Route 16
from West Kowloon to Sha Tin
16號幹線
由西九龍至沙田段

Environmental Impact Assessment
Executive Summary
環境影響評估
總結報告

1 / 1998

Scott Wilson / Parsons Brinckerhoff
in association with
ERM Hong Kong, MVA Asia
Agreement No. CE 42/96

Route 16 Investigation Assignment from West Kowloon to Sha Tin - Environmental Impact Assessment

Executive Summary

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INTRODUCTION

Scott Wilson (Hong Kong) Ltd and Parsons Brinckerhoff (Asia) Ltd in joint venture, in association with ERM Hong Kong and MVA Asia, have been commissioned by Highways Department to undertake the Investigation Assignment for Route 16 from West Kowloon to Shatin (Agreement No. CE 42/96) (hereafter called the Assignment). An Environmental Impact Assessment (EIA) is required as part of the Assignment.

The need for Route 16 was established in the Updating of the Second Comprehensive Transport Study to overcome anticipated traffic problems at the Lion Rock Tunnel, Tate's Cairn Tunnel and Tai Po Road, and has been committed in the Sha Tin Outline Zoning Plan (S/ST/6). The Route 16 will connect the Lai Wan Interchange in West Kowloon to the future Trunk Road T3 and Che Kung Miu Road in Shatin. A Feasibility Study for the Route 16 Dual-2 Scheme was completed in June 1996 including an Environmental Impact Assessment (hereafter called the Previous EIA). A number of alternative alignment options were developed and evaluated against engineering, traffic, structures, tunnelling, geotechnics, environmental, planning and costs factors, and a preferred alignment and preliminary design for the Dual-2 Scheme subsequently endorsed by the Government.

In view of the latest anticipated increase in traffic demand, the Government has now committed to consider constructing a Dual-3 Scheme in the present Assignment as shown in Figure 1, based on the previous alignment given in the Brief. ERM Hong Kong is undertaking the EIA which includes updating the Previous EIA, based on the proposed Route 16 Dual-3 Scheme engineering design, construction programme, and the worst case traffic forecasts for the year 2019; and identifying broad environmental control requirements for incorporation into the Preliminary Design to comply with environmental legislation and guidelines.

PROJECT DESCRIPTION

The Dual-3 Route 16 alignment is shown in Figure 1 and comprises the following sections:

- **West Kowloon** - from Lai Wan Interchange to Lai Chi Kok Interchange, continuing alongside Butterfly Valley Road and passes into tunnel beneath Ching Cheung Road, with slip road connections to Ching Cheung Road, Castle Peak Road and Butterfly Valley Road.

- **Main Tunnel (Eagle's Nest Tunnel)** - approximately 2700m long running under the Lion Rock Country Park and surfacing at the western end of Shatin.

- **Toll Plaza** - a Sha proposed site area located at the Sha Tin entrance of the Main Tunnel.

- **Shatin** - comprising a second tunnel (Shatin Heights Tunnel) of approximately 950m long emerging close to the valley floor just beyond Keng Hau Road, continuing to join T3 trunk road, with a slip road connection to Che Kung Miu Road.

A ventilation building is proposed at Tai Po Road as shown in Figure 1 to disperse vehicle emissions from the Eagle's Nest Tunnel.

**Construction Phase**

The preliminary construction programme of Route 16 is expected to last approximately four years from end 2000 to end 2004, with the following main construction activities:
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- Earthworks excavation;
- Tunnel portal construction;
- Tunnel excavation; and
- Viaduct construction.

Operation Phase

The main operational activities of Route 16 involve:
- Traffic
- Toll Plaza
- Tunnel Ventilation

Construction Impacts

Noise

The main noisy construction activities are portal construction, earthwork excavation, viaduct construction and removal of spoil. Unmitigated construction activities of Route 16 would cause exceedances of the daytime construction criteria of 75 dB(A) at most of the nearby noise sensitive receivers (NSRs) during the weekday daytime hours as well as the 70 dB(A) noise criteria for schools. The worst affected NSRs in West Kowloon area are the Lai Chi Kok Reception Centre Staff Quarters, Mei Foo Sun Chuen (Phase 6) and Lai Chi Kok Hospital. For the toll plaza area the worst affected NSRs are the new residential development along Tai Po Road (Lot 525). For the Shatin area the worst affected NSRs are Shatin Heights, Woodcrest Hill, Christian Alliance Cheng Wing Chee College, Keng Hau Village, Carado Garden and Tin Sam Tsuen.

Therefore, adequate control measures will be necessary for the works to meet the criteria. Mitigation measures including the use of quiet plant, on-site movable noise barriers, limited the number of plant operating concurrently are required. It is also recommended that regular monitoring of noise at NSRs will be required during the construction phase.

If construction works are to be carried out during restricted hours (19:00 - 07:00 hours on weekdays and all hours on Sundays and Public Holidays), further mitigation measures will be required. Such work will require the granting of a Construction Noise Permit by the EPD.

Air Quality

Dust generated from construction activities will be the major air pollutant during construction of Route 16. A dust dispersion model was employed to predict the potential impact at Air Sensitive Receivers (ASR). Without mitigation, the Air Quality Objectives (AQO) dust criteria would be exceeded at Lai Chi Kok Reception Centre Staff Quarters, Keng Hau Village, Woodcrest Hill, Shatin Heights, Shatin Riding School, Chik Wan Street Rest Garden, Lau Pak Lok Secondary School, Holford Garden, Tai Wai New Village, Hin Tin Swimming Pool, Hong Kong School of Motoring, Che Kung Miu Road Playground and Tin Sam Village. Dust control measures as part of good construction practices such as the use of water sprays, covering stockpiles and wheel wash facilities have been recommended to minimise dust impacts on the receivers to comply with the dust criteria and should be incorporated into Contract Specifications. Dust monitoring and audit is recommended to ensure compliance with the AQO during the construction of Route 16.
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Water Quality

Potential water quality impacts from Route 16 construction activities will be from typically land based construction activities involving: construction runoff and drainage; litter and debris; and spillages. With the implementation of proper site management and good construction practices such as the use of sediment traps and oil interceptors, it is unlikely that construction activities would result in incompliances with the Water Quality Objectives (WQO). The recommended mitigation measures should be incorporated into the Contract Specifications.

Ecology

The loss of secondary woodland areas due to the landtaking for the construction of the Toll Plaza and Ventilation Building would result in considerable ecological impact. Given the contiguity with the woodland areas of the adjacent Kam Shan Country Park and Lion Rock Country Park, and provided that the recommended woodland plantings will be undertaken on-site, as well as design measures to minimise land take, residual impact from the project is not considered significant. Mitigation such as woodland plantings and good construction planning and site practices are required.

Landuse and Planning

The main planning issues in the West Kowloon area are the clearance of the existing Butterfly Valley Cottage Area and industries. A number of scenarios were assessed to evaluate the best planning option and identify a preferred scenario for the industrial development of the Butterfly Valley area. The main planning issue in the Sha Tin area relates to the land clearance and resumption at Pak Shek Village. Due consideration was given to minimise the area affected within the Other Specified Use (OU) site which would involve the clearance of the existing Pak Shek Village.

The Provisional Urban and Regional Councils should be informed of the extent of impacts on existing Council facilities, and any encroachment onto those existing facilities and any proposed change in landuse will be subject to the Councils' approval.

Landscape and Visual

Key landscape impacts within Kowloon will be related to the infilling, loss of natural hillslopes and impact upon the townscape. At Shatin, key impacts will include the clearance of vegetation and extensive cutting of natural slope profiles; and the impact of the tunnel ventilation building on the landscape character of the area around Beacon Hill. The landscape impacts will be reduced by woodland planting and the extensive regrading of cut slopes at the tunnel portals, toll plaza and below Tai Po Road.

Route 16 will result in key visual impacts in Kowloon from the elevated road structure and the loss of natural wooded hillslopes. In the Shatin Valley, Route 16 will result in severe visual impact upon nearby residents, as well as recreational users. Re-planting of hillslopes, extensive regrading, careful architectural treatment of highway structures, screen barriers and retaining walls with screen planting in close proximity to residential buildings or sensitive receivers will assist in reducing the visual impacts. Figures 4-6 show illustrations of the road scheme.

Construction Waste Disposal

No adverse impacts upon the environment, in terms of specified government regulations and guidelines, were identified arising from the storage, handling, collection, transport and disposal of wastes from the construction of Route 16. In most cases the waste material can be easily re-used on other fill sites or disposed of to Public Dumps. Mitigation measures recommended as good construction practices should be incorporated into Contract Specifications and applied to ensure that environmental
nuisance does not arise from the storage, transport and disposal of the various types of waste arisings. These recommendations should form the basis of the site waste management plan to be developed by the Contractor at the detailed design stage.

**OPERATIONAL IMPACTS**

**Noise**

This assessment has predicted that the worst case traffic noise levels from Route 16 in 2019 will result in exceedances of the Hong Kong Planning Standards and Guidelines (HKPSG) traffic noise criterion at the Lai Chi Kok Reception Centre Staff Quarters, Shatin Heights, Hin Keng Estate and Carado Garden.

A series of direct mitigation measures have been considered for Route 16 to reduce the noise impacts to comply with the HKPSG criterion. The best practicable mitigation package is recommended, comprising a combination of 3 and 5m high roadside noise barriers and low noise road surfaces for the West Kowloon Section and a combination of 2 to 4m noise barriers, low noise road surfaces and 7m high reinforced earth embankment for the Shatin Section as shown in Figures 7 & 8.

Residual impacts at the affected receivers with the implementation of the recommended direct mitigation measures have been assessed against the insulation criteria as stated in the "Equitable Redress for Persons Exposed to Increase Noise Resulting from the Use of New Roads". The assessment indicates that approximately 24 dwellings of Shatin Heights will meet the criteria for noise insulation as a last resort subject to ExCo approval. It is recommended that a Detailed Noise Insulation Works Study be carried out at the Detailed Design stage to identify the exact requirements of noise insulation.

The specification of the fans for the ventilation building should be attenuated to the $L_{eq, 20}^\text{en} 75 \text{dB(A)}$ at 1m from the main louvres area to ensure no exceedance of the NCO criteria at the nearby NSRs.

**Air Quality**

Vehicular emissions from open section of the road and emissions from tunnel portals/ventilation building are the major air pollutant sources of Route 16. The tunnel ventilation system has been designed to meet the Tunnel Air Quality Guidelines. Due to the existing poor air quality in the West Kowloon Area, there will be no portal emissions at the Kowloon section. Emissions from the main tunnel section will be dispersed via the ventilation building at Tai Po Road and the portals at the Shatin section. Modelling results indicate that cumulative aerial emissions from the two tunnel sections and the open sections of Route 16 will comply with the AQO criteria at all sensitive receivers, except a small area of an existing open car park near the Kwai Chung Interchange planned for storage use. It is recommended that the design of the future storage area should avoid locating fresh air intakes of building within the small affected area. Air quality monitoring and audit requirements have been recommended to monitor the air quality within the tunnel.

**Water Quality**

The operation of Route 16 will inevitably result in discharges such as road run-off, tunnel seepage and sewage from on-site staff at the Toll Plaza. However, these effluent sources will have minimal water quality impacts provided that the recommended measures are implemented such as silt traps and oil interceptors to control road run-off.
OVERALL CONCLUSIONS

This EIA has assessed the potential environmental impacts associated with the construction and operation of the proposed Route 16 Dual-3 Scheme. Environmental control and landscaping measures have been recommended for incorporation into the Preliminary Design as far as engineering and site constraints allowed to comply with the Government environmental criteria. The recommended environmental monitoring and audit procedures will ensure the efficacy of the environmental control measures which should be incorporated into the Contract Specifications of the Route 16 project.
序言

路政署委託鍾信（香港）有限公司和柏誠（亞洲）有限公司聯營，聯同香港環境資源管理顧問公司和 MWA 亞洲共同參予對第十六號幹線，即西九龍至沙田（顧問合約號碼為 CE42/96）研究工作，（以下簡稱為“工作”）。環境影響評估（EIA）作爲“工作”的其中一項內容。

在第二次整體運輸研究修定報告中已確認了第十六號幹線的需要以解決在獅子山隧道、大老山隧道、大埔道所預計出現的交通問題，而在沙田分區計劃大綱圖（SST/6）亦已包括了此路線。第十六號幹線將把西九龍的荔灣交匯處連接到將來的沙田 T3 主幹路以及沙田的車公廟道。第十六號幹線的雙程雙線車道方案的可行性研究已於 1996 年 7 月完成，其中亦包括環評工作的部份（以下簡稱為“原有 EIA”）。這可行性研究建議了許多不同的路線方案，而且評估了其相應的工程、交通、結構、隧道、地質、環境、計劃和費用等因素；而選取的路線和雙程雙線道方案的初步設計最後亦通過了政府的審核。

在預計交通需求的增長情況下，政府現計劃把先前設計概念擴展為建造雙程三線道路，見圖 1 所示，此雙程三線的設計將按在可行性研究所建議的路線為根據。香港環境資源管理顧問公司是負責進行環評工作的公司，包括修定原有的環境影響評估，它是以所建議的第十六號幹線雙程三線車道的工程設計、施工計劃、及預測在 2019 年的最壞的交通情況為依據的；並且結合初步設計，確定廣泛的環境控制要求以符合環境的法例要求。

項目介紹

第十六號幹線的雙程三線車道的路線如圖 1 所示，共分為以下各段：
• 西九龍–主橋從荔灣交匯處到荔枝角交匯處，繼續沿蝴蝶谷道並進入呈祥道下的隧道，並有道路連接呈祥道、青山道和蝴蝶谷道。
• 主隧道（尖山隧道）–約 2700 米長，經獅子山郊野公園下面走，並通往沙田的西部。
• 收費廣場–擬用地面積約 5 公頃，位於主隧道的沙田入口處。
• 沙田–包括另一條隧道（沙田嶺隧道），長約 950 米，穿過徑口道，並繼續且連接 T3 主幹路；另有支路連接車公廟道。

位於大埔道的擬建通風大樓如圖 1 所示，是用來擴散經尖山隧道內車輛所排放的氣體。
施工期

第十六號幹線的初步施工計劃預計施工期需約四年時間，從 2000 年尾到 2005 年初，主要的施工活動如下：

- 土方挖掘；
- 隧道入口的建築工程；
- 隧道挖掘；及
- 高架橋的建築工程。

營運期

第十六號幹線的主要營運作業活動有：

- 行車交通
- 收費廣場
- 隧道通風系統的運作

施工影響

噪音

主要的施工噪音將來自隧道入口的建築、土方挖掘、高架橋的建築及建築廢物的清理工作。在未減低第十六號幹線的施工噪音時，在附近噪音感應強地方所接收的日間噪音將超過最高施工標準 75 分貝，以及為學校訂定的 65 分貝的噪音標準。在西九龍區的荔枝角拘留所職員宿舍、美孚新村（第 6 期）及荔枝角醫院所受到的噪音影響最為。在收費廣場範圍，受噪音影響最大的是沿大埔道（地段 525）的住宅發展。在沙田區，受噪音影響最大的是沙田花園、桂園、宣道會鄭培中學、徑口村、雲捲花園及田心村。

因此，在施工期間必須有足夠的控制措施以令情況符合理噴標準。減低噪音的措施包括使用低噪音設備、可移動的隔音屏障，以及限制同一時間使用機動設備運作的數量。同時建議在施工期間定期對噪音感應強的地方監測噪音。

如果在受限制時間（平日的下午七時至上午七時及星期天和公共假期的任何時間）中施工，承建商須要採取進一步的減低噪音措施。在這段時間中進行施工需獲得環境保護署發給的施工噪音許可證。
空氣

施工期間產生的塵埃將是第十六號幹線施工期的主要空氣污染物。評估中使用了塵埃擴散模型，以預測空氣污染感應強地區的潛伏影響。在荔枝角拘留所職員宿舍、徑口村、桂園、沙田花園、沙田騎術學院、積運街休憩花園、劉百樂中學、海福花園、大圍新村、顯田游泳池、香港駕駛學院、車公廟公園及田心村，塵埃物將會超過空氣質量指標的塵埃標準。評估中建議採用塵埃控制措施，例如良好的施工方法如灑水系統，覆蓋臨時存儲之泥土和採用清洗車輪之設備等，以減低塵埃所產生的影響，從而符合塵埃標準，此等要求將加在合約細則內。評估亦建議定期監測以保障第十六號幹線的施工將符合空氣質量指標。

水質

第十六號幹線施工對水質的潛在影響是來自地面的施工工作，包括施工時的污水排放；以及施工垃圾。若執行於地的管理及良好的施工方法如用濾沙和隔油設備等，是不會導致水質不符合要求的。評估中建議減低影響水質的措施要求須放在合約的細則內。

生態系統

由於建造收費廣場和通風大樓需占用土地，因而將失去再生林地，這都是生態方面的需要深入探討問題。鑑於鄰近的金山郊野公園和獅子山郊野公園有大量林地，以及地盤以外將有再植樹木作爲動物的棲生地，加上仔細設計以減低土地需求，所以失去林地的損害是不會太大的。

評估中建議從新種植再生林和施行動良好的施工方法，將影響減至最少。

土地使用及規劃

在西九龍區土地規劃的主要問題是清拆在蝴蝶谷的屋村及工業廠房。本評估從衆多的建議中推薦採納其中一個方案來重新開發蝴蝶谷地區。這個方案的土地使用主要是作爲工業用地。

在沙田區土地規劃的主要問題是與白石村清拆和收地有關。由於要顧及到盡量減少對其他指定用途土地使用的影響，包括清拆現有的白石村，所以設計過程中已作出詳盡的考慮，以減少土地的徵收及土地使用的轉變。

而臨時區域市政局及臨時市政局亦將會被知會，對现有設施所受的影響作出妥
모터車

風景與景觀

在九龍，主要影響綠化的地方有填土、削坡工程、以及市景的影響。在沙田，主要影響包括草木的砍伐、削坡工作，和隧道通風大樓對筆架山周圍的綠化的影響。透過造林和廣泛關注隧道口、收費廣場和大埔道下面的山坡切割情況，以減少對綠化區所受的影響。

在九龍，第十六號幹線所造成的景觀影響主要由於橋樑造成。在沙田，第十六號幹線會給附近的居民，造成一定程度的景觀影響。山坡重新植樹、廣泛關注、對高速公路結構的建築外觀細致處理。設隔音屏障及在接近民居或問題嚴重之處設有隔聲帶的擋土牆都將有助於減少對景觀上的影響。圖 4 至 6 顯示了道路之設計

建築廢棄物棄置

根據政府訂定的規則和指引，第十六號幹線施工中的廢棄物貯存、處理、收集、運輸過程都不會出現對環境不利的影響。在大多數情況下，廢物料會運往其他堆填區或經公眾傾卸場處理。本評估建議結合合約細則，採用減少影響的措施，例如採用良好的施工方法，以保証在貯存、運輸及處理各類型廢物時，不會對環境作出滋擾。這建議將作爲地盤廢棄物管理計劃的基礎，它將由承建商在仔細設計階段時制訂。

營運期的影響

噪音

本評估已預測到在最差的情況下，第十六號幹線在 2019 年，其所經的荔枝角拘留中心職員宿舍、沙田花園、顯徑邨及雲平花園的交通噪音水平將會超過香港規劃標準及準則中規定的交通噪音標準。

為了符合該噪音標準，評估中已經考慮了一系列措施直接減低第十六號幹線所產生的噪音影響。它包括在西九龍段的橋上，建造 3 米及 5 米高的路邊隔音屏障及低噪音路面；在沙田段，將建造 2 米及 4 米高的隔音屏障，低噪音路面，以及 7 米高護土牆，見圖 7 和圖 8 所示。

本評估根據“給因新路使用所受到噪音影響的人們的合理補償”中所述的隔音標準，評估了所建議的直接減低噪音措施和殘餘噪音對感應強地方的影響。評估表
明了約有 24 戶沙田花園將須提供隔音措施，詳細計劃將提交行政會議批準。評估中建議在仔細設計階段進行詳細的隔音工程研究，以確定隔音的確切要求。

評估中亦建議通風大樓的抽風機技術規格將需說明其在主要百葉區 1 米處範圍外的噪音應減少至 Leq. 30min 75 分貝，以保證在附近噪音感應強地方的噪音標準不會被超過。

空氣

第十六號幹線的主要空氣污染源是來自道路上車輛排放的氣體及在隧道口/通風大樓所排放的氣體。隧道通風系統的設計是符合隧道空氣質量要求的。由於現時西九龍區的空氣質量惡劣，因此在九龍出口將沒有開口排放氣體。來自於主要隧道段所排放出來的氣體將在大埔道的通風大樓及在沙田段的入口排放。模擬系統的結果顯示，除在荔枝角交匯處及近的露天停車場倉庫之外，來自第十六號幹線上兩段隧道所產生的氣體及在公路上的氣體是符合有關的空氣質素標準。此外，在評估中亦建議了將來空氣質量監測及檢查要求，以監測隧道內的空氣質素。

水質

第十六號幹線的營運將不可避免地產生排放物，如道路污水、隧道凈水以及在收費廣場當值職員的污水排放。然而，只要採用所建議的措施，如設置淨化和濾水池來控制道路污水，這些廢水來源對水質的影響將會極低。

總結

本評估結合建議的第十六號幹線雙程三線車道方案的施工和營運，評估了潛在的環境影響。本評估亦建議把環境控制及綠化措施結合到初步設計中，以符合政府的環境標準。評估中建議的環境監測及評審程序將確保環境控制措施有效地執行，而這些措施應納入第十六號幹線工程的合約細則內。
WOODLAND TREE SHRUB PLANTING

NOISE BARRIER TO SHATIN GARDEN

EARTH FILL

CO NCRETE REINFORCED EARTH WALL VISUAL SCREEN WITH NATURAL STONE BLOCK FINISH

PLANTERS

CONCRETE REINFORCED EARTH WALL WITH NATURAL STONE BLOCK FINISH

ROUTE 16 FROM WEST KOWLOON TO SHA TIN

16 號幹線由西九龍至沙田段

TYPICAL SECTION OF REINFORCED EARTH RETAINING WALL - SHATIN

Figure 6
The Government of the Hong Kong Special Administrative Region Highways Department

Scott Wilson - Parsons Brinkerhoff
In Association with
N.Y.A Asia ERW Hong Kong

Route 16
AGREEMENT NO. CE 4296
WEST KOWLOON TO SHATIN

ROUTE 16 FROM WEST KOWLOON TO SHA TIN
16號幹線由西九龍至沙田段

SHATIN VALLEY PERSPECTIVE VIEW
LOOKING NORTH

Figure 5
FIGURE 7 - LOCATION OF 3m+5m ROADSIDE NOISE BARRIER (MITIGATION OPTION 3A)

Environmental Resources Management
6th Floor
Henry Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong
FIGURE 8 - LOCATION OF 3m+4m ROADSIDE NOISE BARRIER
(MITIGATION OPTION 4)

Environmental Resources Management
6th Floor
Henry Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM