noise sources from existing roads include YLH, KSWH, etc.
- 4.4.2.4 The key road traffic noise sources from planned roads are shown in **Appendix 4.6**. The road segments are classified as “Project roads” and “Other roads”. Computer plots of the traffic noise model are presented in **Appendix 4.6**. Agreement on the road sections to be included in the road traffic noise assessment has been obtained from EPD in accordance with Appendix C Clause 3.2.2(a) of the EIA Study Brief.
- 4.4.2.5 The characteristics of the road network such as road width, surface type and traffic flow and the use of Low Noise Road Surfacing (LNRS), the existing and committed noise mitigation measures have been considered in the assessment.
- 4.4.2.6 The locations of existing and committed noise mitigation measures (i.e. noise barrier proposed in the Approved EIA for Deep Bay Link (AEIAR-064/2002)) and its Environmental Permit No. EP-163/2003/H are presented in **Appendix 4.7**.
- 4.4.2.7 In accordance with Highways Department (HyD) Guidance Notes on Road Surface Requirements for Expressways and High Speed Roads (RD/GN/032A), Highly Modified Friction Course (HMFC) is proposed as the standard surfacing material on the high speed road sections of new road projects with design speed of 80km/hr or above and expressway. From the RD/GN/032A, the noise reduction performance of HMFC is comparable to traditional LNRS (i.e. PMFC), hence, it is also served as LNRS. Locations of existing and committed LNRS (including HMFC to be implemented at proposed project road with design speed of 80km/hr or above and expressway) are confirmed with HyD and presented in **Appendix 4.8**.

### 4.4.3 Prediction and Evaluation of Road Traffic Noise Impact

#### Modelling Scenarios

4.4.3.1 Referring to the requirements of the EIA SB, the following scenarios were assessed in the EIA study.

- i. Unmitigated scenario at the assessment year with maximum traffic projection within 15 years upon operation of the Project (i.e. Year 2048); and
- ii. Prevailing scenario for indirect mitigated measures eligibility test (i.e. Year 2025), if mitigation measures are required

### 4.4.4 Prediction Of Noise Impact of Unmitigated Scenario

4.4.4.1 The predicted road traffic noise levels at each representative NAPs under unmitigated scenario are presented in **Table 4.12**. **Appendix 4.9** shows the details of the noise impacts at different levels of the NAPs under unmitigated scenario.

**Table 4.12 Predicted Road Traffic Noise Impact at NAPs Under Unmitigated Scenario**

NSR ID <sup>[1]</sup>	Description	NAP ID	Use <sup>[2]</sup>	Criterion, L10 1hr dB(A)	Max. Predicted Noise Level, L10 hr dB(A) <sup>[3]</sup>				Whether Noise Mitigation Measures on “Project Roads” are required (Y/N)
					Overall	Project Roads	Other Roads	Max. “Project Roads” Contribution when Overall Noise Level Exceed Criterion <sup>[4] [5]</sup>	
<b>Lam Tei</b>									
LT01	Area at/near Lo Fu Hang	LFH-01 – LFH-08	R	70	<b>65-71</b>	≤40-59	<b>65-71</b>	0.0	N
LT02	Area at/near Fu Tei Ha Tsuen	FTT-01 – FTT-04	R	70	54-66	≤40-56	54-65	–	N
	Temples at Fu Tei Ha Tsuen	Te-06	W	65	46	≤40	46	–	N

Notes:

[1] The assessment will only include NSRs which rely on opened windows for ventilation and within 300m assessment area.

[2] R – Residential, W – Place of Public Worship.

[3] Bold figure denotes the predicted noise level is over the relevant EIAO-TM noise criteria.

[4] Bold figure denotes the noise exceedance which is over the relevant EIAO-TM noise criteria and the contribution from Project Roads to the overall noise level is equal to or higher than 1.0 dB(A).

[5] Maximum Project Roads contribution for NSRs with overall noise level exceeding relevant criteria.

## Lam Tei Area

- 4.4.4.2 As discussed in **Section 4.4.2**, the NSRs within the Assessment Area for road traffic noise comprise of villages houses and temple of 1–3 storeys high.
- 4.4.4.3 According to the noise assessment results, the cumulative road traffic noise levels at most of village houses and temple would comply with the noise criterion and hence noise mitigation measures are not required.
- 4.4.4.4 However, for Area at/near Lo Fu Hang (LT01), one of the NAPs would experience cumulative noise impacts higher than the noise criterion. However, the exceedance is caused by the noise generated from Chui Fuk Road instead of the Project Road. The respective Project Contribution is also less than 1dB(A). On this basis, mitigation measures within the Project Road Extent would not be required.

## Consideration of Tunnel Portal Noise

- 4.4.4.5 For portal openings at Lam Tei, the existing NSRs within 300m from the portal openings are village houses, which are located below the portal level. The portal opening would be screened by the viaduct structure of new road sections or terrain. As there is also a proposed satellite control building and two ventilation buildings of TMB and R11, these buildings will be 2-3 storeys in height which can substantially screen the tunnel opening from the existing NSRs. Hence, adverse noise impact from the portal is not anticipated.
- 4.4.4.6 For portal openings near Tuen Mun Area 40, as there is no existing NSR identified within 300m from portal openings. Hence, adverse noise impact from the portal is not anticipated.

## **4.4.5 Indirect Mitigation Measures**

- 4.4.5.1 According to Section 4.8 of EIAO Guidance Note No. 12/2010, the testing criteria for consideration of Indirect Mitigation Measures are set out as below:
- (i) the predicted overall noise level from the road project together with other traffic noise in the vicinity must be above a specified noise level;
  - (ii) the predicted overall noise level is at least 1.0 dB(A) more than the prevailing traffic noise level, i.e. the total traffic noise level existing before the works to construct the road were commenced; and
  - (iii) the contribution to the increase in the predicted overall noise level from the road project must be at least 1.0 dB(A).
- 4.4.5.2 As mentioned above, in the case where NSRs are still exposed to noise levels exceeding the relevant noise criteria after the implementation of all direct mitigation measures, the total number of existing dwellings, classrooms and other noise sensitive elements which may qualify for indirect technical remedies should be identified. However, for those NSRs with cumulative noise level exceed the relevant noise criteria, the noise contribution from “Project Road” would be lesser than 1.0 dB(A). The assessment result of the prevailing scenario is shown in **Appendix 4.10**. Hence, irrespective of the prevailing noise level, all the NSRs would not satisfy the eligibility assessment criteria.

#### **4.4.6 Evaluation of Residual Road Traffic Noise Impact**

4.4.6.1 According to **Section 4.4.4**, adverse residual road traffic noise impact due to the Project is not anticipated.

### **4.5 Fixed Noise Sources Impact Assessment**

#### **4.5.1 Fixed Noise Sources Impact Assessment Methodology**

4.5.1.1 As set out in Appendix C Clause 4.1.2 of the EIA SB, a qualitative assessment is required to identify the fixed noise sources/ temporary industrial sources, and proposing corresponding direct mitigation measures to be adopted during operation phase to demonstrate that no adverse fixed noise sources impact will be associated with the Project. A summary of key steps for this qualitative fixed noise sources noise assessment that has conducted is:

- Determine the assessment area from Project Road and highway / tunnel operation and maintenance facilities;
- Summarize the fixed noise sources;
- Identify and locate representative NSRs that may be affected by the noise sources;
- Determine the noise criteria for both daytime and nighttime;
- Evaluate the potential qualitative impact at the NSRs; and
- Examine and recommend all practical mitigation measures such as quiet plant, silencer, enclosure, etc, to alleviate any potential noise impacts as much as practicable.

#### **4.5.2 Identification of Fixed Noise Sources Impact**

##### Identification of Assessment Area and Noise Sensitive Receiver

4.5.2.1 The assessment area for fixed noise source impact includes an area within 300m from the Project Road and highway / tunnel operation and maintenance facilities. Representative NSRs and NAPs locations that would be affected by the fixed noise sources have been identified and presented in **Table 4.8** and are summarised in the **Table 4.13** below. Locations of Representative NSRs and NAPs for fixed noise sources impact assessment are shown in **Figure 4.5**.

**Table 4.13 Representative NSRs for Fixed Noise Source Impact Assessment**

NSR ID [1]	Description	Use [2]	Number of Storeys	NAP ID	Area Sensitivity Ratings [3]	ANL – 5, dB(A)	Prevailing Background Noise Levels, dB(A)	Noise Criteria, dB(A) [4,5]
Existing NSRs								
a. Lam Tei								
LT02	Area at/near Fu Tei Ha Tsuen	R	1 – 3	FTT-01	A	55 / 55/ 45	52/ 50 / 45	52 / 50 / 45
	Temples at Fu Tei Ha Tsuen	W	1	Te-06	A	55 / 55/ 45	52/ 50 / 45	52 / 50 / 45
b. Tuen Mun West								
TMS01	Harvest Garden	R	17	HAR-01	B	60 / 60 / 50	53 / 53 / 49	53 / 53 / 49
TMS02	Kam Fai Garden	R	15	KAM-01	B	60 / 60 / 50	53 / 53 / 49	53 / 53 / 49

Notes:

[1] The assessment will only include NSRs which rely on opened windows for ventilation and within 300m assessment area.

[2] R – Residential; W – Place of Public Worship.

[3] Refer to [Appendix 4.11](#).

[4] Day / Evening / Nighttime criteria

[5] Fixed noise criteria are stipulated in Annex 5 of EIAO-TM and summarized below:

(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 noise level 5 dB(A) below the ANL).

## Inventory of Noise Sources

4.5.2.2 According to current design, 3 ventilation buildings for the Project are proposed and summarized in **Table 4.14** below. Potential fixed noise impacts arising from the ventilation buildings would be caused by operation of the ventilation fans. The locations of the potential fixed noise sources during operation phase as confirmed with HyD are shown in **Figure 4.5**.

**Table 4.14 Summary of Proposed Potential Fixed Noise Sources**

<b>Location</b>	<b>Ventilation building(s)</b>	<b>Other Potential Fixed Noise Source</b>
Lam Tei	Northern Ventilation Building (NVB)	Satellite Control Building
Wah Fat Playground	Middle Ventilation Building (MVB)	-
Pillar Point (right above the TM-CLKT)	Southern Ventilation Building (SVB)	Administrative Building Maintenance Compound

### **4.5.3 Evaluation of Fixed Noise Sources Impact**

4.5.3.1 As discussed in **Section 2**, the three Ventilation Buildings (ie a total of 3 no. in Lam Tei, Wah Fat Playground and Pillar Point) and Administration Building (in Pillar Point) are the key fixed noise sources for the Project. **Section 4.2.3** has also identified the NSRs in the vicinity of these fixed noise sources. All the planned noise sources would be assumed to be operated at the same time as worst-case scenario as confirmed with HyD.

4.5.3.2 For the Northern Ventilation Building, the nearest existing NSR in the vicinity of are the village houses near Fu Tei Ha Tsuen (LT02). The separation distance between Ventilation Building (i.e. the nearest source) and this NSR is ~50m. It is anticipated that, with a combination of the mitigation measures such as selection of quieter plant, installation of suitable sound attenuators, suitable orientation of the key louvers etc (see **Section 2**), adverse fixed noise impact is not anticipated. The Detailed Designer / Contractor of the Ventilation Building shall consider all the contemporary circumstances including but not limited to the ventilation building for R11 when designing the noise mitigation measures.

4.5.3.3 For Satellite Control Building at Lam Tei, the major noise sources would be noise from ventilation system. Comparing to NVB, they are located further away from nearest existing NSR (i.e. village houses near Fu Tei Ha Tsuen (LT02)). It is anticipated that, with a combination of the mitigation measures such as selection of quieter plant, installation of suitable sound attenuators, suitable orientation of the key louvers etc (see **Section 2**), adverse fixed noise impact is not anticipated.

4.5.3.4 For Highway/ Tunnel Operation Area, it is reserved area for vehicle retention and other tunnel operation. Since the uses, layout and design of the operation area are not yet available at EIA stage, it is feasible that it could be planned and designed with a combination of the mitigation measures such as selection of quieter plant, installation of suitable sound attenuators, to avoid adverse fixed noise impact.

- 4.5.3.5 For the Middle Ventilation Building, the nearest NSR in the vicinity are Harvest Garden (TMS01) and Kam Fai Garden (TMS02), and noise exceedance may be anticipated without the adoption of noise mitigation measures. The separation distances from these NSRs are approximately 150m from Harvest Garden (TMS01) and approximately 95m from Kam Fai Garden (TMS02). All the mitigation measures as discussed for the Lam Tei area would also be applicable. Nevertheless, the Detailed Designer / Contractor of the Ventilation Building shall orient the major louvres towards the natural terrain and away from nearby NSRs as far as practicable.
- 4.5.3.6 For Southern Ventilation Building, Administrative Building and Maintenance Compound at Pillar Point right above the TM-CLKT, as there is no existing noise sensitive use identified within 300m assessment area from these areas. Hence, adverse fixed noise impact due to Southern Ventilation Building is not anticipated.
- 4.5.3.7 For the Recovery Area at Pillar Point, it is retention area for vehicle that is not suitable for entering the tunnel, vehicle will leave this area shortly and no fixed noise sources are identified. There is no existing noise sensitive use identified within 300m assessment area from the Recovery Area. Hence, adverse fixed noise impact due to Recovery Area is not anticipated.
- 4.5.3.8 For the Training Ground and Supporting Area at Pillar Point, it is spare area for supporting tunnel operation, there is no planned use currently and hence, no fixed noise sources are identified. There is no existing or planned noise sensitive use identified within 300m assessment area from the Training Ground and Supporting Area. Hence, adverse fixed noise impact due to Training Ground and Supporting Area is not anticipated.
- 4.5.3.9 The temporary re-provisioned carpark will be operated by others, the future operator should ensure their operation would comply with NCO and the relevant criteria. Adverse noise impacts from carpark are therefore not anticipated.
- 4.5.3.10 As the temporary reprovision of EMSD vehicle servicing centre would only last during the construction of the Project and the permanent reprovision by EMSD would be completed before the commissioning year for the operation of the Project. There is no existing NSR in the vicinity of the temporary EMSD vehicle servicing centre, adverse noise impact from temporary reprovision of EMSD vehicle servicing centre is not anticipated.

#### Consideration of Cumulative Impacts

- 4.5.3.11 The project proponent of R11 is the same as the Project and would implement the equivalent set of noise mitigation measures as the Project. Adverse cumulative noise impacts from R11 are therefore not anticipated.
- 4.5.3.12 The planning studies for the Underground Quarrying at Lam Tei, Tuen Mun and Development at Lam Tei North East are still on-going and there are no definitive design information at the time of preparing this EIA. Nevertheless, it is anticipated that their studies would consider all committed projects in the vicinity, including but not limited to Project during their subsequent study. As any other studies by government, it is anticipated that they will also implement all the best practices and recommended mitigation measures to abate noise impacts where practicable. On this basis, adverse cumulative noise impacts from these projects are therefore not anticipated.

#### **4.5.4 Mitigation of Fixed Noise Sources Impact**

4.5.4.1 Possible mitigation measures with reference to EPD's "Good Practices on Ventilation System Noise Control" could be considered the fixed noise sources and confirmed with the Engineer, for examples:

- Quieter equipment;
- Silencer;
- Barrier; and
- Enclosure, etc.

4.5.4.2 The detailed design should incorporate the following good practice in order to minimize 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 impacts at the receivers.

- Louvres should be orientated away from adjacent NSRs, preferably onto main roads which are less sensitive.
- The façade for these ventilation shafts should have adequate sound insulation properties to minimise the noise emanating through the building fabric.

#### **4.5.5 Fixed Noise Source Management Plan**

4.5.5.1 As set out in Appendix C Clause 4.1.2 and 4.6 of the EIA SB, a Fixed Noise Source Management Plan (FNMP) containing the quantitative fixed noise sources impact assessment, noise mitigation measures and fixed noise sources impact monitoring and audit programme will be submitted to the EPD with reference to the updated and identified plant inventories and utilization schedule once available and in any case before tendering and commencement of implementation of the Project. If there is any change to the specifications of the planned fixed noise sources, layout design, operation modes, mitigation measures, or any other factors that would have implications on the fixed noise sources impact as concluded in the FNMP, an updated FNMP shall be submitted to the EPD no later than one month before the implementation of any such change.

4.5.5.2 A summary of key steps for quantitative fixed noise sources noise assessment will be conducted is:

- Determine the assessment area from Project Road and highway / tunnel operation and maintenance facilities;
- Update representative NSRs that may be affected by the noise sources;
- Review and update the noise criteria for both daytime and nighttime if necessary;
- Use standard acoustic principle for attenuation and directivity;
- Adopt correction of tonality, impulsiveness and intermittency as stipulated in IND-TM;
- Calculate the noise impacts using the latest or the most updated plant inventories and utilisation schedule, if available; and

- Cumulative impacts shall be included.

4.5.5.3 The FNMP will include an implementation schedule clearly listing out the mitigation measures, the implementation party, location and timing of implementation. Mitigation measures recommended and requirement specified in the FNMP shall be fully implemented by the Contactor.

#### **4.5.6 Evaluation of Residual Fixed Noise Sources Impact**

4.5.6.1 Fixed noise sources impact arising from the Project will be within respective criteria. Adverse residual noise impacts are thus not anticipated.

4.5.6.2 The number of dwellings, classrooms and other sensitive elements that will be exposed to adverse residual noise impact exceeding the criteria set in Annex 5 in the TM is nil.

### **4.6 Environmental Monitoring and Audit**

#### **4.6.1 Construction Noise**

4.6.1.1 Noise monitoring should be carried out as part of the Environmental Monitoring and Audit (EM&A) programme for the construction phase of the Project to check compliance with the construction noise criteria. A CNMP should evaluate the potential construction noise impacts and to assess the effectiveness and practicality of all proposed noise mitigation measures. The CNMP would be prepared with reference to section 8 and Annex 21 of the EIAO-TM as well as this EIA report and EM&A manual and submitted before tendering and commencement of construction works. The implementation of the mitigation measures recommended in CNMP should also be audited as part of the EM&A programme. Details of the EM&A requirements are provided in the EM&A Manual.

#### **4.6.2 Road Traffic Noise**

4.6.2.1 As there is no noise mitigation measures proposed under the Project, hence, no monitoring is required for road traffic noise.

#### **4.6.3 Fixed Noise Source Impact**

4.6.3.1 A FNMP should evaluate the potential fixed noise sources impacts and to assess the effectiveness and practicality of all proposed noise mitigation measures. The FNMP would be prepared with reference to section 8 and Annex 21 of the EIAO-TM as well as this EIA report and EM&A manual and submitted before tendering and commencement of implementation of the Project. Fixed noise audit should be carried out for the proposed fixed noise sources during the testing and commissioning stage to verify the compliance of the EIAO-TM criteria.

### **4.7 Conclusion**

#### **4.7.1 Construction Noise**

4.7.1.1 An assessment on construction noise has been conducted according to the requirements in the EIA SB. Results indicated that, with the adoption of proposed noise mitigation

measures, including the use of QPME, use of quieter construction method, use of noise barrier / enclosure, etc, adverse noise impact arising from construction works of the Project is not anticipated. Nevertheless, a CNMP, which contains a quantitative construction noise impact assessment, mitigation measures and monitoring and audit programme, should be submitted before tendering and commencement of construction works.

#### **4.7.2 Road Traffic Noise**

4.7.2.1 A road traffic noise assessment has been conducted according to the requirements in EIA SB. Mitigation measures are not required within the Project Road extent to fulfill the respective requirements.

#### **4.7.3 Fixed Noise Source Impact**

4.7.3.1 An assessment on fixed noise sources has been conducted according to the requirements in EIA SB. With the adoption of proposed noise mitigation measures, including the use of quieter equipment, silencer, barrier, enclosure, etc, adverse noise impact arising from fixed noise sources is not anticipated. Nevertheless, a FNMP, which contains a quantitative fixed noise sources impact assessment, mitigation measures and monitoring and audit programme, should be submitted before tendering and commencement of implementation of the Project.