



香港地下鐵路公司
Mass Transit Railway Corporation

Feasibility Study and Preliminary Design for

Tseung Kwan O Extension Quarry Bay Congestion Relief Works

**Tseung Kwan O Extension
Detailed Environmental
Impact Assessment Report R9T
Volume I : Executive Summary**

July 1997

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Maunsell

in association with

MVA

Parsons Brinckerhoff

Urbis

Dennis Lau & Ng Chun Man

Design Research Unit

ERM

Widnell

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Mass Transit Railway Corporation

Tseung Kwan O Extension
Detailed Environmental Impact
Assessment:
Volume I - Executive Summary

23 July 1997

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For and on behalf of ERM-Hong Kong, Ltd

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1 INTRODUCTION

1.1 BACKGROUND TO THE DETAILED ENVIRONMENTAL IMPACT ASSESSMENT

- 1.1.1 Maunsell Consultants Asia Ltd, in association with MVA, Parsons Brinckerhoff, Urbis, Dennis Lau & Ng Chun Man, Design Research Unit and ERM Hong Kong, were commissioned by the Mass Transit Railway Corporation (MTRC) to undertake the Feasibility Study and Preliminary Design for the Tseung Kwan O Extension (TKE). During the initial stages of the Study, ERM Hong Kong produced the Tseung Kwan O Extension Environmental Feasibility Study Report, Maunsell Consultants (Asia) Ltd, February 1996 (EFS) to determine the environmental constraints which could affect the feasibility of the railway.
- 1.1.2 The EFS showed that, with appropriate mitigation, all identified potentially adverse impacts could be controlled to within the established standards and guidelines. These findings were used by the Study Team during the preliminary design stage of the TKE to develop effective mitigation measures for the construction and operational phases of the Project, to limit the effects of those potential adverse environmental impacts identified in the EFS.
- 1.1.3 Subsequently, ERM has taken the findings of the EFS and used the more developed output of the *MTRC Tseung Kwan O Extension Final Preliminary Design, Maunsell et al, May 1996* to produce a Detailed Environmental Impact Assessment (DEIA). The DEIA will be used to establish the environmental performance criteria to be applied during the construction and operation of the TKE, which will be included in the tender requirements for the TKE Detailed Design Consultancies and the Design and Construct (Black Hill Tunnel) Contract.
- 1.1.4 This Report sets out the findings of the DEIA which ERM, with assistance from Maunsell, Urbis and other members of the Study Team, has undertaken.

1.2 THE TSEUNG KWAN O EXTENSION

- 1.2.1 The Government's *Railway Development Strategy Report* of December 1994, identified the need for the line to serve the Tseung Kwan O Development Area which is expected to develop a population of 250,000 by 2001 and 450,000 by 2011. MTRC are proposing to build a new railway line, principally to serve the new town of Tseung Kwan O to the east of Kowloon and to provide improved public transport in the area. The TKE will provide links from the existing Kwun Tong Line at Lam Tin Station and the Hong Kong Island Line at Quarry Bay and North Point stations. The new line will run eastward via Yau Tong, Tiu Keng Leng, Tseung Kwan O and Hang Hau to Po Lam (see *Figure 1.2a*).
- 1.2.2 The proposed railway will run south-east from Lam Tin to Yau Tong and north-east from the Eastern Harbour Crossing to Yau Tong, before entering a tunnel section running north-east through Ng Kwai Shan (Black Hill), to Tiu Keng Leng. The line will continue in the same general direction through Tseung Kwan O to Hang Hau in a cut-and-cover tunnel before turning north-west for the final section to Po Lam running at ground level. Due to land resumption problems in the Yau Tong area, the original proposal to locate the depot in Yau Tong will no longer be pursued. MTRC and Government are considering the possibility of locating the depot in Tseung Kwan O south, the details of which are still being worked out.

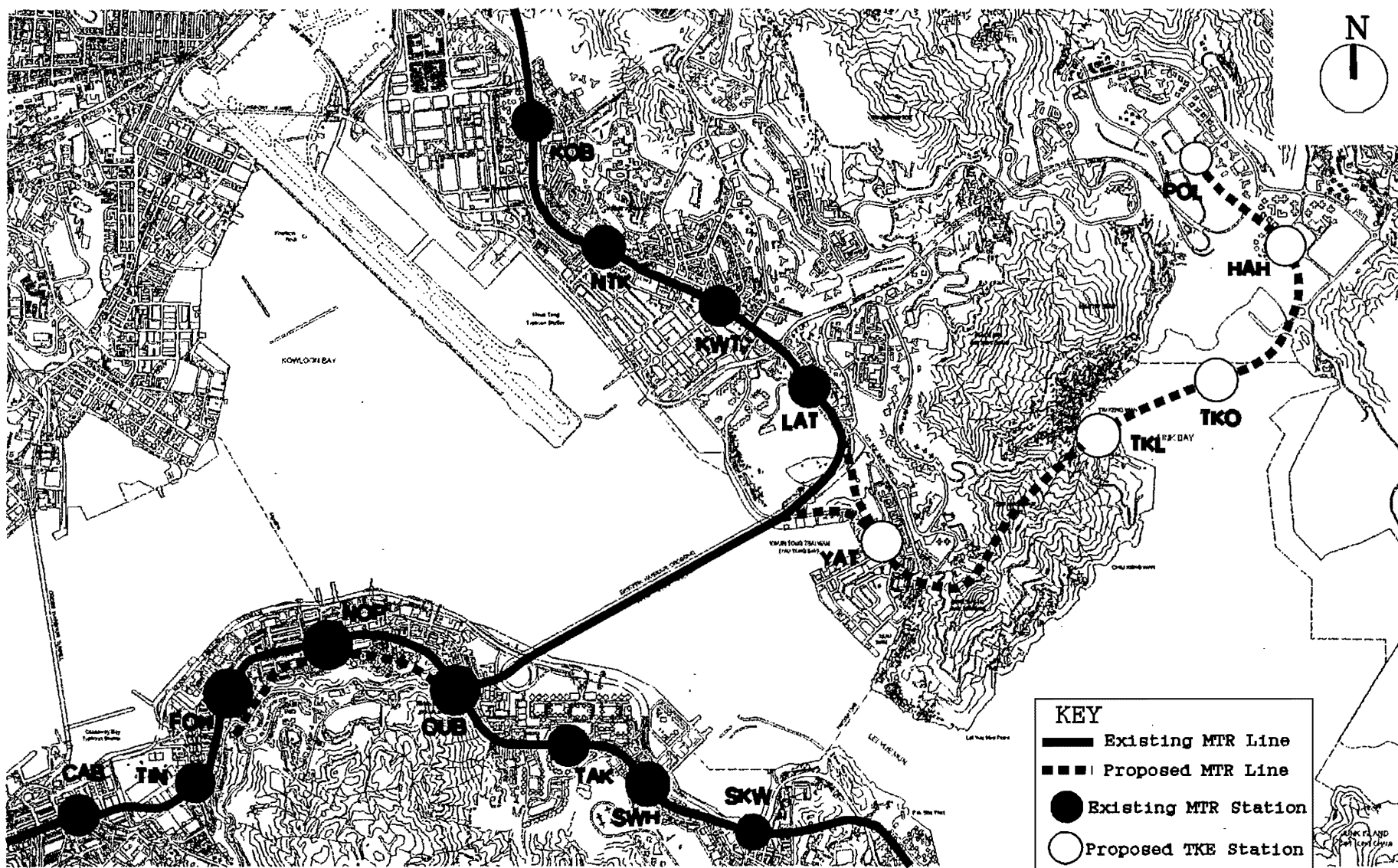
- 1.2.3 In the interest of maintaining the project programme, it is the intention to gazette the alignment from Yau Tong to Po Lam under the Railways Ordinance as Phase I of the TKE scheme. Once the spur line to, and the location of, the depot in Tseung Kwan O south have been finalised, it will be gazetted as Phase II of the scheme.
- 1.2.4 The construction programme for TKE is planned to commence in late 1998/early 1999 with a completion date of mid-2002. The construction sites will follow the alignment with the main works areas at the station sites and the tunnel vent building. The Ng Kwai Shan tunnel and vent building will be the only works area without continuous surface works.

1.3 THE ALIGNMENT

- 1.3.1 The Yau Tong area is in the process of redevelopment and the proposed station will be built during the early stages of the redevelopment work. At present, the Kwun Tong Line connects Lam Tin Station to Quarry Bay Station via a tunnel below Victoria Harbour. It is proposed that new links will be constructed to Yau Tong Station from Lam Tin and from the point where the harbour tunnel breaks ground adjacent to the Eastern Harbour Tunnel Toll Plaza. These two new links, in tunnel, will join at Yau Tong Station, to be built in the area of the existing Cha Kwo Ling Road and Po Chiu College. The alignment will then continue in a cut and cover tunnel, into a rock tunnel beneath Devil's Peak, towards Tiu Keng Leng. The rock tunnel will be constructed by drill and blast method.
- 1.3.2 The alignment will emerge from rock tunnel in Tiu Keng Leng, in the area currently occupied by the Rennie's Mill squatter area, and continue eastward in cut and cover tunnel through reclamation towards Tseung Kwan O. Tiu Keng Leng station will be constructed adjacent to the portal, partially in rock and partially in soft material.
- 1.3.3 The Tseung Kwan O section of the alignment will run eastward through what will become the centre of the new town. The entire alignment will be built in cut and cover tunnel, as will most of the station.
- 1.3.4 As with the Tseung Kwan O alignment, the Hang Hau section will be entirely below ground except for some of the station elements. The alignment will turn towards the north as it passes through Hang Hau station and will rise to ground level, heading north-west, after it has passed under Road P2.
- 1.3.5 The alignment will continue at ground level, within an enclosed concrete structure as far as Po Lam station.
- 1.3.6 There will be a spur line to the proposed depot in Tseung Kwan O south, the configuration of which has yet to be finalised.

1.4 OBJECTIVES OF THE STUDY

- 1.4.1 The objectives of the TKE DEIA are to complete the investigations undertaken in the EFS and thus fulfil the requirements of the Environmental Protection Department's (EPD's) Environmental Impact Assessment Study Brief, which are:



KEY

- Existing MTR Line
- - - Proposed MTR Line
- Existing MTR Station
- Proposed TKE Station

TSEUNG KWAN O EXTENSION (PHASE I) PROPOSED ALIGNMENT

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DATE: NOV 95
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FIGURE No.
 1.2a

Maunsell

- to describe Phase I of the proposed railway and associated facilities including railway stations and the requirements for their development;
- to identify, predict and evaluate the environmental impacts and the cumulative effects which may be expected to arise during the construction and operational phases of the TKE (Phase I);
- to recommend appropriate measures to mitigate these impacts to environmentally acceptable levels in accordance with *Hong Kong Planning Standards and Guidelines* (HKPSG) and relevant Government Ordinances; and
- to identify the environmental monitoring and audit (EM&A) requirements for impact and compliance monitoring to ensure that the conditions referred to above are met.

1.4.2 The Study does not cover the proposed spur line and depot which will be dealt with separately in the second phase of the Project.

1.5 *FORMAT OF THE REPORT*

1.5.1 The TKE DEIA comprises three volumes:

- *Volume I*, the Executive Summary briefly explains how the DEIA was carried out and describes the findings of the Main Report, concentrating on the potential adverse impacts and proposed mitigation measures;
- *Volume II*, the Main Report provides the findings of the DEIA: identifying the environmental performance criteria applicable to the TKE; focusing on the likely impacts of the construction and operation of TKE; and developing appropriate mitigation measures to control any adverse impacts; and
- *Volume III*, the initial version of the TKE EM&A Manual sets out the outline recommendations for the EM&A programme.

1.5.2 After this introductory section, the remainder of *Volume I*, the Executive Summary, of the DEIA is arranged as follows:

- *Section 2* identifies and describes the impacts arising from the construction of the TKE, their magnitude and suitable mitigation measures;
- *Section 3* identifies and reviews the impacts arising from the operation of the TKE and puts forward effective mitigation measures; and
- *Section 4* reviews the findings of the DEIA and puts forward recommendations for environmental protection measures for the TKE.

2 IMPACTS DURING CONSTRUCTION

2.1 INTRODUCTION

2.1.1 The construction of the TKE is scheduled to commence in late 1998/early 1999 and to be completed by the mid-2002. At present, much of the alignment is through areas of ongoing reclamation and other earthworks and the current number of sensitive receivers is low. However, during the TKE construction period these areas will be further developed, largely for new town developments and the number of sensitive receivers will increase. Because the timetables for these developments are not yet available, it is not possible to determine if the additional sensitive receivers will be occupied or under construction at the same time as the TKE. Consequently, the potential for cumulative impacts from other developments upon existing sensitive receivers, or the impact of the TKE (and other construction works) on newly occupied sensitive receivers, cannot be determined at this stage.

2.1.2 This DEIA has, therefore, assumed that the proposed developments will be occupied during the construction of the TKE, but no impacts from other construction work have been included. Once the timetabling of the construction of other developments is available, at the detailed design stage, it will be possible to refine the predictions of the DEIA.

2.1.3 Potential unmitigated impacts and suitable mitigation measures are discussed below. The preliminary implementation schedule for the mitigation measures is set out in *Table 2.1a*.

2.2 AIR QUALITY

Predicted Unmitigated Impacts

2.2.1 In the Yau Tong area unmitigated dust levels from the construction of the station and alignment are predicted to exceed the recommended hourly limit for Total Suspended Particulates (the dust particles which tend to be dispersed furthest from the construction sites) at most receivers. However, the statutory daily *Air Quality Objective* (AQO) is not expected to be exceeded. Dust impacts from blasting for the tunnel portals, which is undertaken under controlled conditions prescribed by Government, is not likely to exceed the recommended hourly limit beyond the site boundaries.

2.2.2 At Tiu Keng Leng, the only receivers close enough to the construction sites to be affected cannot be built until after Tiu Keng Leng station is completed and will not, therefore be impacted by the Project.

2.2.3 Unmitigated impacts at Tseung Kwan O will be similar to those at Yau Tong, where the recommended hourly limit is predicted to be exceeded at most receivers with no exceedances of the daily AQO.

2.2.4 There are already a number of occupied sensitive receivers close to the Hang Hau station construction site and without mitigation, these will be exposed to major exceedances of both the hourly and daily dust limits.

- 2.2.5 At Po Lam, the situation is similar to that at Hang Hau, although the unmitigated dust levels are generally less severe and in some case only exceed the hourly limit.

Mitigation Measures

- 2.2.6 A series of measures have been identified which will largely control dust levels from general construction activities to within the recommended hourly and AQO daily limits, during the construction of the TKE. These include:
- on site vehicle speed restrictions and vehicle washing before leaving the site;
 - careful handling and the containment or damping of dusty materials; and
 - covering or damping exposed areas of ground and prompt site restoration.
- 2.2.7 In some cases, where individual receivers are very close to the site boundary, additional measures have been required to control dust levels to within the established criteria.
- 2.2.8 At Hang Hau, the predicted hourly dust levels are still above the criterion at some receivers. The use of a 3 m site boundary hoarding will reduce the predicted levels to below the established criterion at all but two of the receivers. The remaining two exceedances can be effectively controlled by further limiting site vehicle movements. Furthermore, the installation of supplementary glazing and air conditioning has been recommended at the school as a noise mitigation measure and this will also provide additional dust mitigation.
- 2.2.9 At Po Lam, the only remaining potential exceedance can also be prevented by additional site traffic controls.

2.3 NOISE

Predicted Unmitigated Impacts

- 2.3.1 Other than percussive piling, noise from daytime construction works is not controlled by law, however, the TKE construction will be required to meet the EPD's recommended voluntary daytime noise limits. Any percussive piling, evening, night-time or holiday working will only be allowed if the contractor can demonstrate to the EPD that noise levels will meet their criteria for the issue of a construction noise permit under the *Noise Control Ordinance* (NCO).
- 2.3.2 Unmitigated construction noise impacts at all identified sensitive receivers are predicted to exceed the recommended voluntary daytime noise limits and unmitigated activities at other times are predicted to breach the NCO requirements.
- 2.3.3 A package of mitigation measures has, therefore, been designed to control construction noise and these are described below.

Mitigation Measures

- 2.3.4 Whilst not sufficient to fully resolve the predicted noise impacts, general good site practices will help to control noise impacts. These include
- care in the location and operation of plant and equipment;

- correct fitting and use of silencers, mufflers and acoustic shields; and
- regular maintenance of plant and equipment.

2.3.5 A series of further mitigation measures have been identified which will provide increasing levels of noise reduction which will be sufficient to control daytime noise impacts to within the recommended limit. These are:

- Mitigation Stage 1 - the use of items of quieter construction equipment than those listed by the EPD as standard;
- Mitigation Stage 2 - in addition to the use of quiet plant, movable noise barriers are located in close proximity to operational plant within the construction site; and
- Mitigation Stage 3 - as well as a combination quiet plant and moveable barriers, the number of items of equipment operating at the same time is limited.

2.3.6 The recommended voluntary daytime limit for schools and other educational establishments is lower than that for the other sensitive receivers considered in the DEIA. Additional mitigation is, therefore, required for one school in Hang Hau and three schools in Po Lam. MTRC has proposed to install secondary glazing and air conditioning at those schools where the TKE construction noise levels would otherwise exceed the recommended daytime limit. Further mitigation measures may be required if noisy construction activities coincide with examination periods, necessitating further restrictions on plant use.

2.4 WATER QUALITY

Predicted Unmitigated Impacts

- 2.4.1 Unmitigated construction site runoff is a potential problem, however, under the *Water Pollution Control Ordinance* (WPCO) all sites will be required to obtain a discharge licence. In meeting the discharge requirements of the WPCO the contractor will prevent adverse impacts upon receiving water bodies.
- 2.4.2 Sewage effluent arising from the construction workforce has the potential to cause adverse impacts if dealt with in an inappropriate manner.

Mitigation Measures

- 2.4.3 To meet the discharge requirements of the WPCO, mitigation measures should include:
- appropriate drainage facilities to control site runoff;
 - proper site management to prevent debris and harmful materials from reaching drainage facilities of water bodies; and
 - the provision of adequate toilet facilities and proper disposal of sewage by a recognised waste disposal company.

2.5 WASTE

Predicted Unmitigated Impacts

- 2.5.1 The potential for the uncontrolled disposal of wastes arising from the TKE to generate adverse impacts has been identified in the DEIA, however, observance of the relevant legislation will prevent such effects.
- 2.5.2 Waste materials will be removed from the sites by truck, or preferably by barge and impacts will be limited to the effects associated with increases in vehicle movements.

Mitigation Measures

- 2.5.3 Inert excavated material and construction waste can either be reused on site, taken to other reclamation or construction projects, or sent to a public dump. Materials containing more than 20% by weight of organics would be sent for disposal at a landfill. Other waste, including general refuse, should also be disposed of in a responsible manner and not give rise to significant impacts.
- 2.5.4 Mitigation measures will include:
- general good housekeeping practices;
 - sorting and segregation of wastes for reuse and disposal;
 - observing the requirements of the disposal permits; and
 - meeting the requirements of the *Waste Disposal Ordinance*.

2.6 ECOLOGY

Predicted Unmitigated Impacts

- 2.6.1 Most of the TKE alignment is either: within existing urban developments; new developments on reclamation; or is in the process of reclamation or other earthworks. This land is of little or no ecological value and adverse unmitigated construction impacts are extremely unlikely. However, the work site areas associated with the two tunnel portals and vent building on the slopes of Devil's Peak have been identified as potential ecological resources. Although none are of particular value or contain rare or endangered species, in keeping with general conservation policy in the Territory, they should be protected from unnecessary disturbance and appropriate mitigation measures are identified below.

Mitigation Measures

- 2.6.2 Mitigation measures to minimise impacts on ecological resources should include the following:
- restrict construction works to within the identified site boundaries and check regularly that no damage is being caused to the surrounding areas;
 - maintain high standards of good housekeeping and dust control to protect habitats adjacent to work sites;

- restoring work areas with native plant species wherever possible to provide habitats for wildlife; and
- where areas remain the responsibility of the MTRC, maintenance of planted areas for at least the first two years after the completion of the works.

2.7 LANDUSE AND VISUAL IMPACTS

Predicted Unmitigated Impacts

- 2.7.1 Unmitigated adverse landuse and visual impacts are predicted from the construction of the TKE and whilst landuse impacts can be largely overcome by careful planning, some residual visual impacts from construction works will remain even after mitigation. However, these impacts should be considered in the context of the local environment near the alignment which is one of ongoing urban renewal and new urban development. In such an environment, the construction works for the TKE only represent an additional element in an already disturbed landscape.

2.8 ENVIRONMENTAL MONITORING AND AUDIT

- 2.8.1 The DEIA has identified that EM&A will only be necessary for air quality and noise impacts during the construction of the TKE. No water sensitive receivers will be affected and any potential impacts on the local drainage system will be controlled by the requirements of the wastewater discharge licence.
- 2.8.2 The MTRC will undertake the EM&A work required during the construction of the TKE. The MTRC's and the Contractor's responsibilities will be related through the application of Event Contingency Plans to deal with any exceedance of the established criteria, either in the course of normal construction working or through unforeseen circumstances.

Table 2.1a Implementation of Mitigation Measures

Mitigation Measure	Site Preparation	Excavation	Structures	Reinstatement	Commissioning
<i>Air Quality</i>					
Site Watering & Compaction	All sites	All sites	All sites	All sites	-
Vehicle Speed Control	All sites	All sites	All sites	All sites	-
Boundary Fencing	HAH	HAH	HAH	HAH	-
Blast Suppression	-	YAT & TKL Portals	-	-	-
Vent Orientation	-	-	-	-	All sites
<i>Noise</i>					
Use of Quiet Plant	POL	POL	-	POL	-
Quiet Plant and Moveable Barriers	TKO	TKO	TKO & POL	TKO	-
Quiet Plant, Moveable Barriers and Limited Numbers of Plant	YAT & HAH	YAT & HAH	YAT & HAH	YAT & HAH	-
Glazing for Schools	YAT, HAH & POL	YAT, HAH & POL	YAT, HAH & POL	YAT, HAH & POL	-
Acoustic Control of Vents	-	-	-	-	Stations
<i>Water Quality</i>					
Site Boundary Drainage	All sites	All sites	All sites	All sites	-
Site Runoff Control and Drainage	All sites	All sites	All sites	All sites	-
Station and Tunnel Drainage	-	-	-	-	Stations & tunnels
<i>Landuse and Visual</i>					
Site Boundary Fencing	All sites	All sites	All sites	All sites	-
Vehicle Movement Controls	All sites	All sites	All sites	All sites	-
Revegetation	-	-	-	All Sites	All sites

3 *IMPACTS DURING OPERATION*

3.1 *INTRODUCTION*

3.1.1 The Phase I TKE alignment from Yau Tong to Hang Hau and most of the station structures will be underground. The only above ground structures will be the: station entrances, atria and upper sections of the ventilation systems; the above ground section of the alignment between Hang Hau and Po Lam; and Po Lam station. Consequently, potential operational impacts will be limited and easily mitigated.

3.2 *AIR QUALITY*

3.2.1 The only potential impacts will arise from the ventilation systems and as these are primarily used for the circulation of fresh air, no adverse impacts are expected during normal operations. However, the ventilation system is designed to extract smoke in the event of a fire and the vent locations and orientations should be selected to avoid facing onto sensitive receivers.

3.3 *NOISE*

3.3.1 The entire TKE alignment will be enclosed, either in tunnel, or within a substantial concrete structure. Therefore, no adverse impacts from operational train noise are expected. Uncontrolled night-time noise impacts from the ventilation systems could exceed the requirements of the NCO. The DEIA has identified the maximum acceptable noise levels at each of the vents and provided these are incorporated into the design requirements, there will be no exceedances.

3.4 *WATER QUALITY*

3.4.1 As any operational discharges will be required to comply with the WPCO, no adverse impacts are expected.

3.5 *WASTE*

3.5.1 Solid waste arisings during the operation of the TKE will be small. Some chemical and industrial waste will be generated during occasional station refurbishment works but the implementation of good housekeeping practices and the observation of the requirements of the WDO will prevent adverse impacts.

3.6 *ECOLOGY*

3.6.1 As the entire alignment is covered, no operational impacts are anticipated.

3.7 *LANDUSE AND VISUAL IMPACTS*

- 3.7.1 The entire TKE alignment will be either below ground or fully enclosed and as such, provided that the above ground structures are designed to fit in with the rest of the planned townscapes, there will be no adverse impacts during the operational phase.

3.8 *ENVIRONMENTAL MONITORING AND AUDIT*

- 3.8.1 No adverse impacts have been identified during the operational phase which cannot be effectively controlled through, as in the case of vent locations, specified design criteria, therefore, no operational EM&A will be required.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

4.1.1 No unmitigated environmental impacts, generating exceedances of the established criteria, have been predicted to arise as a result of the construction or operation of Phase I of the TKE, which cannot be avoided or reduced to acceptable levels by the implementation of appropriate mitigation measures.

4.1.2 The measures for mitigation recommended by ERM generally indicate the type of measures which may be employed to ensure compliance with the statutory requirements, Government guidelines and other environmental standards agreed with EPD. In addition, the EM&A programme which will be adopted during construction of the TKE will help ensure compliance whatever means of mitigation are used.

4.1.3 However, it must be noted that the DEIA process inherently includes elements of uncertainty, such as:

- the precise final form of the proposed Project will not be known until the detailed design is completed;
- until the successful contractors have finalised their preferred methods of working, the precise construction programme, working arrangements and plant to be used on site will not be known.

4.2 RECOMMENDATIONS

4.2.1 Because of the limiting factors discussed above, the MTRC contracts should require the contractor to reassess the likely impacts in the light of his proposed construction programme and timetable and design an Environmental Management Plan, which will incorporate sufficient mitigation measures to ensure that any impacts from the contractor's works do not exceed the criteria identified in the DEIA Report.

4.2.2 The EM&A procedure will control potential impacts from the effects of dust emissions and noise during the construction of the TKE. The EM&A requirements for the construction stage are outlined in the initial version of the EM&A Manual (*Volume III* of this Report) and should be set out in the relevant engineering contracts.

4.2.3 The recommended EM&A programme should be used to confirm the accuracy of the DEIA findings and to ensure compliance with regulatory environmental requirements, related guidelines and/or recommended control levels. Regular EM&A reports should be submitted to the EPD for information.