## Appendix 3-5 Assumptions on the Adjusted PATH Model for Year 2021

The PATH model was used to quantify the background air quality during the operation phase of the Project. The PATH model has been re-run by removing some emission sources such as mobile vehicle within the project area and updating marine emission to avoid over-estimation, which has been agreed with EPD. The PATH model has been re-run using the assumptions stated in the below sections.

Mobile Vehicle

In order to reduce the double counting of emission from the open sections within the study area, part of mobile vehicle emission in PATH model input has been deducted. In this study, the 500m study area covers 4 grids of PATH model, including grids (25, 30), (25, 31), (26, 30) and (26, 31) as shown below.

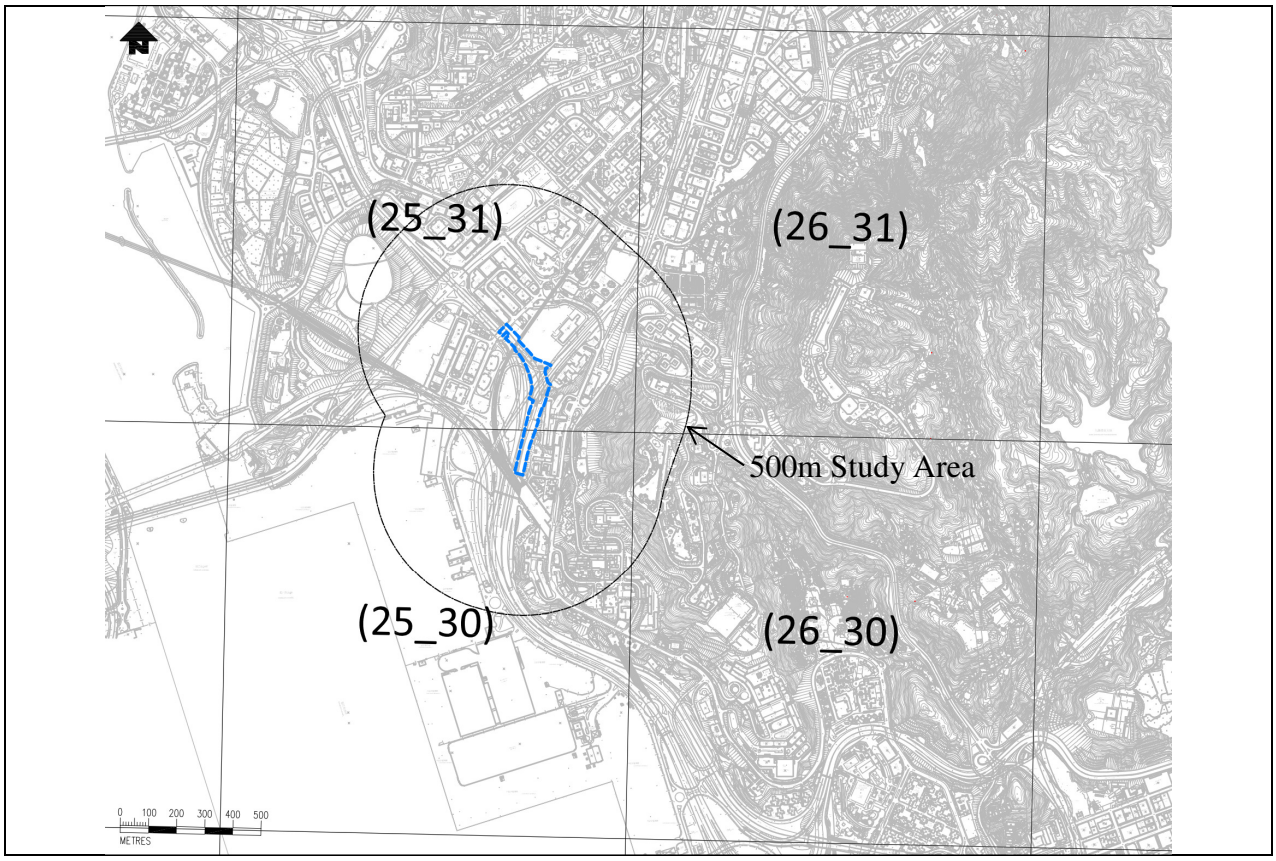


Plate 1 The Concerned Grids of the PATH Model

The percentage of removal was determined in proportion to the Vehicle-Kilometres-Travelled (VKT) within the study area to the VKT within the associated grids. The proposed adjustments of mobile vehicle emissions inputs in PATH model at the concerned grids are shown in **Table 1**. The removed emissions have been replaced with the predicted concentrations simulated from CALINE4 model.

**Table 1 Proposed Mobile Vehicular Emissions Adjustment**

| Grid | Total VKT | VKT within 500m from Project boundary | % | PATH MV Adjustment |
|---|---|---|---|---|
| (25,30) | 314441.11 | 160850.07 | 51.15% | $MV_{new} = MV_{old}$ x (1-51.2%) |
| (25,31) | 479127.03 | 289360.70 | 60.39% | $MV_{new} = MV_{old}$ x (1-60.4%) |
| (26,30) | 273691.91 | 0 | 0% | $MV_{new} = MV_{old}$ x (1-0%) |
| (26,31) | 91954.48 | 6766.19 | 7.36% | $MV_{new} = MV_{old}$ x (1-7.36%) |

Marine Emissions

While vehicular $NO_2$ emissions would be reduced upon implementation of replacement of pre-Euro IV Diesel Commercial Vehicles in Year 2020, it is assumed that emissions of $NO_2$ will be gradually prevailed by growing vessel arrival numbers, although the lowering of fuel sulphur content and $NO_x$ control measures would slightly offset the increase according to the "Final Report of Study of Marine Vessels Emission Inventory (2012)" published by Hong Kong University of Science and Technology (HKUST).

As the concerned grids are located nearby KCCT, emissions from ocean going vessels (OGV) are dominant in the region. It is therefore reasonable to assume that the $NO_2$ emission at concern grids (24, 30), (25, 29), (25, 30), (25, 28) due to marine vessels is directly proportional to the ocean containers throughput in KCCT.

According to the Table 10-3 in Section 10.1.8 of the Final Report of Study on Marine Vessels Emission Inventory, which quoted Hong Kong Port Cargo Forecast 2005/2006, the cargo growth rates at KCCT were estimated to be 2.6% from Years 2011 to 2015, and 4.7% from Years 2016 to 2020.

Refer to the Table 10-3 of the Final Report of Study on Marine Vessels Emission Inventory, and the Summary Statistics on Port Traffic of Hong Kong, the updated OGV number in Years 2011 and 2012 would be less than the prediction by growth rate of 2.6%. If the same annual growth rate of 2.6% (Years 2011-2015) and 4.7% (Years 2016-2020) are adopted, a 6.5% of OGV number reduction is resulted by this correction.

Taken into consideration of growing emissions of $NO_2$ were mainly caused by growing vessel arrival numbers, 6.5% of $NO_x$ reduction has been applied to PATH model for marine emission input in scenario Year 2020 in association with the OGV number reduction (6.5%).

Since no further information about the distribution of OGV emission is available, the distribution of marine emission is unchanged. Besides, no available information indicates change on the OGV growth rate after Year 2020. The growth rate of marine emission after Year 2020 will adopt the same change factor as observed from the PATH model. The change factors are estimated by comparing between marine emission rates from PATH model in 2015 and 2020 scenario years. A summary of changes in concerned grids are summarized in **Table 2**.

**Table 2 Marine Emission Input ($NO_x$ in g/s)**

| Grid | 2015 | 2020 | Annual Changes |
|---|---|---|---|
| **(24,30)** | 22.77 | 24.10 | +1.1% |
| **(25,28)** | 24.53 | 26.64 | +1.7% |
| **(25,29)** | 24.18 | 25.88 | +1.4% |
| **(25,30)** | 24.01 | 25.67 | +1.4% |

A summary of the predicted background concentrations in Year 2021 is shown in **Table 3** below. It shows that the 1-hour and annual $NO_2$ background level marginally comply with the AQOs, especially at grids (25, 30) and (25, 31), which local vehicular emissions contributed by the road network and this Project at Kwai Chung area have not been taken into account.

## Table 3 Summary of Predicted Results from PATH Model in Year 2021

| Pollutant | Averaging Time | Concentration Limits in AQOs ($\mu g/m^3$) (i) | Year 2021 PATH Re-run Concentration ($\mu g/m^3$) (ii) | | | |
|---|---|---|---|---|---|---|
| | | | Grid (25,30) | Grid (25,31) | Grid (26,30) | Grid (26,31) |
| RSP | 24-hour | 100 (9) | 100 [1] | 97 [0] | 98 [0] | 96 [0] |
| | Annual | 50 | 43 | 41 | 40 | 40 |
| FSP | 24-hour | 75 (9) | 77 [1] | 75 [0] | 76 [1] | 74 [0] |
| | Annual | 35 | 31 | 29 | 29 | 28 |
| Nitrogen Dioxide ($NO_2$) | 1-hour | 200 (18) | 244 [10] | 234 [12] | 241 [6] | 238 [6] |
| | Annual | 40 | 39 | 30 | 29 | 26 |

Notes: (i) The numbers in brackets ( ) refer to number of exceedances allowed per year.
(ii) The numbers in brackets [ ] refer to number of exceedances of the background concentration.