16. AIR QUALITY IMPACT ASSESSMENT

16.1 Introduction

This section presents the potential air quality impacts to Air Sensitive Receivers (ASRs) during the construction and operational phases of the EAR and the associated junctions with the existing road network near the West Rail Kam Tin Station. The major issue during the construction phase is the potential for dust impact to ASRs, while vehicle emissions are the major source of pollutants, and therefore concern, during the operational phase. If appropriate, mitigation measures have been recommended to reduce, to acceptable levels, the identified impacts to the ASRs.

16.2 Construction Phase

16.2.1 Potential Sources of Impacts

Dust nuisance is the major impact during the construction phase. The major construction works are the construction of the EAR and the improvements to the junctions with Kam Tin Road and Kam Sheung Road.General road work activities such as materials handling, top soil removal, site clearance and wind erosion are the main dust generating sources. As the worksite is small, stockpiling is not expected at the site. Excavated fill materials will be transported off-site. It is anticipated that the existing road network in the area will be used for the transportation of waste and construction materials to and from the site. Haulage within the worksite is not expected.

SO_2 and NO_2 will be emitted from the diesel-powered mechanical equipment used on-site. However, the number of such plant required on-site will be limited and gaseous emissions will be minor. It is therefore not expected to cause an exceedance of the AQO for these gases due to the limited construction plant on site.

Due to the small scale of the road works sites around Kam Tin Station, the volume of excavated material and the rate of excavation are anticipated to be low. It is therefore, expected that the dust impact due to the road improvement work is low. However, in order to ensure the environmental performance of the construction works, environmental control and mitigation measures are recommended. Verification of the effectiveness of the proposed control measures and of compliance with the required dust criteria is also recommended through the implementation of environmental monitoring and auditing (as outlined in *Section 23*. The mitigation measures are described in *Section 16.4.2.*

Apart from the works associated with the construction of the EAR, other construction activities, including those for Kam Tin Station, the Main Drainage Channel, Kam Tin By-pass and Kam Tin Road Improvements are likely to be undertaken concurrently. At present, the detailed construction programmes for these other projects are not available. Nevertheless, it is expected best practice will be adopted by these projects, and that dust, as well as gaseous emissions, from these works will be controlled in accordance with

relevant environmental guidelines developed by the EPD. The potential for cumulative air quality impacts to nearby ASRs would therefore be limited. However, to ensure that any potential problems are identified and quickly addressed, EM&A procedures will be implemented at the most appropriate dust monitoring locations to ensure that dust from the EPIW construction activities and the concurrent projects do not give rise to cumulative exceedances of the dust criteria at the ASRs.

16.2.2 Mitigation Measures

The Contractor is required to comply with the *Air Pollution (Construction Dust) Regulation*. However, in order to ensure that dust emissions are controlled as far as is reasonably practicable, it is recommended that particular attention is paid to implementing the following mitigation measures:

- the heights from which materials are dropped should be reduced to a practical minimum height to control fugitive dust emissions arising during materials handling;
- materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport;
- water sprays should be applied to maintain the worksite wet;
- all dusty materials should be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet;
- the load carried by the vehicle should be covered by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle; and
- the excavation working area should be sprayed with water after the operation so as to maintain the entire surface wet.

16.2.3 Environmental Monitoring and Auditing

With the implementation of the above suggested mitigation measures, the dust emissions from the site should be minimised and residual adverse impacts on the nearby sensitive receivers are not expected. To scrutinise the effectiveness of the recommended dust control measures, environmental monitoring is recommended to ensure that dust levels during the construction are controlled to within the specified dust criteria. The locations and requirements of dust monitoring are identified in *Section 23*.

16.3 Operational Phase

16.3.1 Potential Sources of Impact

With the operation of the West Rail Kam Tin Station and its supporting facilities such as the Public Transport Interchange (PTI), traffic flows in the area will increase. There is the potential for these traffic increases to give rise to air quality impacts at adjacent

developments. Vehicular exhausts will be the major source of impacts, and NO_2, CO and RSP have been identified as the major components of vehicle exhaust for the assessment.

Noise barriers of 2.5 - 5.5 m height have been proposed along the Kam Tin Eastern Access Road (please refer to Section 15.3.4). With the barriers in place, pollutants will be dispersed above the barrier and higher concentrations will be experienced at the ASRs, corresponding to a greater impact.

16.3.2 Assessment Methodology

Nitrogen dioxide (NO_2), carbon monoxide (CO) and respirable suspended particulates (RSP) are considered as the major pollutants associated with the vehicular exhaust emission. The emission factors for each of these pollutants are based on EURO III criteria. The EAR is the new road proposed in the area, and details of its predicted total traffic flow rates, including a breakdown of traffic and vehicle exhaust emission rates for the years 2003, 2011 and 2018 have been forecasted and presented *in Table 16.3 a* below.

Table 16.3a NO_x Emission at Year 2018

	Year 2003	Year 2011	Year 2018
Total Traffic Flow (veh/hr)	570	880	1,012
% Traffic Breakdown of P-c/p[(i)]	79	79	79
% Traffic Breakdown of HGV[(i)]	21	21	21
Fleet Emission Rate of NO_x of P/c-p (g/km)[(ii)]	0.90	0.71	0.71[(iii)]
Fleet Emission Rate of NO_x of HGV (g/km)[(ii)]	6.21	3.84	3.84[(iii)]
NO_x Emission Rate of the fleet (g/km-hr)	1,149	1,203	1,384

Note:

(i) P-c/p : Petrol Private Car; HGV : Heavy Goods Vehicles

(ii) Fleet Emission Rate based on EURO III criteria

(iii) 2018 NO_x emission rates are not available and 2011 emission rate is used.

A comparison of the emission rate of the fleet for the critical pollutant, NO_x, from the EAR for the years 2003, 2011 and 2018 has been carried out. It was predicted that the NO_x emission will be the largest in year 2018 and the traffic data for the year 2018 were, therefore, used to assess the worst case impact for this assessment.

The air dispersion model, CALINE4, approved by EPD, was used to predict the pollutant levels of NO_2, CO and RSP.

Peak hour traffic levels will occur during the daytime as will the worst case meteorological and neutral conditions. As specified in the 1998 *EPD's Draft Guidelines on Choice of Models and Model Parameters*, the following criteria were used for the dispersion modelling:

- wind speed 1 ms^{-1};
- wind direction worst case for each receivers;
- stability class D;
- mixing height 500 m;
- standard deviation of wind direction 16 degrees; and
- temperature 298K

The NO_x gas was assumed to be inert and levels of conversion to NO_2 were taken as 20% of total NO_x emission.

The proposed alterations to the road networks, together with the barrier effects and the background air quality were considered in the assessment of the cumulative air quality impacts. The predicted concentrations at the ASRs were assessed against the AQOs.

16.3.3 Prediction and Evaluation of Impacts

The hourly concentrations of pollutants from vehicular emissions at ground level and 10 m above ground were predicted; and the results are presented in *Table 16.3 b* below.

Table 16.3b Predicted Hourly Concentration of Pollutants (μgm^{-3})

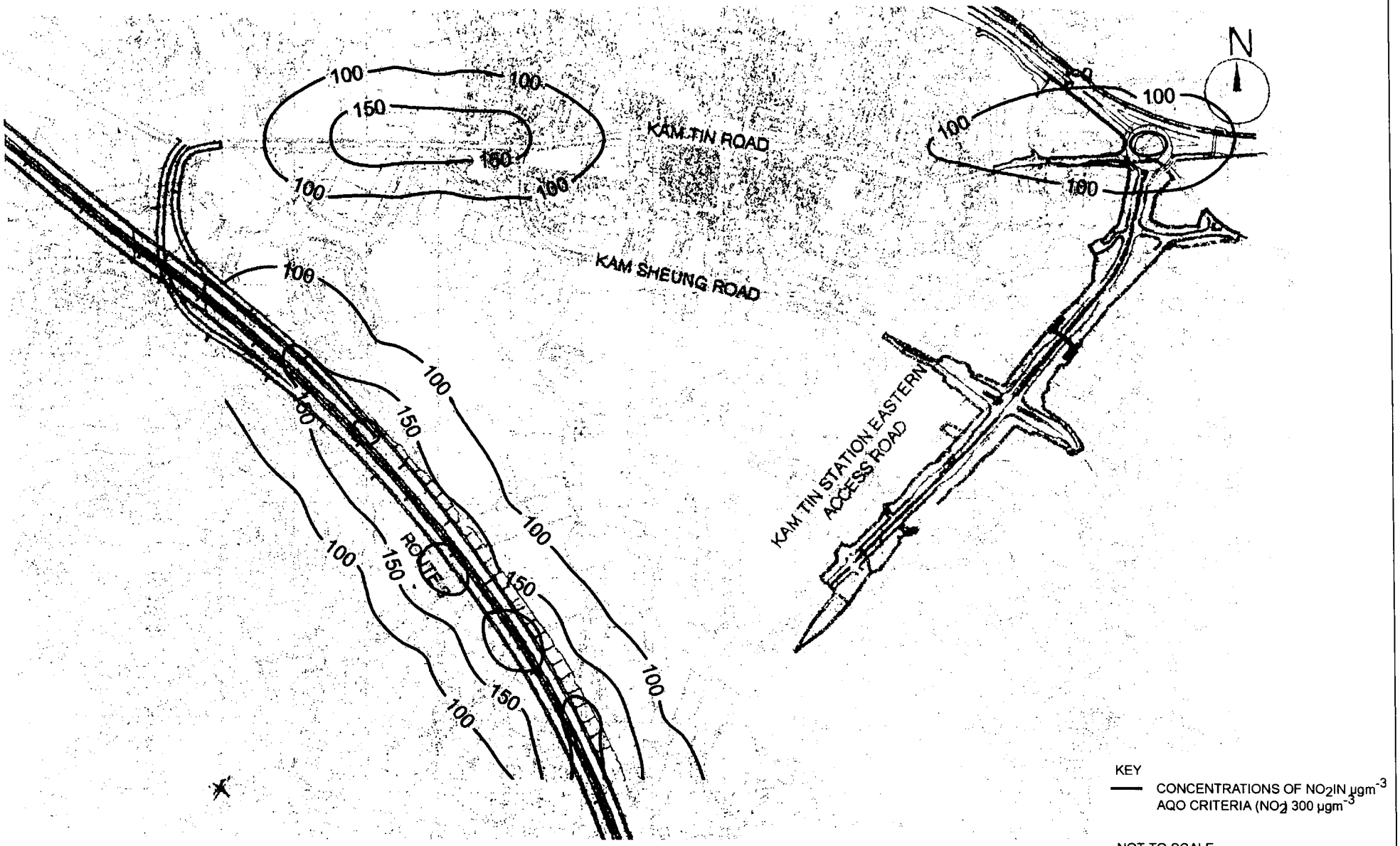
ASRs	Predicted Hourly Concentration [(i)] (μgm^{-3})					
	At Ground Level			At 10 m Above Ground		
	NO_2	CO	RSP	NO_2	CO	RSP
A1	58	720	65	54	720	64
A2	65	720	67	62	720	66
A3	73	835	73	84	835	77
A4	69	720	71	69	720	70
A5	129	1,295	109	118	1,180	100
Criteria	**300**	**30,000**	**180 [(ii)]**	**300**	**30,000**	**180 [(ii)]**

Notes:

(i) Background included in the above prediction

(ii) Since hourly RSP criteria is not available, a daily RSP criteria was used for the assessment

The results of the evaluation indicate that all the predicted hourly concentrations of pollutants are within the AQO criteria. The predicted hourly concentration of NO_2, CO and RSP at ground level are in the range of 58 - 129 μgm^{-3}, 720 - 1,295 μgm^{-3} and 65 - 109 μgm^{-3} respectively. While the predicted hourly concentration of NO_2, CO and RSP at 10 m above ground range from 54 - 118 μgm^{-3}, 720 - 1,180 μgm^{-3} and 64 - 100 μgm^{-3} respectively. The highest concentrations of the critical pollutant, NO_2, at the worst affected height, ground level, is predicted at A5 (Kiu Tau Tsuen).



ISOPLETHS OF NO_2 AT THE WORST AFFECTED LEVEL (GROUND LEVEL) FOR KAM TIN

FIGURE 16.3a

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Moreover, the above results indicate that, for A3 (Lutheran Kam Sheung Church), the predicted pollutant concentrations 10 m above ground are higher than at ground level due to the barrier effect.

The isopleths of NO_2 at ground level over the Study Area are shown in *Figure 16.3a*. The figure indicates that Route 3 is the areas major pollutant source and that the contribution from the Kam Tin Station Eastern Access Road is low (less than 100 μgm^{-3}) in most areas. It also confirms that the AQO criteria of the area will be satisfied, and as such, there should be no adverse impacts to the health of the local community due to the introduction of the EAR.

No air quality related mitigation measures are required for the operational phase of this road scheme.

16.4 Conclusion

16.4.1 Construction Phase

Dust nuisance is the major air pollutants during construction phase. The major dust generating activities are identified to be material handling, top soil removal and wind erosion. It was envisaged that the volume of material to be handled on site and the excavation rate for road construction would be low. Adverse dust impact on the nearby ASRs was not expected. However, mitigation measures have been recommended to ensure there is no exceedance of dust criteria.

16.4.2 Operational Phase

The assessment indicates that the air quality levels at the identified ASRs are within the AQO criteria under the worst case scenario and no further mitigation measures are necessary.

Table 16.4a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project

Phase	Recommended Mitigation Measures
Construction Phase	Requirements stated in the *Air Pollution (Construction Dust) Regulation* should be followed and incorporated in the contract specification to limit the dust emission from work sites. These include: • the heights from which materials are dropped should be reduced to a practical minimum height to control fugitive dust emissions arising during materials handling; • materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport; • water sprays should be applied to maintain the worksite wet; • all dusty materials should be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet;

Phase	Recommended Mitigation Measures
	• the load carried by the vehicle should be covered by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle; and • the excavation working area should be sprayed with water after the operation so as to maintain the entire surface wet.
Operation Phase	None required.