

## 10. CONCLUSIONS AND RECOMMENDATIONS

### 10.1 Introduction

10.1.1 The Tseung Kwan O Feasibility Study of Opportunity for Further Development (TKOOFD), completed in 1990 and endorsed by the then LDPC for implementation, identified amongst other infrastructure works the widening of Road P2 between Roads D1 and D2 and the construction of grade separation of road junction T1/P1/P2. The TKO Town Centre Traffic Review (1997) has also confirmed that the capacity of the existing roundabout would be exceeded by 2001 because of increasing traffic flows.

10.1.2 As the southern portion of Tseung Kwan O New Town is developed and populated, it is therefore necessary to upgrade the existing at-grade interchange at Roads T1/P1/P2 junction to a grade-separated interchange, and widen the section of Road P2 between Roads D1 and D2 so as to cope with the increasing traffic demand. The proposed works have been identified as a designated project under Schedule 2, Part I (A.1) of the EIA Ordinance, so an Environmental Permit is required prior to the construction and operation of the Project. Since the proposed works are likely to have adverse impacts on the environment, the Study Brief requires an Environmental Impact Assessment (EIA) Study to determine the nature and extent of environmental impacts arising from the construction, operation of the proposed road alignment and all related activities taking place concurrently. The findings of the EIA are summarised in the following sections.

### 10.2 Construction Noise

10.2.1 Construction of the proposed infrastructure works is likely to produce high noise levels exceeding 75 dB(A) Leq(30-min) at the existing NSRs, if unmitigated. The potential impacts are amenable to mitigation through proper implementation of suitable noise control measures, including the use of silenced equipment, siting of equipment, and mobile noise barriers. In particular, the use of acoustic enclosures and curved/inverted-L noise barriers (located close to the noise source) are considered appropriate especially in front of KL7 and CM4. It is anticipated that using the above measures, the impacts from the construction works could meet the EIAO-TM requirements. As a full enclosure has been proposed in front of King Lam Estate and Chung Ming Court, it is recommended that the construction of these barriers should be completed within 6 months after works commencement in order to screen the above buildings from construction noise. This will further reduce the noise level at these receivers.

10.2.2 Construction work in restricted hours is not required and thus the impact has not been assessed. However, if this is found necessary at a later stage, a Construction noise Permit under the Noise Control Ordinance will be applied separately.

10.2.3 In the vicinity of the Project, Mass Transit Railway Corporation (MTRC) has a reserve alignment for the future TKO Extension, and the expected completion date is tentatively the end of 2002. Though the alignment is expected to cut through many of the same Planning Areas (i.e. Areas 17, 23, 24, 38, 40 and 41) as that of the Study Area, the sensitive facades affected by this Project are not the same as those affected by the MTRC alignment construction. In other words, the sensitive facades facing the road improvement works will predominantly be affected by the construction noise generated from the road works, and the sensitive facades facing the railway alignment will predominantly be affected by its construction. Therefore, cumulative noise impact at the NSRs is virtually negligible.

10.2.4 According to the *Detailed Environmental Impact Assessment Report R9T for Tseung Kwan O Extension* completed in July 1997, the use of quiet plant, mobile noise barriers and site hoarding as well as limiting the number of equipment used at one time near critical NSRs, have been recommended. Given that all of the mitigation measures as mentioned above are being properly implemented in both projects, the cumulative noise levels should still comply with the TM noise criteria since the affected sensitive facades by the two projects are not likely to overlap.

### 10.3 Construction Dust

10.3.1 Construction of the Project will give rise to considerable amount of dust from the roadworks, and the haulage of construction materials on unpaved surfaces. Model calculations have shown that dust concentrations at the nearby existing receivers (e.g. the open space areas) are expected to exceed EIAO-TM dust criteria and Air Quality Objectives in respect to TSP. Dust suppression measures in the form of good housekeeping, frequent watering of the dusty areas, providing wheel-washing facilities at site exit(s) and covering of materials on trucks with tarpaulin sheeting, are necessary to reduce the impacts. It is anticipated that the EIAO-TM dust criteria and air quality objectives can be achieved by the implementation of these dust suppression measures.

10.3.2 In anticipation of the construction of the MTRC TKO Extension in the vicinity of the Study Area, a comprehensive impact assessment has been carried out to quantify the amount of dust to be generated from the construction of the alignment. The cumulative impacts of this Project and MTRC alignment construction at two of the representative locations (ON2 & SC1) have been assessed. Assuming a worst-case scenario, the result shows that there would be significant exceedance at the ASRs that are close to the MTRC alignment and the roadwork (i.e. Chung Ming Court, On Ning Garden and King Lam Estate) if no dust suppression measures are applied. Dust suppression measures including the use of water sprays, blast nets and canvas covers, wind barriers and enclosures, wheel-washing, and paved haul roads within the site, etc. were recommended in the *Tseung Kwan O Extension: Final Detailed Environmental Impact Assessment*. The previously proposed dust suppression measures in this Project together with those mitigation measures recommended in the MTRC Report, will greatly minimize the impact. The mitigated cumulative impacts at the representative locations are predicted to comply with the EIAO-TM dust criteria and AQO. Overall, the cumulative impact after implementation of the above recommended dust suppression measures should be reduced to within EIAO-TM dust criteria and AQO standards.

## 10.4 Road Traffic Noise

10.4.1 Road traffic noise is a key environmental issue during the operation phase of this Project. It has been predicted that the majority of the noise sensitive facades around the T1/P1/P2 junction will be exposed to noise levels exceeding the stipulated noise criteria based on the highest traffic flows within 15 years after opening of the roads to traffic. Segments of barriers on the approach roads to the junction have been examined for effectiveness. Due to engineering constraints, traffic sightline and height restriction problems, the following mitigation measures are considered effective and thus recommended for implementation:

- a full enclosure of about 120m along Po Shun Road in front of King Lam Estate and Chung Ming Court;
- a 5m plain barrier of about 265m on Slip Road A;
- an absorptive, 5.5m inverted L-shaped barrier of about 155m on Slip Road C; and
- LNRS on the new segment of Roads P2 and T1.

10.4.2 The recommended noise mitigation measures are effective in reducing the new road contributions at all the NSRs to below 70 dB(A). For those NSRs with noise levels exceeding 70 dB(A), the dominant noise sources are contributed by other existing roads outside this Project. In fact the traffic noise from new roads contribute less than 1 dB(A) to the overall noise levels. Hence, consideration has been given to indirect mitigation at the affected NSRs. The assessment for eligibility of sound insulation shows that none of the NSRs is eligible for consideration for indirect measures as either the new roads do not contribute more than 1.0 dB(A) to the overall noise levels or the predicted overall noise level is no more than 1.0 dB(A) higher than the prevailing traffic noise level at these receivers.

10.4.3 The total number of dwellings where the predicted noise levels exceed 70 dB(A) is estimated to be 2605, and the total number of classrooms where the noise levels exceed 65 dB(A) is estimated to be 135, if no mitigation measures are provided. While the noise criteria cannot be met, the proposed direct technical remedies on the new roads serve to some extent to minimise the noise impact at the NSRs and to reduce the total number of affected dwellings by about 835. In addition to the 835 dwellings being in full compliance with the stipulated noise criteria of 70 dB(A), a total of about 2690 dwellings and 130 classrooms are estimated to benefit from the proposed noise mitigation scheme by 1-22 dB(A) noise reduction.

## 10.5 Vehicle Emissions

10.5.1 Model calculations using the worst-case traffic scenario in terms of vehicle emissions have shown that no adverse impacts on air quality will result from the use of the new roads and the proposed noise mitigation measures. As a result, no mitigation measures are considered necessary.

## 10.6 Landscape and Visual

10.6.1 The recent development on the reclamation of TKO New Town is an area dominated by high rise residential areas and transport corridors. In general, the local landscape quality of the study area is medium to high. The medium quality of the high-rise residential areas are juxtaposed with the dominating and low quality transport corridors and the good and high quality landscape afforded by the local parkland, hillsides and tree planted slopes.

10.6.2 The proposed works are generally confined to being within areas already occupied by the existing road infrastructure or use the current slip roads at the interchange. However, there are two localised impacts to the existing landscape, namely:

- a slight adverse impact to the local residential high-rise estates of King Lam Estate, Hau Tak Estate and On Ning Garden; and
- a significant adverse impact to the planned open space between On Ning Garden and the proposed interchange.

10.6.3 The proposed works will cause a number of impacts to the existing visual context. They are, however, limited and localised to the following:

- parts of On Ning Garden and Hau Tak Estate;
- planned open space at Areas 45 and 59; and
- pedestrians along Road P2.

10.6.4 The source of the major impacts is the high level slip roads between T1 and P2 (i.e. Bridge A), together with the Bridge B becoming a dominating feature in a number of views. The noise mitigation measure cause additional effects, particularly along Road P2.

10.6.5 As the landscape and visual are confined to areas already occupied by existing road infrastructure their impact is in effect localised. In addition to this, mitigation measures using fast growing tree species on cut slopes in Area 40 are proposed to provide quick vegetative screening of the works for potential park users and residents. Consideration of the design of hard element will reduce the overall landscape and visual impact of the works. The landscape and visual impact is therefore considered acceptable with mitigation measures in accordance with assessment criteria of Annex 10 of TM.

10.6.6 The mitigation measures for the Project are as follows:

- retention of all existing roadside planting, where possible;
- dense tree and shrub planting on any new cut slopes to create a landscape buffer zone and visual screen. Tree species used should be fast growing exotic species such as *Eucalyptus* and *Casuarina* to provide a quick screen with slower growing native species such as *Aleurites*, *Celtis*, *Machilus* and *Mallotus* used to provide the long-term vegetative cover and screen;
- re-instatement of street tree planting where it is required to be removed;
- transplantation of street tree planting within or in the vicinity of the site, where it is regard to be removed, where possible;
- dense screen tree and shrub planting in the planned Open Space at Area 40. This plant will help screen the impact of the spilt level interchange from On Ning Garden, Hau Tak Estate and the future park users in Area 40 open space. Plants used in this area should be a mix of fast growing *Eucalyptus* and *Casuarina* species mixed with the slower growing native species of *Aleurities*, *Celtis* and *Mallotus*. Ornamental flowering shrubs should be used as an edge to the screen planting to provide seasonal display;
- dense tree and shrub planting in all roadside amenity areas within the interchange. Native tree species should be used in these areas, species should be selected for their form, resistance to pollutants and ease of maintenance, typical species would include *Michelia* and *Aleurities*;

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- dense tree and shrub planting to screen all retaining walls and noise barriers/enclosure where possible;
  - consideration of the design of, and hard materials finishes to, all elevated sections of road, particularly those section, together with their piers, in the planned Open Space at Area 40 in conjunction with advice from Advisory Committee on the Appearance of Bridges and Associates Structures (ACABAS);
  - consideration of the materials used to enhance the existing streetscape while maintaining consistency;
  - consideration of the design of subway tubes and portals for consistency with the existing subways on or adjacent to the site and in conjunction with advice from ACABAS; and
  - consideration of noise barrier design to create elements that are integrated within the scheme and the surrounding landscape, and incorporating the advice from ACABAS.

The above mitigation measures will need to be further developed in the detail design stage.

**10.7 Land Use**

The proposed Grade Separated Interchange T1/P1/P2 falls wholly on government land and any private land or structures adjoining are unlikely to be affected by the works. The proposed alignment option has avoided interference with the existing, planned and future land uses. The adverse effect of any public works related to the proposed Road P2 alignment would be kept to the minimum. Therefore, the study concludes that the proposed Grade Separated Interchange T1/P1/P2 will have no significant land use impact.

## **10.8 Impact Summary**

10.8.1 An impact summary for the environmental aspects is presented in Appendix N.