

## 1. INTRODUCTION

In January 2014, it was decided by the client that only Phase 1 of public housing (PH) site will be developed, and Phase 2 & 3 of PH site and Yuen Long Industrial Estate Extension (YLIEE) would be shelved. Arup was commissioned to carry out the separate study for the "Phase 1 development only". This paper is to present the findings of the preliminary fixed noise impact assessment for Phase 1 development.

## 2. FIXED NOISE CRITERIA

The Area Sensitive Ratings (ASR) of Noise Sensitive Receiver (NSRs) depends on the type of area containing the NSR in accordance with TM-Places. With the proposed high-rise housing development in place, the type of area containing the NSR within the Site would no longer be rural area or low density residential area. Since the planned PH Site are not considered as Type (i) Rural area, including country parks or village type developments, Type (ii) Low density residential area consisting of low-rise or isolated high-rise developments or Type (iii) Urban area, Type (iv) Area other than those above is considered as appropriate type of area containing NSRs for the proposed development site. Long Tin Road is an Influencing Factor (IF) since the Annual Average Daily Traffic (AADT) is greater than 30,000 vehicles according to "The Annual Traffic Census 2012" by Transport Department (TD). The Area Sensitive Rating for the proposed development in Phase 1 should be "B" as the type of area is (iv) and is indirectly affected / not affected by Long Tin Road according to TM-Places. The Acceptable Noise Level (ANL) for Area Sensitivity Rating "B" is 65dB(A) for day & evening period, and 55dB(A) for night time period.

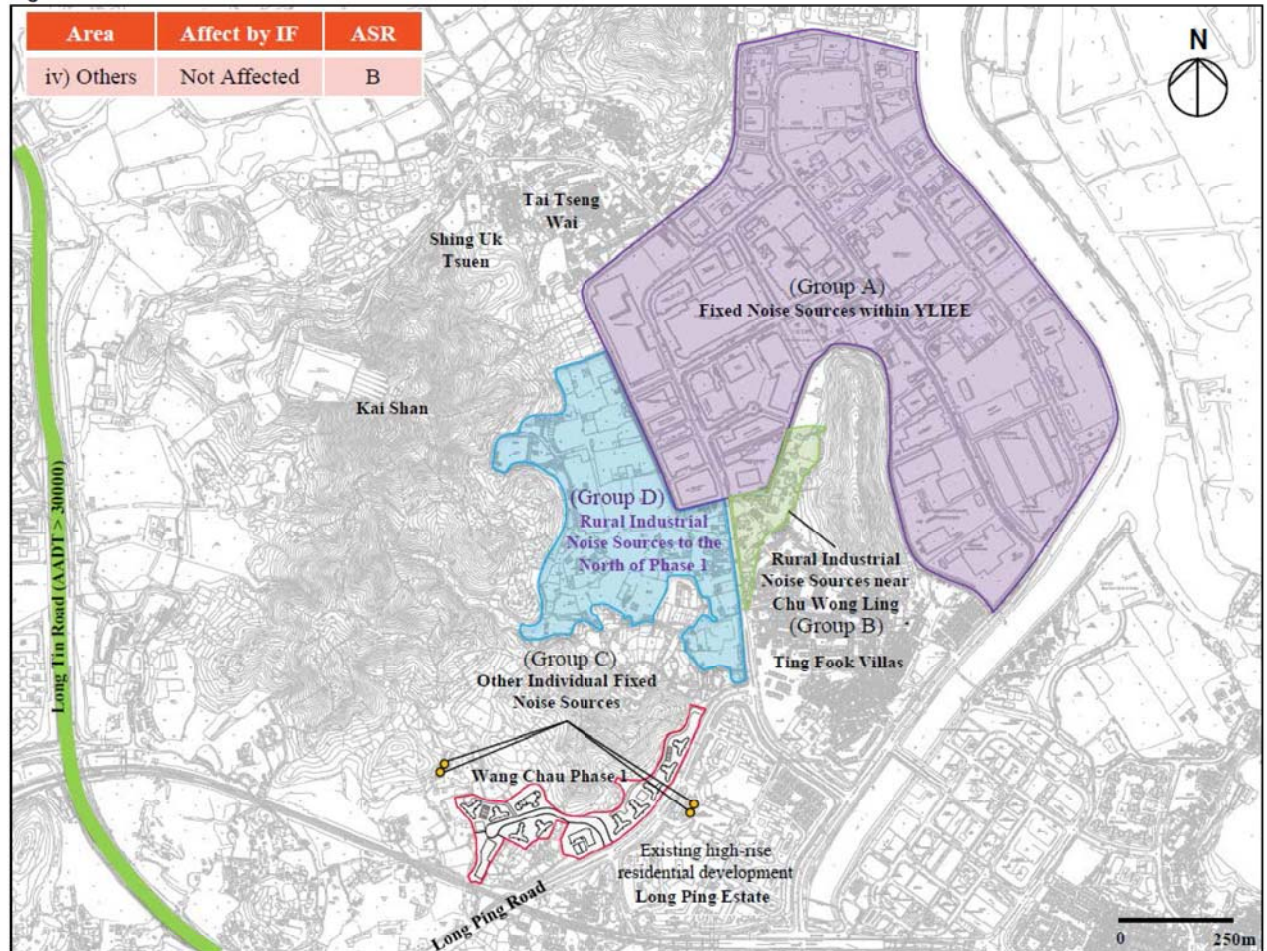
Besides, the HKPSG stipulates that in order to plan for a better environment, all fixed noise sources should be so located and designed that when assessed in accordance with the TM-Places, the level of the intruding noise at the facade of the nearest sensitive use should be at least 5 dB(A) below the appropriate Acceptable Noise Limit (ANL) as stipulated in TM-Places or, in the case of the background being 5 dB(A) lower than the ANL, should not be higher than the background. However, since the present project is to plan a residential development which differs from planning a fixed noise source and would not aggravate the ambient noise condition, resulting in a high future background level, a noise limit of ANL- 5 dB(A), i.e.  $Leq_{(30min)}$  of 60dB(A) for daytime and evening time (from 7:00 to 23:00) and 50dB(A) for nighttime (from 23:00 to 7:00) for ASR of B, is therefore applied to this site for planning purposes.

## 3. FIXED NOISE SOURCES

Site visits have been conducted in 2013 to identify the existing major fixed noise sources in vicinity of the development site. There are 4 geographical groups of industrial noise sources. **Figure 3.1** indicates the locations of the identified fixed noise source groups. Group A is the industrial operation with YLIE located to the far north of the site. They are mainly chillers / ventilation plants on the roof top of the industrial buildings and there are also occasional loading and unloading activities at the ground level inside the industrial lots. Group B is the rural industrial noise sources located near Chu Wang Ling to the south of YLIE. Group C is some individual fixed noise sources located to the west of the Site and within Long Ping Estate. Detailed noise emission inventory for Groups A to C has been presented in previous TR-3. Without the developments in previous Phase 2 and 3 and YLIEE, Phase 1 development would expose to various rural industrial noise sources located to the north of the site (i.e. Group D). Group D is mainly consisted of metal workshops, waste recycling workshops, container yards, motor vehicle/ equipment depots, open storage areas and car parks. As advised by the operators and further verified by site inspection, no nighttime operation was found for Group D.



Figure 3.1: Location of Identified Fixed Noise Sources



4. ASSESSMENT METHODOLOGY AND ASSUMPTIONS

The noise emission inventory for Group A to C sources has been established during the stage of TR-2 and TR-3. The noise impacts on Phase 1 development due to these three categories of sources are assessed based on the established Sound Power Levels (SWLs) for each identified noise activity. The assessment has taken into account the distance attenuation, screening effect, number of equipment, time correction, air absorption and facade effect etc. A summary of the corrections and assumptions adopted in the calculation are presented in **Table 4.1**. The detailed methodology should be referred to TR-3.

Table 4.1: Summary of Corrections and Assumptions Adopted in the Assessment

Correction	Calculation / Assumption (dB(A))
Distance	- (20 log (d) + 8) where d = shortest slant distance from assessment point to noise source
Screening Effect	Screening calculation is based on the method described in "ISO-9613-2 Acoustics Attenuation of Sound during Propagation Outdoors" and simulated by LimA. For rural industrial operation, -5 dB(A) is applied if the activities are undertaken inside a fully enclosed building.
Number of Equipment	10 log (number of equipment)
Air Absorption	Attenuation calculation is based on the method described in "ISO-9613-1 Acoustics Attenuation of Sound during Propagation Outdoors". Only applied to fixed plants at 500m away from the NSR.
Operating Time	10 log (operation time in mins / 30 mins)
Facade	+3dB(A)

For Group D, a list of plants/noisy activities has been established for each industrial premise based on site observation. However, noise measurements for each individual noise source were not permitted by the operators. As such, typical SWLs by making reference to other plants/activities of similar scale and nature have been therefore assumed. Based on the established list of plants/noisy activities and assumed typical



SWLs, fixed noise levels are then predicted using the same method as described in TR-3 and the same correction as shown in **Table 4.1** above.

**5. ASSESSMENT RESULTS**

The development layout plan for Phase 1 is yet to be finalised at this stage. Thus for this preliminary assessment, the latest layout plan presented in TR-3 is adopted. The worst representative NSRs, i.e. P107A in Block10 and P122C at Block 1, are selected for fixed noise assessment (**Figure 5.1**). Assessment results indicate that the predicted noise levels at the NSRs are ranged from 53dB(A) to 58dB(A) for daytime and 42dB(A) to 48dB(A) for nighttime, thus satisfying both the NCO and HKPSG’s requirement (**Table 5.1**). Therefore, no adverse fixed noise impact on the proposed housing development is anticipated.

Figure 5.1: Location of Assessment Point

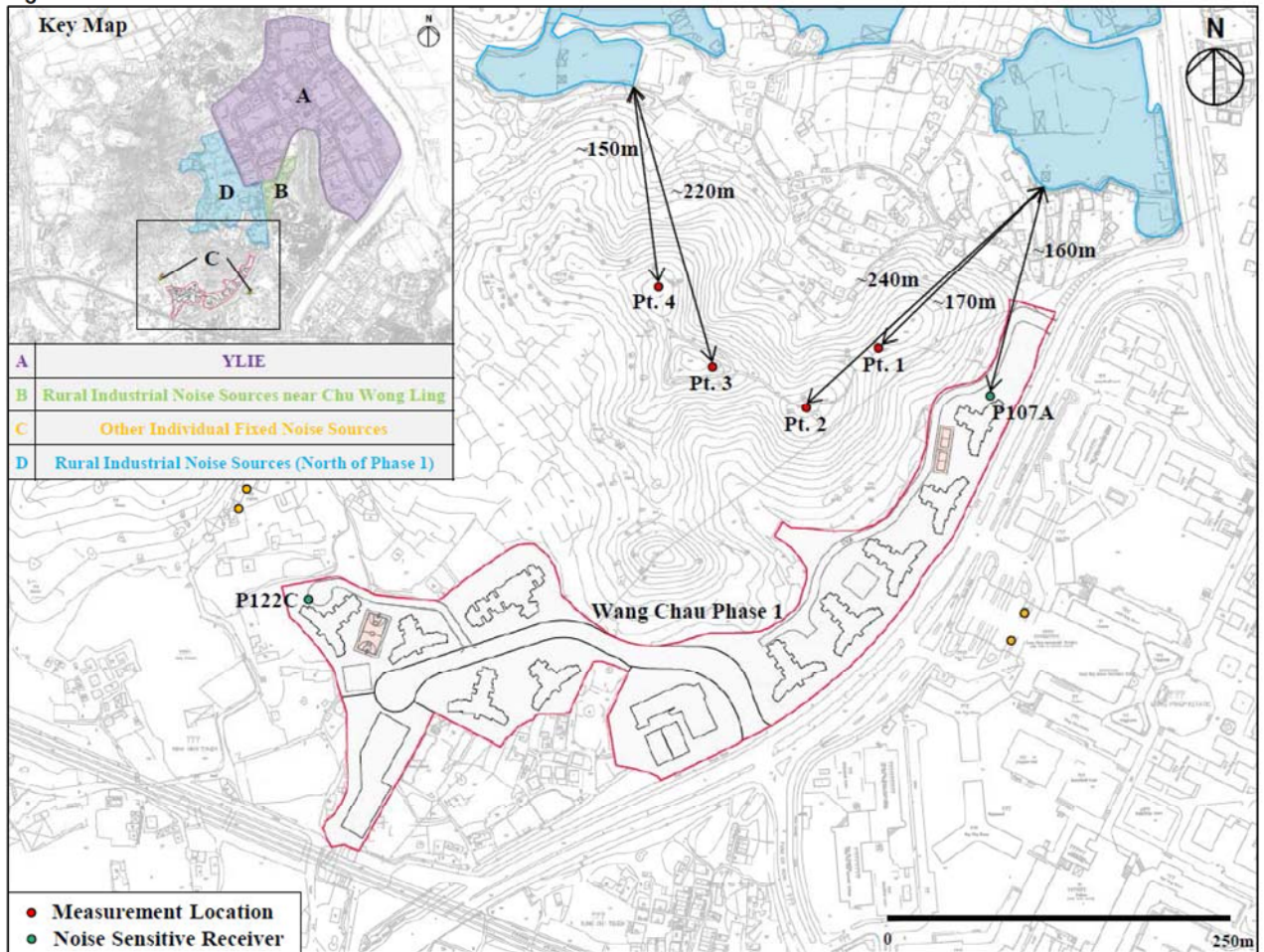


Table 5.1: Predicted Fixed Noise Impacts on the Worst Representative NSRs

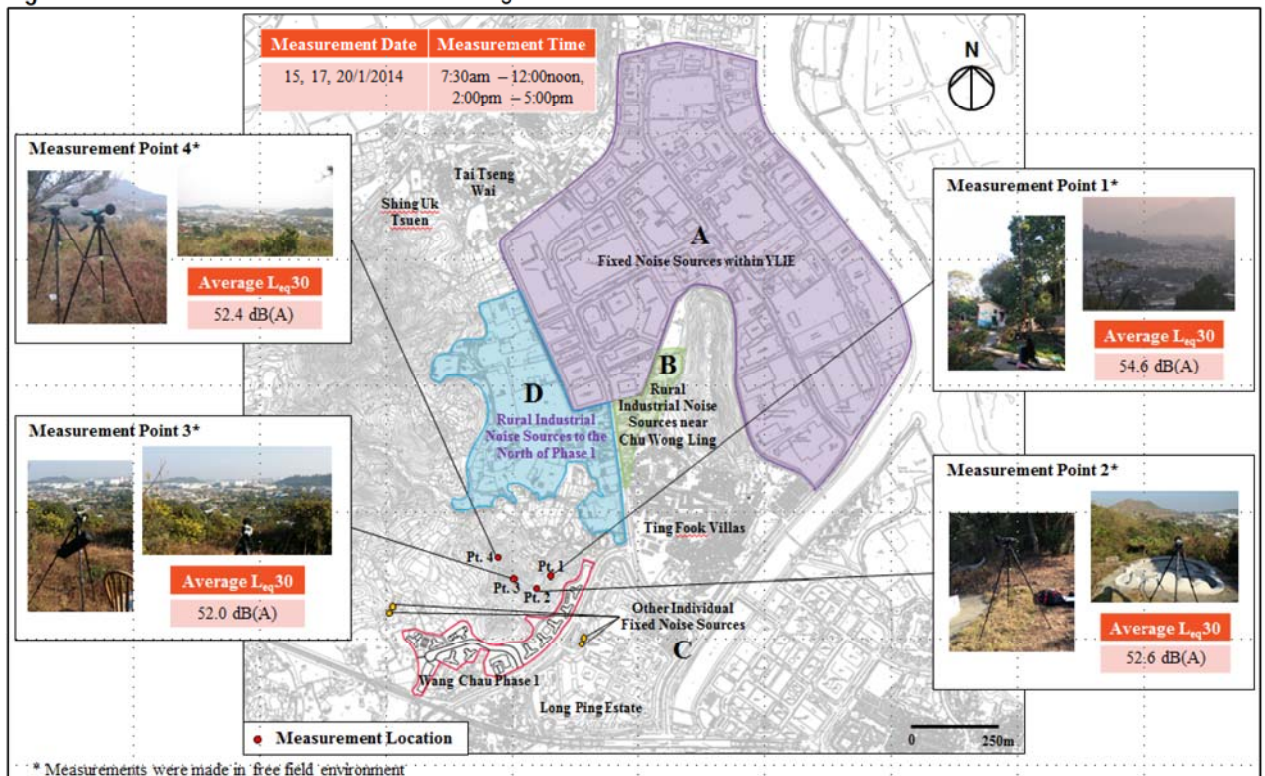
Location	AP	Floor	ASR	Assessed Scenario	Criteria (ANL-5), dB(A)	Fixed Noise Impacts, dB(A)		Comply [Y / N]	
						Daytime	Night-time	Daytime	Night-time
Proposed Housing Development in Phase 1	P107A	1/F	B	Daytime/ Night-time	60/50	58	42	Y	Y
		15/F				58	45	Y	Y
		30/F				58	45	Y	Y
	P122C	1/F	B	Daytime/ Night-time	60/50	53	48	Y	Y
		15/F				53	48	Y	Y
		30/F				53	47	Y	Y



**6. CALIBRATION BY ON-SITE DIRECT NOISE MEASUREMENT AT RECEIVER END**

To justify the validity of the quantitative assessment method and results described above, on-site direct noise measurements at receiver end have also been carried out during typical days to establish the existing noise exposure level. Measurements were taken on three days from 7:30a.m. to 12:00p.m. and 2:00p.m. to 5:00p.m. in Jan 2014 at 4 selected points (Figure 5.1) on Kai Shan to the north of the development site, where access was permitted and possible without undue safety concerns. The measurement points were set with an open view in the direction toward the noise source group A, B and D. The rural industrial premises were found in operation with similar and typical activities observed throughout the 3-days measurement period. Thus the measurements are considered representative of the existing typical condition of the industrial operation in the area.

Figure 6.1: Noise Measurement Location & Average Measured Noise Level



The average measured noise levels at the four selected locations (free field) range from 52 to 55dB(A), as illustrated in Figure 6.1. The measured noise levels at Pt 2, 3 and 4 are found to be more or less the same at 52-53dB(A). Based on site observations, Pt 1 was influenced by background road traffic to a certain extent and this is also reflected by the measured noise level which is found to be 2-3dB(A) higher than the other three points. With inclusion of the façade correction, the noise levels would be in range of 55 to 58dB(A) and all could comply within the criterion.

In addition, the noise levels at these four points have also been predicted using the same method and assumptions as described in Section 4. Results are presented and compared with the on-site direct noise measurement levels in Table 6.1 below. It is found that the predicted noise levels based on quantitative assessment method are 1-3dB(A) higher than the on-site measured level, implying that the noise prediction is adequately conservative to represent the worst case condition as it has assumed all industrial noise sources/activities in operation concurrently. Nonetheless, the discrepancy between the predicted and measured noise levels is considered in a reasonable and acceptable range.

**Table 6.1:** Comparison between the Predicted Fixed Noise Impacts and On-site Noise Measurement Levels

Location	AP	MPD level	ASR	Period	Criteria (ANL-5), dB(A)	Predicted Noise Level dB(A)	Measured Noise Level dB(A)
						Daytime	Daytime
Measurement Point on Kai Shan	Pt. 1	34	B	Daytime	60	58	58
	Pt. 2	44	B	Daytime	60	57	56
	Pt. 3	51	B	Daytime	60	57	55
	Pt. 4	51	B	Daytime	60	58	55

Note:

[1] No nighttime measurement was taken due to safety reason. There was also no nighttime operation in Group D and hence comparison with measured noise level was not made.

## 7. CONCLUSION

Based on the preliminary assessment, it can be concluded that there is no adverse fixed noise impact on Phase 1 development. No noise mitigation measures are required.