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1 INTRODUCTION

1.1 Project Background

1.1.1 Tuen Mun Road Town Centre Section (TMRTCS) is bounded between Lam Tei Interchange in the north and Wong Chu Road in the south. This road section is already heavily used in peak hours. The general public and members of Tuen Mun District Council have expressed concerns on potential congestion of TMRTCS after opening of the Hong Kong – Shenzhen Western Corridor and the Deep Bay Link in July 2007. To address the public's concern, HyD have commissioned the Feasibility Study on Traffic Improvement to TMRTCS in December 2005. The study recommended dual 3-lane widening of sections of TMRTCS. The Project is to widen about 1.5km of Tuen Mun Road from Yan Oi Square to Wong Chu Road Interchange from dual-two to dual-three carriageway and to construct a 450m long flyover from Tsing Hoi Circuit to Tuen Mun Road Kowloon bound. The total road length of the Project is about 1.8km.

1.1.2 Based on the recommendation of the above Feasibility Study, HyD appointed Maunsell Consultants Asia Ltd. in May 2007 to undertake the Investigation, Design and Construction (IDC) of Traffic Improvements to TMRTCS (hereafter "the Project") and the associated "Environmental Impact Assessment" .

1.1.3 In the Feasibility Study under the HyD Agreement No. CE 38/2005(HY), four options have been considered for traffic improvement of Tuen Mun Road Town Centre Section. The four options include:

- Option 1 – Sam Shing Hui Slip Road Option: This option suggested a new interchange constructed at Sam Shing Hui;
- Option 2 – Tunnel Option: This scheme was initiated by TMDC members during consultations;
- Option 3 – Dual 3-lane Widening Option which is currently; &
- Option 4 – Dual 3-lane Widening combined with modified slip road.

1.1.4 Four traffic improvement options under the Assignment were compared and evaluated against the criteria including traffic benefits, social benefits, engineering feasibility, land requirement, programme and cost.

1.1.5 In brief, having assessed and evaluated each of these options, the D3 Option was selected as the preferred option of the Project. The recommended option was presented to the Tuen Mun District Council (TMDC) on 10 November 2006. The TMDC had no objection to the implementation of the recommended option and reiterated the urgency of the Project. Subsequently, HyD commissioned this TMRTCS – IDC assignment to carry out the investigation, design and construction of the TMRTCS Project. Under the IDC stage, the D3 option was further assessed and presented to the T&TC meeting under TMDC member on 14 September 2007 and was well-received by TMDC. The location of the Project site is shown in **Figure 1.1**.

1.2 Objectives of the EIA Study

1.2.1 Under Section A.1 of Schedule 2, Part 1 of the Environmental Impact Assessment Ordinance (EIAO) (Cap. 499), the Project is a designated project and therefore Environmental Permit is required under the EIAO for the construction and operation of the Project.

1.2.2 An Environmental Impact Assessment (EIA) has been undertaken to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and all related activities taking place concurrently.

1.2.3 This Executive Summary provides a summary of the key findings of the EIA study, including an assessment of potential air quality, noise, water quality, waste, ecology, land contamination, visual and landscape impacts from the construction and operation phases of the Project, and recommendations for mitigation measures to comply with environmental legislations and standards.

2 PROJECT DESCRIPTION

2.1 Site Location

2.1.1 The Project involves widening the following sections of TMR from dual-two carriageway to dual-three carriageway:-

- Wong Chu Road Section (from Wong Chu Road Interchange to Tuen Hing Road); and
- Tuen Mun Town Plaza Section (from Yan Oi Town Square to Tuen Hing Road).

2.2 Work Programme

2.2.1 The construction of the Project will commence in 2009 and complete by 2012.

3 IMPACT ASSESSMENT

3.1 Introduction

3.1.1 The environmental impacts associated with the construction and operation of the Project are summarised in the following sections.

3.2 Air Quality Impacts

Construction Phase

3.2.1 Potential air quality impacts arising from the construction of the Project would mainly be related to dust nuisance from excavation, material handling and wind erosion of the site. With the implementation of appropriate dust control and suppression measures as stipulated in the Air Pollution Control (Construction Dust) Regulation and good site practices, no adverse dust impact at the air sensitive receivers would be expected.

Operation Phase

3.2.2 The potential impacts arising from the background pollutant levels within and adjacent to the Project area, vehicle emissions from open road networks and the implementation of roadside noise barriers and enclosures were assessed. Results showed that the predicted air quality at the air sensitive receivers would comply with the Air Quality Objectives.

3.3 Noise Impacts

Construction Phase

3.3.1 Potential construction noise impacts would mainly be due to road works and construction of noise barriers/enclosures and would affect the noise sensitive receivers (NSRs) in the vicinity of the work site. With the implementation of noise mitigation measures such as use of quiet powered mechanical equipment, movable noise barriers and scheduling of some construction activities, the noise levels at the NSRs except CMA Choi Cheung Kok Secondary School (CMA), Yan Oi Tong Madam Lau Wong Fat Primary School (LWF), Lui Cheung Kwong Lutheran College (LCK), Lui Cheung Kwong Lutheran Primary School (LCKP) and CSBS Mrs. Aw Boon Haw Secondary School (CSBS) would comply with the construction noise criteria stipulated in the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). It is anticipated that NSR CMA, LWF, LCK, LCKP and CSBS would expose to noise levels exceeding the construction noise criterion for school during examination periods (65 dB(A)) by 1 – 5 dB(A). To avoid adverse noise impact, it is recommended that the construction works should be carefully planned during examination period.

Operation Phase

3.3.2 The potential road traffic noise impacts have been assessed based on Year 2025 traffic flow which would be maximum traffic projections within 15 years upon operation of the Project. The noise levels at some NSRs were predicted to exceed the EIAO-TM traffic noise criteria due to both widened TMR section and other existing roads. Direct noise mitigation measures on the widened TMR road section were proposed to mitigate the corresponding noise impacts at affected NSRs where the widened TMR road section noise contributions to the overall noise levels would be more than 1.0 dB(A).

3.3.3 With the proposed noise mitigation measures in place (**Figures 3.1A, 3.1B, 3.1C, 3.2A and 3.2B**), the widened TMR road section noise contributions to the overall noise levels at all representative NSRs would be less than 1.0 dB(A), except some NSRs at Chi Lok Fa Yuen, Ting Fuk House of On Ting Estate, Hong King Garden, Tung Wah Group of Hospitals Tai Tung Pui Social Service Building, JC Place, Harvest Garden and Kam Fai Garden. Eligibility test was conducted to assess the eligibility of these NSRs for provision of noise insulation works (NIW). The test results showed that these NSRs were not eligible for provision of NIW.

3.3.4 Monitoring of road traffic noise is recommended to verify the effectiveness of the mitigation scheme during the first year after road opening.

3.4 Water Quality

3.4.1 Potential sources of water quality impact associated with the road widening work and construction of noise barriers/enclosures would be site runoff, effluent discharges from construction activities and sewage effluent from workforce. Water quality impacts from the land-based construction works can be controlled to comply with the standards of Water Pollution Control Ordinance by implementing the recommended mitigation measures. All the effluents and runoff generated from the works areas shall be treated. No unacceptable water quality impacts would be expected from the land-based construction activities. Site inspections should be undertaken routinely to inspect the works areas in order to ensure the recommended mitigation measures are properly implemented.

3.4.2 For the operation phase, a surface water drainage system would be provided to collect runoff from the road during periods of rain, no adverse impact was anticipated.

3.5 Waste Management Implications

3.5.1 Wastes generated by the construction activities are likely to include construction and demolition (C&D) materials from the construction works, general refuse from the workforce and chemical waste from any maintenance of construction plant and equipment. Provided that these identified waste are handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed, adverse environmental impacts would not be anticipated during the construction phase.

3.6 Ecological Impact

3.6.1 Ecological survey on terrestrial ecological resources for the Project was conducted. The results of ecological survey identified seven habitat types within the Study Area including woodland, shrubland, plantation woodland, inactive/active agricultural area, town park, developed area/village and watercourse. The identified woodland and shrubland habitats are considered to have moderate ecological value, while the other habitats are considered to have low to moderate value.

3.6.2 No direct impact on ecologically important habitats would be resulted from the proposed works, which would take up 12 ha of developed area. The proposed construction works would only occur within the developed area, which is of low ecological value and is comprised of a section of Tuen Mun Road from San Hui Sitting-out Area to Kam Fai Garden. The developed area supports no floral and faunal species of conservation importance. The impact on habitat loss is considered to be low.

3.6.3 Little Egret (*Egretta garzetta*), a species of conservation interest, has adopted to tolerate a certain level of pollution and disturbance. It was recorded at the egretry and along the embankment of Tuen Mun River Channel within the Study Area. Construction and operation of the Project are not expected to have significant impact on the egretry and bird population (approximate 270m away) with the implementation of proposed mitigation measures.

3.6.4 The impact of loss of vegetation through removal of roadside plantation of common species within the proposed Works Area is not considered to be ecologically significant. The loss could be compensated by compensatory planting or transplantation. Species of choice should be composed of similar native species, and the felling and planting ratio should be no less than 1:1 in terms of quantity.

3.6.5 Bird collision with the proposed construction of permanent noise barrier/enclosure could result in bird mortality. With bird-friendly design of noise barrier/enclosure, such as using falcon sticker, tinted materials, embedded opaque stripes and superimposed patterns of thin opaque stripes, the chance of bird collision during operation phase of the Project would be minimized.

3.6.6 Considering the small scale of proposed construction works, highly disturbed nature of the Study Area, and with the proposed mitigation measures in place, including noise mitigation measures and good site practice, no adverse ecological impacts from the construction and operation of the Project is expected.

3.7 Landscape and Visual Impact

3.7.1 The source of landscape and visual impact is mainly due to the provision of noise barriers and enclosures for the road widening works. Under the EIAO, noise barriers and enclosures must be provided to mitigate the traffic noise. Such provisions are supported by the Tuen Mun District Council because the current noise level due to the existing traffic at TMRTC is high. The provision of noise enclosures will reduce the noise level to satisfy current standard. The relevant meetings with TMDC were held on 14 September 2007, 21 September 2007, 19 February 2008, 14 March 2008 and 21 November 2008.

3.7.2 Given the tight space within the Tuen Mun Road, the additional lane and provision of noise barriers and enclosures will cause significant impact on existing trees along Tuen Mun Road and such impact is unavoidable. The impact on trees has been consulted with TMDC and comments on tree treatment proposals will be incorporated in detailed design of the Project. Approximate 860 trees (out of approximately 1000 existing trees) will be affected by the construction of traffic improvement works to Tuen Mun Road and the proposed noise barriers and enclosures. Approximately 50% of the affected trees will be transplanted and approximately 50% will be felled. Many of the affected trees are mature. None of these are LCSD Champion Trees or Registered Old and Valuable Trees. There are no rare species or endangered species but common species. Opportunities for tree compensation within the site boundary and outside the site boundary within Tuen Mun Town Centre have been fully explored and incorporated in the mitigation measures as much as possible. Heavy standard and standard trees will be planted to compensate for the felled trees at 1:1 ratio in terms of quantity. Advance tree planting is proposed within Tuen Mun Town Centre as soon as possible and practical to mitigate the loss of greenery during construction and operation of the Project.

3.7.3 A number of open space and planting areas in Tsing Sin Park, Yan Oi Tong Circuit, On Tin Estate and Tsing Hoi Playground will be alienated by the temporary works during the construction phase. Many of the affected areas during the construction will be reinstated after the construction work. Approximate 350sqm of open space area (12%) will be permanently lost in Tsing Hoi Playground and approximate 700sqm of open space area (14%) will be permanently lost in Tsing Sin Park due to the road works. The residual impact on these open spaces is slight as only a small percentage of the overall park or playground will be affected.

3.7.4 To minimize the visual impact due to the provision of noise barriers and enclosures, an integrated landscape and engineering design approach has been adopted. Design measures have been incorporated to minimize the visual bulkiness of the structure. Vertical greening panels with design theme in area with adequate sunlight and maintenance access to reflect the local context are proposed. The green roof for the noise enclosure has been fully explored

and proposed where space for maintenance access is allowed. There are a number of design options considered for the green roof, vertical facade treatment and colour scheme for the noise barriers and enclosures. Based on the assessments and considerations documented in the report, the preferred overall landscape and aesthetic design treatments on the noise barriers and enclosures is recommended as the proposed design scheme for the landscape and visual impact assessment.

3.7.5 With the implementation of the proposed mitigation measures as per the preferred landscape and aesthetic design treatment, unavoidably, there will still be moderate residual visual impact on adjacent Visual Sensitive Receivers (VSR) as well as the traveling VSRs along Tuen Mun Road due to the blockage of views by the noise enclosures and barriers and loss of existing greenery. However, with the thematic design treatment on the vertical facade and green roof treatment with pattern, it is considered that the residual visual impact has been reduced to a marginally acceptable level.

3.7.6 In summary, the provision of the noise barriers and enclosures for the road widening works is a mandatory requirement under the EIAO and is supported by the Tuen Mun District Council. With the implementation of the mitigation measures, including the provision of approximate 11,000sqm vertical green panels with thematic treatment along the noise barriers and enclosures facade, the provision of approximate 20,000sqm green roof and the implementation of Tuen Mun District Planting Scheme, it is believed that the landscape and visual impact will be brought down to a marginally acceptable level after 10 years.

3.8 Land Contamination

3.8.1 An investigation of the historical / current land uses in respect of land contamination, including a desktop study and site inspection was conducted around the TMRTCS.

3.8.2 Based on the site reconnaissance, there has been no potential land contamination concern within the Project boundary. However, the existing petrol filling station located outside the assessment area, near the junction of Tuen Hing Street and TMR was identified as an indirect concern. This petrol filling station has been operated for over a decade and has potential of land contamination concern resulting from localised fuel leakage/ seepage. A preliminary land contamination survey is therefore proposed within boundary of the assessment area at the immediate down gradient of the petrol filling station to determine the baseline soil and groundwater conditions.

3.8.3 Mitigation measures have also been proposed for handling of the potential contaminated materials as general measures. No adverse residual impact in respect of land contamination is anticipated if necessary remediation is carried out at the contaminated areas confirmed by site investigation.

3.9 Environmental Monitoring and Audit

3.9.1 Environmental monitoring and audit is recommended for construction dust, construction noise and operational traffic noise, to check compliance with relevant statutory criteria and to ensure the effectiveness of the mitigation measures. Site inspection and audit are also recommended for ecology, water quality, waste management, land contamination, landscape and visual during construction, and implementation of landscaping measures during operation. Details of the recommended mitigation measures, monitoring procedures and locations are presented in a stand-alone Environmental Monitoring and Audit (EM&A) Manual. This will enable the Contractor to have early warning and provide necessary action to reduce impacts at specific areas if the monitoring results are close to the criteria. The effectiveness of on-site control measures would also be evaluated through a monitoring exercise. All the recommended mitigation measures would be incorporated in an EM&A programme during implementation.

3.10 Overall Conclusion

3.10.1 The EIA has been conducted based on the currently available information. The findings of this EIA have provided information on the nature and extent of environmental impacts arising from construction and operation of the Project. The EIA has, where appropriate, identified mitigation measures to ensure compliance with environmental legislation and standards.

3.10.2 In conclusion, the Project would generally comply with the environmental standards and legislation with implementation of the proposed mitigation measures during the construction and operational stages. This EIA has also demonstrated the general acceptability of the residual impacts and the population and environmentally sensitive resources in the vicinity of the site would be protected. Environmental monitoring and audit mechanisms have been recommended for construction and operation of the Project, where necessary, to verify the effectiveness of the recommended mitigation measures.