



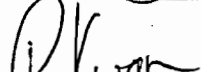
MTR Corporation Limited

Contract No. KGS 811

**Kowloon Southern Link (KSL)
Independent Environmental Checker**

Groundborne Noise Performance Test Proposal

April 2009

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1 INTRODUCTION

1.1 Purpose

- 1.1.1 The Environmental Impact Assessment (EIA) Report for the Kowloon Southern Link (KSL) project concluded that operational groundborne noise impacts induced from the running of KSL train would be mitigated by the special trackform.
- 1.1.2 According to the Environmental Permit No. EP-215/2005/B, a noise performance test proposal should be submitted to the Environmental Protection Department (EPD) six months prior to the operation of the project. The noise performance test proposal will include key sensitive receivers including the Hong Kong Cultural Centre, Hong Kong Space Museum, hotel and domestic premises in the vicinity of the KSL to demonstrate that the operation of the Project is able to meet the operational ground borne noise criteria mentioned in the EIA report.
- 1.1.3 This plan provides the details of the groundborne noise monitoring programme to confirm the noise performance for KSL.

1.2 Legislation and Standards

- 1.2.1 With reference to the Technical Memorandum for the Assessment of Noise from Places Other Than Domestic Premises, Public Places or Construction Sites (TM-Places) under the Noise Control Ordinance (NCO), the criteria for noise transmitted primarily through the structural elements of the building or buildings will be 10dB(A) less than the relevant acceptable noise level (ANL). These criteria apply to all kinds of use from domestic premises to performing arts centres. According to the TM-Places, the groundborne noise standard for Hong Kong Cultural Centre (HKCC) and Hong Kong Space Museum (HKSM) is $L_{Aeq(30min)}$ 55dB(A) during general operational periods.
- 1.2.2 Given the nature of activities held at HKCC and HKSM, a more stringent design goal for these facilities was suggested in the EIA Report of the KSL Project. Groundborne noise limit of L_{Amax} 25dB(A) is proposed and agreed by the EIAO Authority for Grand Theatre, Studio Theatre, Concert Hall of HKCC and Planetarium, Recording Room of HKSM following a recognised international standard - the latest guidance manual "Transit Noise and Vibration Impact Assessment" 1995 issued by the Federal Transit Administration (FTA), US Department of Transportation.
- 1.2.3 The operational groundborne noise criteria in the EIA report are tabulated in Table 1-2 below.

Table 1-2: Operational groundborne noise criteria for HKCC, HKSM, schools, hotel guestrooms and domestic premises

Noise Sensitive Receiver Description	Groundborne Noise Criteria, dB(A)	
	Day & Evening (0700 to 2300 hrs)	Night (2300 to 0700 hrs)
HKCC - Grand Theatre, Studio Theatre, Concert Hall	25 (L_{Amax}) ^[1]	- ^[2]
HKSM - Planetarium, Recording Room	25 (L_{Amax}) ^[1]	- ^[2]
School – Classrooms	55 ($L_{Aeq 30 min}$)	- ^[2]
Hotel guestrooms along Canton Road & Salisbury Road	55 ($L_{Aeq 30 min}$)	45 ($L_{Aeq 30 min}$)
Domestic premises along Canton Road	55 ($L_{Aeq 30 min}$)	45 ($L_{Aeq 30 min}$)

Note:

[1] For HKSM and HKCC, the 25dB(A) criterion is based on FTA guidance manual. It is maximum rms average over a 1 second period.

[2] No sensitive uses during these periods

2 KOWLOON SOUTHERN LINK OPERATIONS MONITORING

2.1 Vibration Sources

2.1.1 When trains operate in tunnels that are located in close proximity to occupied structures, there is a possibility that vibrations associated with train pass-bys will be transmitted through the track tunnel to the building structure, and be radiated as noise in the occupied spaces within the structure. The noise and vibration levels within the structure may be high enough to cause annoyance to the Noise Sensitive Receivers (NSR).

2.2 Monitoring Locations

2.2.1 According to the KSL Environmental Monitoring and Audit Manual, the noise performance test should be conducted at selected key noise sensitive receivers including HKCC, HKSM, Hong Kong Hotel and Park Avenue (Olympian City II - OCII). With reference to this manual, the noise monitoring locations are selected accordingly with due considerations of the following factors:

- (i) distance between the NSR to the railway;
- (ii) sensitivity of the NSR;
- (iii) trackform next to the NSR; and
- (iv) latest site conditions and site constraints.

2.2.2 Monitoring at HKCC, HKSM and OCII will be conducted as recommended in the manual. However, Hong Kong Hotel located at about 20m away from the alignment would be subject to groundborne noise impact of a lesser extent as a result of larger distance attenuation in comparison to Royal Pacific Hotel which is at 10m away. Royal Pacific Hotel is, therefore, considered as a more representative location and selected for the monitoring.

2.2.3 Monitoring at the redeveloped Former Marine Police Headquarters (FMPHQ) and Man King Building, which are adjacent to curved tracks and crossovers has also been considered. However, these locations are inaccessible during the time of this proposal being prepared. Nevertheless, special trackforms have been adopted that no adverse groundborne noise impact would be expected.

2.2.4 The proposed groundborne noise monitoring locations are summarised in Table 2-1 and shown in Figures 2-1, 2-2 and 2-3. Information including description of trackform, distance to the track from NSRs is also summarized in the table.

Table 2-1 Summary of the proposed NSR location for groundborne noise monitoring

Monitoring Location	Trackform	Distance to the nearest track
Hong Kong Space Museum ● Planetarium ● Recording room	Type 4	25m
Hong Kong Cultural Centre ● Studio Theatre ● Concert Hall ● Grand Theatre	Type 4	60m
Royal Pacific Hotel	Type 2	10m
Park Avenue - Olympian City II	Type 1	60m

Notes:

- (i) Type 1 Trackform is resilient baseplate.
- (ii) Type 2 Trackform is 12.5Hz Floating Slab Track (FST) with plain bearing.
- (iii) Type 4 Trackform is 10Hz modified FST with plain bearing.

2.2.5 If the proposed noise monitoring locations are not accessible, alternative monitoring locations will be proposed. The selection of these alternative monitoring locations will base on the following criteria:

- at locations closest to the KSL tunnel which are likely to have noise impacts; and
- close to the proposed NSRs or other NSRs, such as domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law and performing arts centre.

2.3 Monitoring Parameters

2.3.1 The appropriate parameter for measuring noise impacts will be the A-weighted equivalent continuous sound pressure level (L_{Aeq}) for Royal Pacific Hotel and Olympic City II and L_{max} for HKCC and HKSM.

2.4 Noise Monitoring Equipment

2.4.1 In accordance with (TM-Places), sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications will be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement, the accuracy of each sound level meter will be checked using an acoustic calibrator generating a known sound pressure level at a known frequency.

2.4.2 For recording real time octave band noise levels, a noise meter which is capable of carrying out detailed real time octave band analysis and broadband statistical distributions with data logging rate down to 1 second.

2.5 Groundborne Noise Monitoring

2.5.1 The groundborne noise monitoring is scheduled during the testing and commissioning of the KSL. The commissioning test will be a time table run that simulate the real operation. The test will be carried out at night time and after the normal operation of MTR West Rail Line and East Rail Line i.e. 0100 - 0530. The actual monitoring date and time is subject to the full commissioning schedule of the KSL.

2.5.2 Groundborne noise level in L_{Aeq} at 1 second interval will be recorded at designated monitoring locations continuously throughout the monitoring period. All data will be stored in the data logger of the sound level meter for further analysis.

2.5.3 For HKCC and HKSM, L_{Amax} will be recorded during the noise measurement. Information such as the operating condition of the theatre (e.g. A/C on and off, equipment noise and doors conditions) will be recorded for analysis.

2.5.4 Measurements may be accepted as valid only if the calibration levels from before and after the noise measurement agree to within 1.0 dB.

2.5.5 Measurements will be made in accordance with generally accepted international acoustical practices.

2.6 Data Analysis Methodology

2.6.1 Background noise levels and train noise levels in terms of $L_{Aeq (30 min)}$ will be evaluated from the overall noise levels recorded at the monitoring stations.

2.6.2 Train noise in terms of $L_{eq (30 min)}$, will be calculated by using the following formula:

$$\text{Train } L_{Aeq, (30 min. train)} = 10 \times \log \left(10^{\text{Overall } L_{Aeq (30 min) / 10}} - 10^{\text{Background } L_{Aeq (30 min) / 10}} \right)$$

Notes: Train $L_{Aeq, (30 min. train)}$ = Equivalent continuous train noise level for 30 minutes

Overall $L_{Aeq, (30 \text{ min. train})}$ = Equivalent continuous overall noise level for 30 minutes
Background $L_{Aeq, (30 \text{ min. train})}$ = Equivalent continuous background noise level for 30 minutes

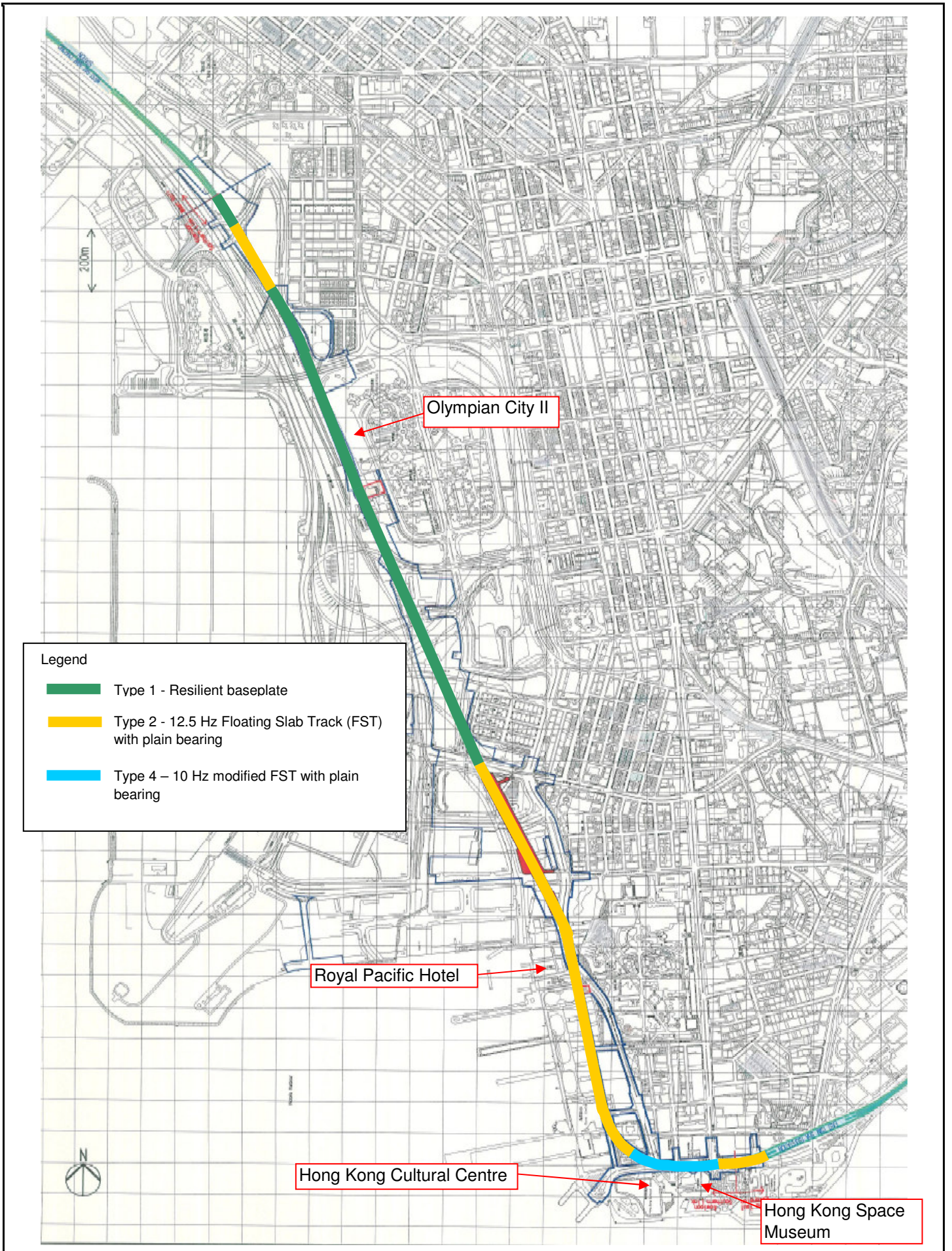
2.6.3 For HKCC and HKSM, measured L_{Amax} will be used to compare with the criteria as shown in Table 1-2.

3 REPORTING

3.1.1 A groundborne noise monitoring report will be certified by the ET Leader and verified by the IEC before submit to the EPD. The content of the report will include:

- (i) Introduction
- (ii) Monitoring equipment
- (iii) Monitoring methodology
- (iv) Results
- (v) Data analysis
- (vi) Conclusion

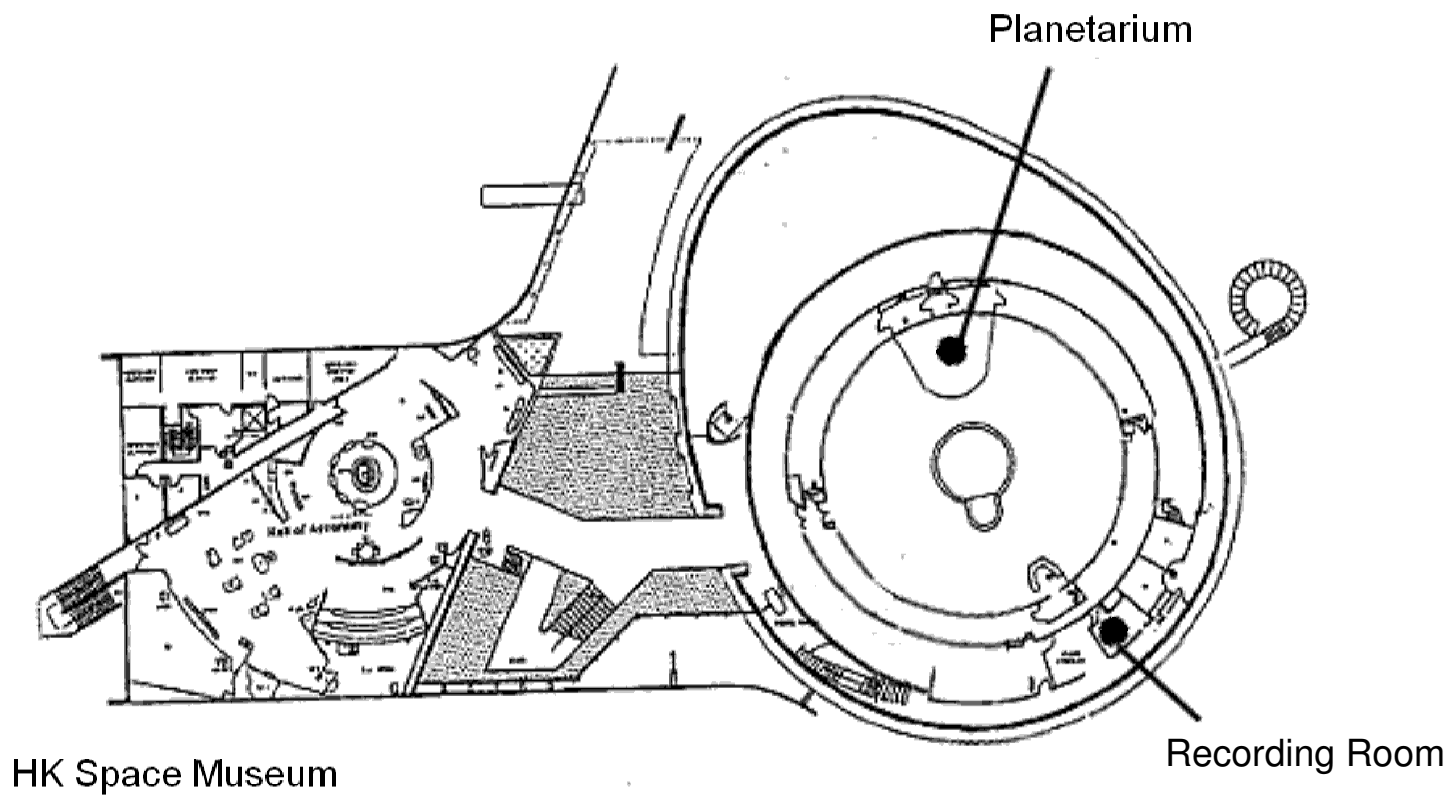
FIGURES



Legend

- Type 1 - Resilient baseplate
- Type 2 - 12.5 Hz Floating Slab Track (FST) with plain bearing
- Type 4 - 10 Hz modified FST with plain bearing

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		Groundborne Noise Monitoring Proposal		CHECK		DRAWN	
		Groundborne Noise Monitoring Location		JOB NO.	60016779	DRAWING No.	2.1



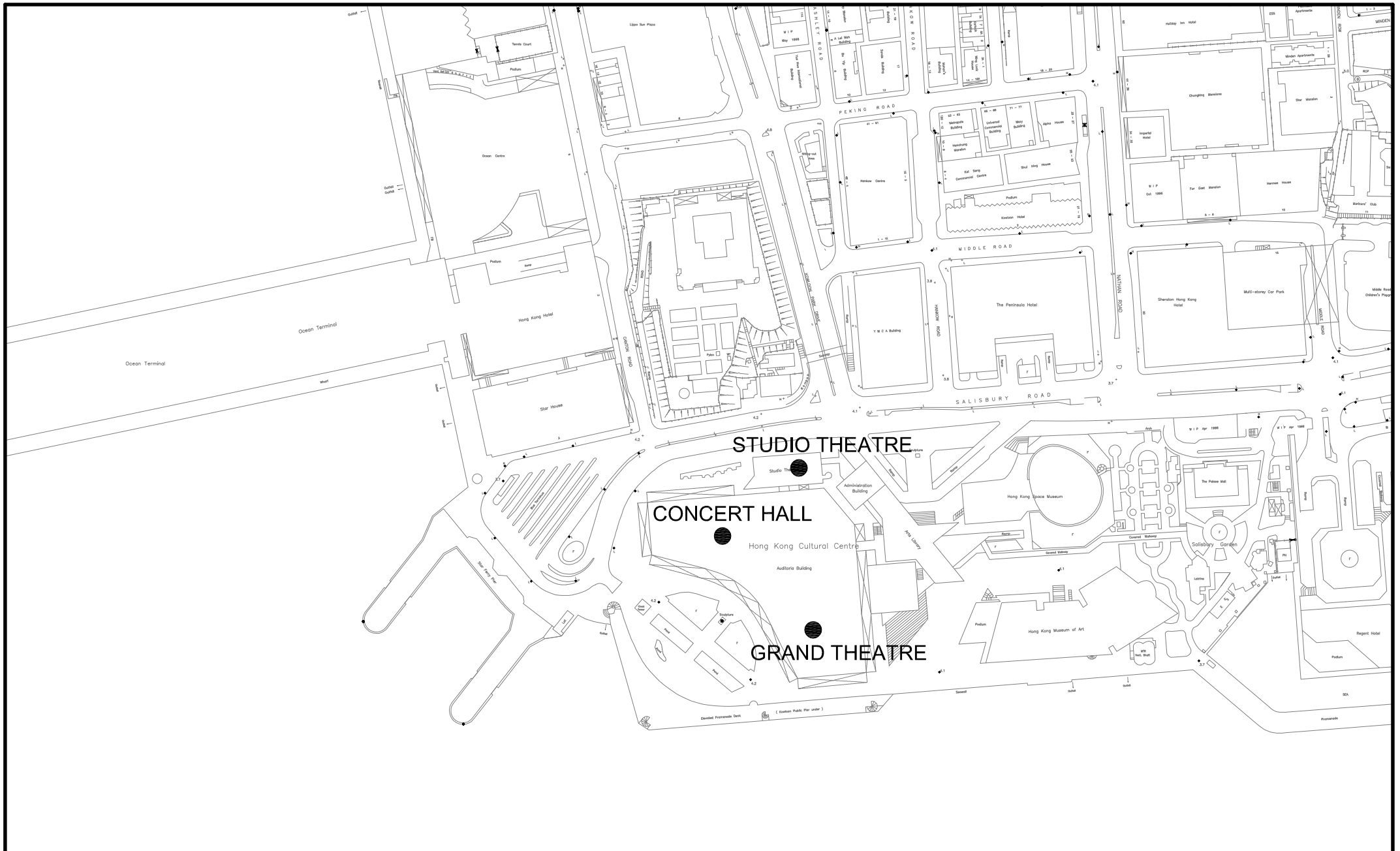
KOWLOON SOUTHERN LINK
 GROUNDBORNE NOISE MONITORING PLAN

MONITORING LOCATIONS AT HONG KONG SPACE MUSEUM

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KOWLOON SOUTHERN LINK
 GROUNDBORNE NOISE MONITORING PLAN

MONITORING LOCATIONS AT HONG KONG CULTURAL CENTRE

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