## Marine Traffic Noise Assessment Methodology

Marine traffic noise measurements has been carried out at SkyPier. A measurement period of 60 mins was made reference to an approved EIA study having marine traffic noise issue, namely "Proposed Joint User Complex and Wholesale Fish Market at Area 44, Tuen Mun (Register No.: AEIAR-070/2003)". The noise monitoring locations are shown in **Drawing No. MCL/P132/EIA/7-7-002.**

It is noted that various operation activities of vessels always take place at the same time and therefore measurement for different single event of operation activity of vessel would be not easy. The measurement is thus proposed to be carried out at the monitoring locations during the afternoon peak hours (1530-1630) in order to capture the worst case scenario according to the ferry schedule.

During the 60 mins noise monitoring period at monitoring location, maximum noise level (Lmax) and duration of different events of vessel operation will be noted. The Leq(60min) of the marine traffic noise impact of total events is then derived by the following equation:

$$\mathbf{L_{A,eq\ (60\ mins)}\ noise\ level = L_{max}\ (measured) + 10\ log\ (Kd/V) - DC + FC - 10\ log\ (T) + 10\ log\ (N)}$$

where
K = Empirical Constant = 2
d = Perpendicular Distance between the Reference Measurement Location and the Source (m)
V = Travelling Speed of Vessel, use of maximum speed for conservative approach (all maximum speeds are provided by the Marine Department)
Max 15 knots (7.72 m/s) for Macao and Mainland Mainland China high speed vessel within Victoria Harbour
Max 5 knots (2.57 m/s) for any vessels within the typhoon shelter
DC = Distance Correction
FC = Facade Correction = +3 dB(A)
T = 1 hr = 3600 secs
N = number of event per 60 mins period (reference to ferry schedule)

According to AEIAR-070/2003 Appendix 5.5, empirical constant K may be less than π in reality, because of either source directivity or possible air absorption. An empirical value of 1.83 for K is suggested for aircraft noise, while a maximum value of 2 for K is estimated for diesel locomotives. For marine vessel, K is taken as 2 in the noise prediction.

Distance Correction (DC) is estimated from the following equation:

$$\mathbf{DC = 20\ log\ (d/d_0)}$$

where
d = Perpendicular Slant Distance between the Source and the Receiver (m)
$d_0$ = Reference Distance where the Source Noise Level is Determined (m)

Summation of the $L_{eq\ (60\ min)}$ of all different events will then give the overall marine traffic noise impact level. Appropriate distance and façade corrections are taken into account for the assessment of the noise impact at the planned NSRs if necessary. If the marine traffic noise is 10 dB(A) below the prevailing background noise level, it is a positive indication that complaints are unlikely from the nearby NSRs.

Potential change in ferry service frequency have been taken into account in the assessment based on the forecast of Skypier passenger volumes at Year 2038 from the average growth rate of passenger from Airport Authority.

## Marine Traffic Noise Measurement Results during 15:30 - 16:30

| Event | Vessel 1 | | Vessel 2 | | Vessel 3 | |
|---|---|---|---|---|---|---|
| | Duration (s) | Lmax, dB(A) | Duration (s) | Lmax, dB(A) | Duration (s) | Lmax, dB(A) |
| (1) Vessel from Mainland China / Macao | 68 | 63.7 | 50 | 62.8 | 60 | **65.0** |
| (2) Vessels to Mainland China / Macao | 60 | 67.5 | 45 | **68.6** | 53 | 68.1 |

Note:
(1) All measurements were Free field measurement
(2) The duration is the event with maximum measured noise level over the measurement period
(3) The greatset Lmax over the measurement period was selected for each of the events
(4) Period 1530-1630 is selected for worst case scenario according to ferry schedule. Total 6 vessels arrival at HKIA and 6 vessels departing HKIA.
Vessels without affected by aircraft noise have been recorded.
(5) Vessel Route has been shown in Drawing No. MCL/P132/EIA/7-7-002

## Predicted Single Event Noise Exposure Level (L exposure level (at measurement point), dB(A))

**L exposure level (at measurement point) = Lmax (at measurement point) + 10log (Kd/V)**

Note:
Lmax (measured) = Measured Noise Level of Vessel Passby, dB(A)
K = Empirical Constant = 2
d = Perpendicular Distance between the Reference Measurement Location and the Source (m)
V = Travelling Speed of Vessel, use of maximum speed for conservative approach (all maximum speeds are provided by the Marine Department)
Max 15 knots (7.72 m/s) for Macao and Mainland China high speed vessel wihtin Victoria Harbour

**Predicted Single Event Noise Exposure Level (L exposure level (at measurement point), dB(A), Vessel from Mainland China / Macao)**
**L exposure level (measured) = 65 + 10log ( 2 x 325 / 7.72 ) = 84.3 dB(A)**

**Predicted Single Event Noise Exposure Level (L exposure level (at measurement point), dB(A), Vessel to Mainland China / Macao)**
**L exposure level (measured) = 68.6 + 10log ( 2 x 325 / 7.72 ) = 87.9 dB(A)**

### Predicted Noise Level for a period under consideration (Leq, 1 hour (at measurement point), dB(A))

**Leq, 1 hour (at measurement point) = L exposure level (at measurement point) - 10logT = L exposure level (at measurement point) - 35.56**

Note:
T = period under consideration (3600 secs (1 hr))

**Predicted Noise Level for a period under consideration (Leq, 1 hour (at measurement point), dB(A), Vessels from Mainland China / Macao)**
**Leq, 1 hour (at measurement point) = 84.3 - 35.56 = 48.7 dB(A)**

**Predicted Noise Level for a period under consideration (Leq, 1 hour (at measurement point), dB(A), Vessels to Mainland China / Macao)**
**Leq, 1 hour (at measurement point) = 87.9 - 35.56 = 52.3 dB(A)**

### Predicted Total Noise Level for all Passby Vessels (Leq, 1 hour (total), dB(A))

**Leq, 1 hour (total) = Leq, 1 hour (at measurement point) +10logN**

Note:
N = Number of Vessel Passby within 1 hour (Period 1530-1630 is selected for worst case scenario as it contains the highest frequency over the day)
For Vessel from Mainland China or Macao, N = 5
For Vessel to Mainland China or Macao, N = 6
Forecast at Year 2038, vessel increased 91.6%
For Vessel from Mainland China or Macao, N = 10
For Vessel to Mainland China or Macao, N = 12

**Predicted Total Noise Level for all Passby Vessels (Leq, 1 hour (total), dB(A), Vessels from Mainland China / Macao)**
**Leq, 1 hour (total) = 48.7 + 10 log (10) =58.7 dB(A)**

**Predicted Total Noise Level for all Passby Vessels (Leq, 1 hour (total), dB(A), Vessels from Mainland China / Macao)**
**Leq, 1 hour (total) = 52.3 + 10 log (12) =63.1 dB(A)**

**Overall Predicted Noise Level for Marine Traffic (Leq, 1 hour (overall), dB(A)) = 64.5 dB(A)**

### Marine Traffic Noise Assessment Area Boundary (m)

**L exposure level (NSR) = L exposure level (measured) - DC + FC**

Note:
Distance Correction (DC) = 20log(d1/d2)
d1 = slant distance between the noise assessment area boundary and the assumed vessel route
d2 = distance between the source and the reference measurement location = 325 m
Facade Correction (FC) = 3 dB(A) for all parcels

**L exposure level (NSR) = L exposure level (measured) - 20log(d1/d2) + FC**
Maximun Allowable L exposure level (NSR) = Daytime Background Noise Level at NSR - 10 dB(A) = 55.2 dB(A)
L exposure level (measured) = Overall Predicted Noise Level for Marine Traffic = 64.5 dB(A)
55.2 = 64.5 - 20log(d1/325) + 3
**d1 = 1336 m ≈ 1350 m**

### Conclusion
**There is no representative NSR identified within the 1,350 m assessment area hence adverse noise impact is not envisaged.**