3. NOISE IMPACT

3.1 Legislation, Policies, Plans, Standards and Criteria

3.1.1 *Environmental Impact Assessment Ordinance*

3.1.1.1 The general criteria and guidelines for evaluating and assessing noise impact are listed in *Annexes 5 and 13* of the *EIAO-TM* and summarized here in **Tables 3.1, 3.2 and 3.3**. The specific areas of noise impact are described in the sections that followed.

Table 3.1 Noise Standards for Daytime Construction Activities

Time of the Day / Noise Standards / Uses	0700 to 1900 hours on any day not being a Sunday or general holiday Leq (30 mins) dB(A)	1900 to 0700 hours or any time on Sundays or general holiday
All domestic premises including temporary housing accommodation	75	(See Note 3)
Hotels and hostels	75	
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	70 65 (During examinations)	

Notes:
1. The above standards apply to uses that rely on opened windows for ventilation.
2. The above standards should be viewed as the maximum permissible noise levels assessed at 1 m from the external façade.
3. The criteria laid down in the relevant technical memoranda under the Noise Control Ordinance for designated areas and construction works other than percussive piling may be used for planning purpose. A Construction Noise Permit (CNP) shall be required for the carrying our of the construction work during the period.

Table 3.2 Noise Standards for Planning Purpose

Noise Sources / Noise Standards / Common Uses	Aircraft Noise (Noise Exposure Forecast: NEF)		Helicopter Noise L_{max} dB(A)	Road Traffic Noise Peak Hour Traffic L_{10} (1hour) dB(A)	Rail Noise	Fixed Noise Sources
	Kai Tak Airport	New Chek Lap Kok Airport	0700 to 1900 Hours			
All domestic premises including temporary housing accommodation	30	25	85	70	(see Note 3) The appropriate Acceptable Noise Levels shown in Table 3 of the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites and (b) L_{max} (2300-0700 hours) = 85dB(A)	(a) 5dB(A) below the appropriate Acceptable Noise Levels (ANL) shown in Table 3 of the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites, or (b) the prevailing background noise levels (For quiet areas with level 5 dB(A) below the ANL)
Hotels and hostels	30	25	85	70		
Offices	30	30	90	70		
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	30	25	85	65		
Places of public worship and courts of law	30	25	85	65		
Hospitals, clinics, convalescences and homes for the aged, diagnostic rooms, wards	30	25	85	55		

Notes: The above standards apply to uses that rely on opened windows for ventilation.
1. The above standards should be viewed as the maximum permissible noise levels assessed at 1 m from the external façade.
2. Rail noise is under the control of the Noise Control Ordinance and shall comply with the Acceptable Noise Levels laid down in the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites.

Table 3.3 Suitable Window Types for Noise Insulation

Suitable window type when the estimated noise level exceeds the relevant standard by β value.

Window Types / Exceedance over standard / Noise source	I	II	III
Rail Traffic	$\beta < 5$	$5 \le \beta < 10$	$\beta \ge 10$
Road Traffic	$\beta < 10$	$10 \le \beta < 15$	$\beta \ge 15$
Aircraft	-	$\beta < 10$	$\beta \ge 10$
Helicopter	$\beta < 5$	$5 \le \beta < 10$	$\beta \ge 10$

NOISE INSULATION PERFORMANCE AND WINDOW TYPES

I – openable well-gasketted window, 6mm pane, or transmission loss (TL) or 28dB or above in 250Hz octave-band and sound transmission class (STC) 31 or above

II – openable well-gasketted window, 8mm pane, or TL or 32dB or above in 250Hz octave-band and Sound transmission class (STC) 34 or above

III – openable well-gasketted window, 12mm pane, or TL or 33dB or above in 250Hz octave-band and sound transmission class (STC) 38 or above

3.1.2 *Construction Noise*

3.1.2.1 The Noise Control Ordinance (NCO) (Cap. 400) provides the statutory framework for noise control in Hong Kong. Assessment procedures and standards have been set out in four Technical Memoranda (TM) promulgated under the NCO. The following three are applicable to the assessment and control of construction noise.

- *TM on Noise from Construction Work other than Percussive Piling*
- *TM on Noise from Percussive Piling*
- *TM on Noise on Construction Work in Designated Areas*

3.1.2.2 To ensure a better environment, the *EIAO-TM* promulgated under the *Environmental Impact Assessment Ordinance* (EIAO) (Cap. 499) has imposed more stringent criteria for noise impact assessment and control (see **Table 3.1**). For example, there is no statutory limit on daytime construction noise under the NCO and related TM. Yet, the *EIAO-TM* imposes a 75 dB(A) [Leq(30-min)] criterion on daytime construction activities.

Construction Noise During Restricted Hours

3.1.2.3 For 1900 to 0700 hours or any time on Sundays or general holidays, construction noise (except percussive piling) is controlled by the *NCO* and the *TM on Noise from Construction Work other than Percussive Piling*. A Construction Noise Permit (CNP) from the Environmental Protection Department (EPD) is required for works carried out in these restricted periods. The *TM* also established permissible construction noise levels and described the methods for calculating noise levels. The control of noise from powered mechanical equipment (PME) is based on the Area Sensitivity Ratings (ASR) of where the noise sensitive receivers (NSRs) are located, rather than the measured background noise level. The ASRs, as shown in **Table 3.4**, take into account the types of dwelling present and the surrounding land uses.

Table 3.4 Area Sensitivity Ratings (ASR)

Type of Area Containing Noise Sensitive Receiver (NSR)	Degree to which NSR is affected by Influencing Factors		
	Not Affected	Indirectly Affected	Directly Affected
Rural area including country parks or village type developments	A	B	B
Low density residential area consisting of low rise or isolated high rise developments	A	B	C
Urban area	B	C	C
Areas other than those above	B	B	C

3.1.2.4 Basic Noise Levels (BNL) are then ascribed according to the ASR, as shown in **Table 3.5**. Acceptable Noise Levels (ANL) for construction works are calculated from the BNL, following corrections for the duration of the CNP and for multiple site situations.

Table 3.5 Basic Noise Levels (BNL) in dB(A)

Time Period	Area Sensitivity Rating (ASR)		
	A	B	C
All days during the evening (1900 to 2300 hrs) and general holidays (including Sunday) during the day-time and evening (0700 to 2300 hrs)	60	65	70
All days during the night-time (2300 to 0700 hrs)	45	50	55

Percussive Piling

3.1.2.5 Construction Noise Permits are also required for percussive piling (*TM on Noise from Percussive Piling*), which specify the permitted hours and other conditions of piling. **Table 3.6** lists the acceptable percussive piling noise levels for various types of NSR buildings.

Table 3.6 Acceptable Noise Levels (ANL) for Percussive Piling

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

3.1.2.6 Percussive piling may be restricted to 12, 5 or 3 hours per day. It is prohibited during restricted periods unless specifically exempted. For NSRs that are particularly sensitive to noise, such as hospitals, medical clinics, educational institutions and courts of law, a further reduction of 10 dB(A) shall be applied to the above ANLs.

3.1.3 *Operational Noise*

Fixed Sources

3.1.3.1 Operational noise is controlled under the NCO's *Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites.* Table 3 of the TM specifies the ANLs.

3.1.3.2 To plan for a better environment, the EIAO-*TM* specifies the following requirements:

- 5 dB(A) below the appropriate ANLs shown in Table 3 of the *Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites;* or
- the prevailing background noise levels. (For quiet areas with 5 dB(A) below the ANL).

3.1.3.3 **Table 3.7** compares the two criteria. The *EIAO-TM* criteria were adopted for this study.

Table 3.7 Acceptable Noise Levels (ANL) for Operational Period

Time Period	Part I: Criteria in TM-NCO			Part II: Criteria in EIAO-TM		
	ASR A	ASR B	ASR C	ASR A	ASR B	ASR C
Day (0700 to 1900 hours)	60	65	70	55	60	65
Evening (1900 to 2300 hours)	60	65	70	55	60	65
Night (2300 to 0700 hours)	50	55	60	45	50	55

Note: According to the *EIAO-TM*, the level of the intruding noise should be lower than Part II values and the background level, whichever is lower.

Road Traffic, Rail Traffic and Helicopter

3.1.3.4 Reference is made to the *EIAO-TM* Annex 5 Table 1A Noise Standards for Planning Purposes and to **Tables 3.2 and 3.3**.

3.1.3.5 In cases where practicable direct mitigation measures alone would not be adequate in mitigating road traffic noise impacts, indirect technical remedies may be adopted provided that the residual impacts satisfy all three criteria below:

(i) the predicted overall noise level from the new road together with other traffic in the vicinity must be above the specified noise level (e.g. 70 dB(A) for domestic premises and 65 dB(A) for education institutions, all in L10(1hr));

(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 were commenced; and

(iii) the contribution to the increase in the predicted overall noise level from the new road must be at least 1.0 dB(A).

3.1.3.6 The total number of existing dwellings, classrooms and other noise sensitive elements that may qualify for indirect technical remedies are then estimated.

3.1.3.7 For this assessment, all roads were described as either:

- Existing roads: including existing roads that will remain either completely unchanged or that will undergo only very minor alterations; or
- New roads / Altered roads: including roads that will be new or substantially altered.

3.2 Assessment Methodology

3.2.1 *Construction Noise*

3.2.1.1 Construction noise impact would be assessed by adopting the standard acoustic principles and the methodologies relevant to technical memoranda issue under the Noise Control Ordinance, primarily the TM on Noise from Construction Work other than Percussive Piling (GW-TM).

3.2.1.2 The whole SEKD is broken down into four major development packages as shown in **Drawing No. 22936/IM/010**, namely:

1. Kai Tak Airport Early Development Package (KTA)

2. Kowloon Bay Reclamation Early Development Package (KBR)

3. Waterfront Facilities & Kai Tak Nullah/Kwun Tong Typhoon Shelter Reclamation (KTAC/KTTS) and

4. Truck Road T2/Runway.

3.2.1.3 Each development package is individually divided into different work packages and is summarized in **Table 3.8**.