1. INTRODUCTION

1.1 Preamble

The Highways Department (HyD) of the Hong Kong SAR Government has commissioned **Scott Wilson (Hong Kong) Limited** in association with specialist sub-consultants to undertake an Environmental Impact Assessment (EIA) as part of the Preliminary Design and Ground Investigation Assignment for Widening of Yuen Long Highway between Lam Tei and Shap Pat Heung Interchange, (Agreement No CE 98/98). This document presents an Executive Summary of the Environmental Impact Assessment (EIA) – Final Assessment Report.

The Yuen Long Highway (YLH) is a strategic route in the North West New Territories (NWNT) connecting Tuen Mun new town and Yuen Long. The area has been identified as suitable for development and there are proposals for additional housing in Tuen Mun, Yuen Long and Tin Shui Wai. The Tin Shui Wai Development Study conducted in 1996 identified that most sections of YLH would operate beyond capacity by the year 2001.

The existing YLH is a dual-2 highway completed in 1993/94. The Highway traverses terrain which encompasses some cuttings to the south in the Tuen Mun area, whilst the northern section towards Yuen Long is constructed largely on embankment. Major interchanges are sited at Tong Yan San Tsuen connecting Long Tin Road, (the eastern distributor from Tin Shui Wai New Town), and at Tin Shui Wai West interchange connecting Hung Tin Road, the western distributor for the above estate.

1.2 Description of the Project

The proposals to alleviate the anticipated shortfall in capacity, include widening of the existing Yuen Long Highway from dual-2 lane to dual-3 lane, (including associated infrastructure works) between Lam Tei and Shap Pat Heung. The location of the proposed works, which cover a length of approximately 7 km is shown in **Figure 1.1**.

The proposed works are due to be carried out over a period of three-years commencing August 2003, with completion scheduled for December 2005. The construction programme is shown in **Figure 1.2.**

2. APPROACH TO THE EIA STUDY

The EIA has been carried out in accordance with the EIA Ordinance (Cap. 499) and the associated Technical Memorandum (EIA-TM).

Whilst there is a recognised need for the project to alleviate predicted traffic impacts, it has been identified that due to its nature, scale and location, the project has the potential to cause adverse environmental impacts. The EIA Ordinance sets out the legislative procedures to ensure that these potential impacts are identified, and where possible quantified, which then allows recommendations to be made such that adverse impacts can be mitigated to within acceptable levels.

The methodologies used for assessing the potential environmental impacts resulting from the construction and operation of the widening works are as defined in the EIA-TM. Where relevant, modelling techniques have been used to predict future conditions. Such modelling techniques have been used locally and internationally and were discussed and agreed with the Environmental Protection Department (EPD) prior to being used. The accuracy of the modelling results will be tested and verified as part of an environmental monitoring and audit (EM&A) programme, as discussed below.

Consideration of the project's environmental implications began at the earliest stages of the project's inception through the preparation of a

Preliminary Environmental Review (PER) and Project Profile. The PER provided an initial review of the potential environmental implications of the development, and determined that the proposals were deemed to be a Schedule 2 Project under the EIA Ordinance. The PER was subsequently used by EPD to prepare the EIA Study Brief in accordance with the procedures. The EIA Study Brief defined the scope of the environmental issues that needed to be addressed during this EIA Study, namely:

- construction and operational noise impacts;
- construction and operational air quality impacts;
- water quality impacts;
- waste management impacts;
- land contamination impacts;
- landscape and visual impacts;
- cultural heritage issues; and
- the EM&A requirements during project construction and operation.

The EIA Study has been carried out based upon a Preliminary Design. Following completion of this EIA Study, the Preliminary Design will proceed to Detailed Design.

The EIA Study has been undertaken in an iterative manner, in that the Preliminary Design elements have been evaluated and where considered practicable and necessary, alternative approaches have been investigated to minimise the associated environmental impacts.

Original construction of the Highway in 1993/4, included the provision of a Highway Reserve surrounding the road, in which development is prohibited. It has been identified that widening of the Highway to the required standard can be carried out within the existing Highway Reserve, thereby minimising impacts associated with land-take on hitherto undisturbed land.

Within the Highway Reserve, alternative options for widening have been addressed in the PER for the Study and include:

- symmetrical widening with one additional lane on each side of the existing road;
- asymmetrical widening with both additional lanes to one side or the other; or
- a combination of the above.

Taking into consideration the various constraints along the Highway, a combination of symmetrical and asymmetrical widening has been adopted in the preliminary design.

Following prediction and evaluation of the potential impacts caused by the preferred development option, environmental remedial measures have been recommended to address any unacceptable environmental impacts. These measures will be incorporated into the Detailed Design and where relevant, the construction contract. The recommendations will also become conditions of the Environmental Permit (EP) for the Project, which will be issued to the proponent on endorsement of the EIA -Final Assessment Report.

Mitigation measures recommended by the EIA Study are supported by a programme of Environmental Monitoring and Audit (EM&A) during construction and operation. Specific requirements for EM&A are presented in a stand alone EM&A Manual.

3. CUMULATIVE IMPACT FROM CONCURRENT PROJECTS

It is noted that there are a number of highway studies and development planning being carried out concurrently within the Study Area of this Assignment. These studies include the EIA for the proposed Deep Bay Link, EIA for the NWNT Hung Shui Kiu Development and the Study for Route 10. The assessment of the cumulative impact on

the receivers in Lam Tei/Hung Shui Kiu areas has been carried out using methodologies consistent with the interfacing projects.

4. KEY FINDINGS OF THE EIA

The following sections summarise the key environmental investigations carried out during the EIA Study, and identify the significance of the impacts identified and the requirement for mitigation.

4.1 Noise Issues

Existing development is generally close to Yuen Long Highway along the length of much of the proposed widening works. There are a number of noise sensitive receivers potentially affected by construction activities. These include existing and future residential developments at To Yuen Wai, Tan Kwai Tsuen, Tai Tao Tsuen and Fuk Hang Tsuen, as well as schools, churches and homes for the elderly (refer to **Figure 1.3)**.

Noise generating activities will occur throughout the construction phase, the principal noise source being slope excavation and piling activities. The noise impact assessment has indicated that without mitigation, construction activities have the potential to exceed acceptable standards for construction noise limits, as defined in the EIA-TM, at sensitive receivers closest to the work sites. Therefore, it has been necessary to design a strategy through which these noise impacts can be reduced to an acceptable level.

The noise mitigation strategy developed includes the use of quiet plant, on-site movable noise barriers, barriers along work-site boundaries and limiting the number of plant operating concurrently.

Following implementation of the recommended noise mitigation strategy, residual noise impacts are predicted to meet the EIA-TM daytime noise criteria and thus adverse construction noise impacts are not anticipated to occur.

Traffic noise associated with the proposed widening of Yuen Long Highway is a key environmental issue and constitutes the major environmental impact to nearby sensitive receivers.

The assessment has predicted that without mitigation, the traffic noise levels from the proposed road widening at the year 2021 are anticipated to result in an exceedance of the road traffic noise criterion.

The best practicable mitigation package has been recommended to comply with the road traffic noise criterion, comprising a combination of 2 to 6m high road side vertical and cantilevered noise barriers.

For noise sensitive receivers situated at areas subject to impacts arising from the adjacent concurrent projects, the cumulative construction noise levels have been assessed and found no exceedance of the relevant noise limits provided that sufficient mitigation measures are in place. However, for the cumulative noise impact during the operation stage of the concurrent projects, the predicted noise levels at some of the receivers have been found exceeded the noise limits. Consequently, direct mitigation measures have been proposed to reduce the impacts to an acceptable level.

4.2 Air Quality

Typical construction works and the major dust generating activities have been identified and reviewed. Good site work practices based on the statutory requirements laid down in the *Air Pollution Control (Construction Dust) Regulations* have been recommended to ensure effective implementation of dust control measures during the construction phase. Provided that these recommendations are

followed, measures for the control of fugitive dust emissions are considered to be adequate.

The operational phase impacts due to vehicle emissions have been assessed through computer modelling of the worst case scenario when the maximum 15-year peak hour traffic occurs and together with the impacts arising from the concurrent projects. No breaches of the Air Quality Objectives are anticipated as a result of the Highway and the cumulative effect from the concurrent projects. The air pollutant levels for the "worst-case" scenario for traffic noise control have been predicted. The results also confirm that no adverse impacts are anticipated as a result of the installation of the proposed noise barriers.

4.3 Water Quality

Construction activities along the highway have the ability to impact upon identified water sensitive receivers, principally through the generation and discharge of silt-laden surface runoff from spoil stockpiling areas and during landscape stripping and embankment reworking. However, such impacts can be readily mitigated and measures have been specified to control such impacts.

During operation, highway run-off is the key source of pollutants. Surface water run-off from the highway pavement, typically contains sediments and organic/inorganic pollutants from vehicles. Assuming appropriate management of road drainage water, the impacts are not anticipated to be significant.

4.4 Waste Management

The proposed works are likely to result in the generation of a variety of construction-related wastes and require the importation of fill. Opportunities have been identified for the reduction of construction and demolition materials and reuse on Site.

Provided that both waste arisings and imported fill are managed using recommended methods through development of a Waste Management Plan during the construction activities, no unacceptable adverse environmental impacts are envisaged.

4.5 Land Contamination

There are a number of land uses adjacent to the Highway that have the ability to cause land contamination. However, as the proposed widening scheme will be maintained within the existing Highway Reserve, the works will not impinge upon potentially contaminated plots of land and the impacts are not considered significant.

4.6 Landscape & Visual Impacts

Overall, the primary source of landscape and visual impacts arise from the disturbance to the existing planted embankments and the loss of the roadside vegetation (including approximately 4913 trees). However some 386 trees would be retained in-situ and 103 transplanted to locations within the project limit. Additional sources of visual impact will arise from the extension of the road surfacing and the introduction of the noise barriers (total length 13,597m ranging in height from 2 to 6m).

Mitigation measures have been devised to alleviate the identified landscape and visual impacts including compensatory woodland planting and the consideration of the design of engineering structures, particularly the noise barriers. The EIA has recommended that these are designed to be partially transparent with a colour tint to minimise visual impact, dense tree and shrub planting has also been recommended (refer **Figures 1.4** to **1.7**). It is considered that the mitigation measures will alleviate some of the impacts caused, resulting in the long-term impacts being acceptable overall.

4.7 Cultural Heritage

There are a number of villages along the alignment, which have general features of cultural heritage interest. However, all such villages have been affected to some degree by the construction and operation of the existing Highway.

Areas of interest include a number of traditional village houses at Shung Ching San Tsuen and earth-gods at Sham Chung and Lam Hau. As the proposals do not involve the resumption of additional land, impacts upon these features are not considered significant, and impacts from general disturbance will be offset through mitigatory planting or suitably designed retaining walls specified for mitigation of landscape impacts. The potential for nuisance around Lam Hau (to the south of the alignment) has been reduced further by proposed asymmetrical widening to the north of the Alignment.

4.8 Environmental Monitoring and Audit

An EM&A programme will be implemented during the construction and early stages of the operation of the Highway, this will cover noise, air quality and landscape planting. The programme is designed to act as a mechanism to verify the predictions made in the EIA Study, but also to intercept any unforeseen adverse environmental impacts. In this regard, the EM&A Manual prepared for this development specifies “action” levels for various environmental parameters being monitored. These action levels are set below statutory limits; should these levels be breached, prompt mitigation action can be taken to ensure that statutory limits are not exceeded.

5. CONCLUSION

The EIA Study has indicated that whilst the proposals to widen the Yuen Long Highway are intended to alleviate a projected shortfall in Highway capacity, the construction and subsequent operation of the works have the potential to cause environmental impacts, principally in relation to noise. However, through the adoption of specified mitigation measures, anticipated impacts should be within acceptable limits.