

Mass Transit Railway Corporation

Tseung Kwan O Extension Phase II :
*Environmental Impact Assessment -
Executive Summary*

December 1997

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For and on behalf of ERM-Hong Kong, Ltd

Approved by: *P. King*

Position: *Technical Director*

Date: *31 December 1997*

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1 INTRODUCTION

1.1 Background To The Study

- 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 final stages of the Study, ERM Hong Kong produced the *Tseung Kwan O Extension Detailed Environmental Impact Assessment Report, Maunsell Consultants (Asia) Ltd, July 1997* (TKE Phase I DEIA) to determine the environmental impacts which could arise from the construction and operation of the railway and to identify suitable mitigation measures to control any adverse impacts. This Report was endorsed by the Advisory Council on the Environment in August 1997.
- 1.1.2 The TKE Phase I DEIA established the environmental performance criteria to be applied during the construction and operation of the TKE and for inclusion in the Tender requirements for the Detailed Design and Construct Contracts. The successful Tenderer will be required to demonstrate that his preferred construction methodology will meet the performance criteria established in this Report regardless of the similarities or differences between the two methodologies.
- 1.1.3 It is now proposed that the depot for the Mass Transit Railway Corporation's Tseung Kwan O Extension be located in Area 86 Tseung Kwan O (TKO). This will require the construction of a spur line to the depot and a station in Area 86 (TKE Phase II).
- 1.1.4 The depot, station and associated track will be covered by a podium structure, the development above the podium and over the rest of Area 86 has been broadly dealt with under the *Tseung Kwan O Area 86 Planning Study, Maunsell et al, 1997*.
- 1.1.5 The TKE Phase II will be constructed using methods already assessed in the Phase I DEIA and will have the same operational characteristics for the railway, depot and station as those considered in the Phase I DEIA. This Study, the TKE Phase II DEIA will, therefore, be based on the original EIA Study Brief and utilise the assessment methodologies established for the previous Phase I DEIA, to identify potentially adverse impacts and to determine suitable mitigation measures.
- 1.1.6 As the timing of the Phase I and Phase II works is expected to be the same, this Study will also consider the cumulative effects of the works for both phases where appropriate. The main area of overlap will be in the Tseung Kwan O to Hang Hau section where the cut and cover tunnel works for the Phase II alignment are in close proximity to the Phase I cut and cover tunnels and station works.

1.2 The MTRC Tseung Kwan O Extension

1.2.1 The Government's *Railway Development Strategy Report* of December 1994, identified the need for a 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. Phase I of 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. The new line will run eastward via Yau Tong, Tiu Keng Leng, Tseung Kwan O and Hang Hau to Po Lam.

1.2.2 Phase II of the TKE is proposed to consist of a spur line which will leave the main line just east of TKO Station, run below ground in cut and cover tunnel as far as the boundaries of Areas 47 and 108, in rock tunnel below Areas 47, 50, 108, 78 and 106 and finally emerge at ground level in the north-east corner of Area 86 where it will run under a podium to the depot and station (see *Figure 1.2a*).

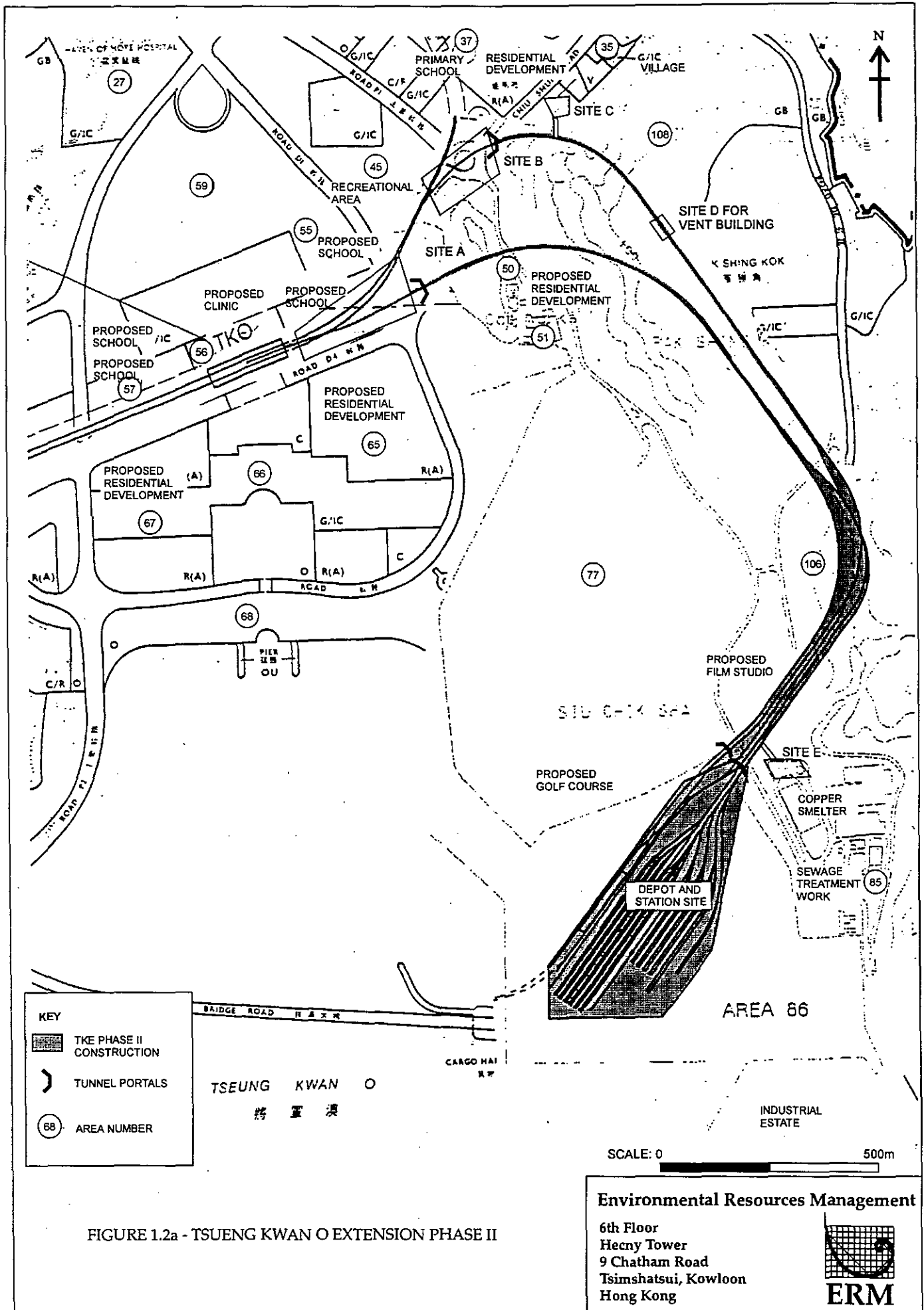
1.2.3 The construction programme for the TKE Phase II is planned to commence in early 1999 with a completion date of late 2002. The construction sites will follow the alignment with:

- Site A covering the cut and cover section from TKO station to the southern spur portal;
- Site B covering the section to the northern spur portal;
- Site C providing an access adit to the northern section of rock tunnel;
- Site D an access adit for a ventilation building (the exact location has yet to be determined);
- Site E an access adit for the southern section of rock tunnel; and
- the main depot and station site.

1.2.4 The potential for landfill gas and leachate impacts upon the proposed station and depot and podium in Area 86 has been identified. A landfill gas and leachate hazards assessment is being undertaken in parallel to this DEIA and the findings will be presented after gas and leachate sampling are completed in early 1998. Any requirements for monitoring of landfill gas and/or leachate will be fully implemented as part of the overall environmental monitoring and audit programme for the Project and any protective engineering measures that are identified in the hazard assessment will be incorporated into the design of the railway structures.

1.3 Objectives of the Detailed Environmental Impact Assessment

1.3.1 The objectives of the TKE Phase II DEIA are to complete the earlier investigations undertaken for the TKE Phase I and thus fulfil the requirements of the Environmental Protection Department's (EPD's) Environmental Impact Assessment Study Brief, which are:



- to describe Phase II of the proposed railway and associated facilities, including the station and depot;
- 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 II;
- to recommend appropriate measures to mitigate these impacts to environmentally acceptable levels in accordance with *Hong Kong Planning Standards and Guidelines* (HKPSG), other relevant guidelines and statutory requirements and relevant Government Ordinances;
- to minimize potential pollution and environmental disturbance arising from the development and its operation;
- 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; and
- to identify any additional studies necessary to fulfil the objectives of the EIA Study.

1.4 Format of the Report

1.4.1 The TKE Phase II DEIA comprises two 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; and
- *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.

1.4.2 The EM&A requirements for the TKE Phase II, which are identified in the Main Report, will be incorporated into the first revision of the TKE EM&A Manual which was produced as part of the TKE Phase I DEIA.

1.4.3 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 Phase II, their magnitude and suitable mitigation measures;
- *Section 3* identifies and reviews the impacts arising from the operation of the TKE Phase II and puts forward effective mitigation measures as appropriate; and

- *Section 4* reviews the findings of the DEIA and puts forward recommendations for environmental protection measures for the TKE.

2 IMPACTS DURING CONSTRUCTION WORKS

2.1 Introduction

2.1.1 The construction of the TKE Phase II is scheduled to commence in early 1999 and to be completed by late 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 TKO to HAH area, unmitigated dust levels from the construction of the alignment are predicted to be well within both the recommended 1-hour limit for Total Suspended Particulates (the dust particles which tend to be dispersed furthest from the construction sites) and the statutory 24-hour *Air Quality Objective* (AQO) at all of the identified sensitive receivers. Dust impacts from blasting for the tunnel portals, which is undertaken under controlled conditions prescribed by Government, is not predicted to exceed the recommended hourly limit beyond the site boundaries.

2.2.2 In the southern section of the alignment, the only predicted exceedances of the established criteria are at the copper smelter offices in Area 85 (1-hour and 24-hour) and at the recreational open space in Area 77 (1-hour).

Mitigation Measures

2.2.3 A series of measures have been identified which will control dust levels from general construction activities to within the recommended 1-hour and AQO 24-hour limits, during the construction of the TKE Phase II. 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.
- 2.2.4 These measures will be applied at all sites, even those where no exceedances have been predicted, to minimise dust levels.

Cumulative Impacts

- 2.2.5 Cumulative impacts from TKE Phase I and Phase II works could lead to exceedances of the established criteria at the proposed school in the western part of Area 55 and the primary school and Yuk Ming Court in Area 37. However, the use of the same additional mitigation measures as those recommended in the TKE Phase I DEIA, 3 m hoardings along the site boundary, will reduce dust levels at all three locations to within the established criteria.

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 are predicted to exceed the recommended voluntary daytime noise limits at most noise sensitive receivers during on or more stages of the construction works.
- 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 with movable noise barriers located in close proximity to operational plant within the construction site;
 - Mitigation Stage 2 - in addition to the use of quiet plant and moveable barriers, the number and active time of items of equipment operating simultaneously 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 will, therefore, be required for the proposed schools in the western part of Area 55 and the eastern part of Area 56 during piling and tunnelling works. The same measures should also be applied to the clinic in Area 56 to provide an adequate level of noise protection.
- 2.3.7 The predicted noise levels at the two schools can be reduced to within the established criteria through the further restriction of operating times for noisy plant. Alternatively, the works could be scheduled during school holidays. However, as these additional restrictions could adversely affect the construction programme, it is recommended that the schools and clinic be provided with secondary glazing and air conditioning for the affected facades. Noise insulation would be required if it were necessary to undertake noisy activities during the school examination periods.

Cumulative Impacts

- 2.3.8 Potential cumulative impacts from TKE Phase I and Phase II activities have been identified at the sensitive receivers identified in *Section 2.3.6* above and at the proposed school in the eastern part of Area 57, the proposed residential developments in Area 65 and at the primary school and Yuk Ming Court in Area 37. These can be effectively controlled by either avoiding simultaneous noisy activities on adjacent sites or by limiting the use of noisy items of plant. An alternative noise control option which would place less constraints on the construction programme, would be to provide noise insulation in the form of secondary glazing for the affected facades of the schools and clinic in Areas 55 and 56 which would be most affected by the piling works.

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 Phase II works 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 not more than 20% by weight of inert material could 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 Phase II alignment is either new development on reclamation or is in rock tunnel. The work site for the vent building in Area 108 is located in an area of heavily disturbed grassland. These areas are of little or no ecological value and adverse unmitigated construction impacts are extremely unlikely.

- 2.6.2 The boundaries of a number of work sites are adjacent to vegetated areas and some removal of vegetation from within the work sites may be required. Although none of these vegetated areas 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

- 2.6.3 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 TKE Phase II construction 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 development. In such an environment, the construction works for the TKE Phase II 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 TKE Phase II construction works. 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.
- 2.8.1 The MTRC will undertake the EM&A work required during the construction of the TKE Phase II as part of the overall TKE Project. 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 from normal construction working or through unforeseen circumstances.

Table 2.1a Implementation of Mitigation Measures

Mitigation Measure	Sheet Piling	Bulk Excavation	Concreting Tunnels	Shotcreting Tunnels	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	Sites A, B & C	Sites A, B & C	Sites A, B & C	Sites A, B & C	-
Blast Suppression	-	Rock Tunnel Portals	-	-	-
Vent Orientation	-	-	-	-	Vent Building, Depot and Station
<i>Noise</i>					
Quiet Plant and Moveable Barriers	Sites A & B	Sites A & B	Sites A, B & C	Sites A, B & C	-
Quiet Plant, Moveable Barriers and Limited Numbers of Plant	Sites A & B	Site A	Sites A & B	Sites A & B	-
Option of Glazing for Schools and Clinic	TKO & HAH	TKO & HAH	TKO & HAH	TKO & HAH	-
Acoustic Control of Vents	-	-	-	-	Vent Building, Depot and Station
<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	-
Operational Drainage Systems	-	-	-	-	Depot, Station & tunnels
<i>Ecology</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 entire alignment for the TKE Phase II will be either in tunnel or covered by a podium structure which will also enclose the station and depot. The only above ground structures will be the podium in Area 86 and the ventilation building in Area 108. 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 for the depot, station and tunnels and as these are primarily used for the circulation of fresh air and its exhaust, 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 Phase II alignment will be enclosed, either in tunnel, or within a substantial concrete podium structure. The engineering design of the railway will effectively control noise and vibration from train movements and, therefore, no adverse impacts from operational trains are expected. To ensure no adverse impacts, the railway, depot and station ventilation systems will be designed to meet the appropriate noise criteria at all sensitive receivers.

3.4 Water Quality

3.4.1 All discharges from the operational railway will be controlled and treated as necessary to comply with the WPCO, no adverse impacts are, therefore, expected.

3.5 Waste

3.5.1 Solid waste arisings during the operation of the TKE Phase II will be limited. Some chemical and industrial waste will be generated from the depot during maintenance work and from 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 enclosed, 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 within a podium structure which will be incorporated into the Area 86 development. The only elements which could extend beyond the podium will be the station entrances and the station and depot ventilation systems 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. Similarly, provided that the vent building in Area 108 is designed to blend in with the prevailing landscape/townscape features of the Area there will be no adverse impacts.

3.8 Environmental Monitoring and Audit

- 3.8.1 No adverse impacts have been identified during the operational phase and, therefore, no operational EM&A will be required. Specific design criteria will be developed for the necessary engineering measures to control potential noise and vibration from the operational railway and their efficacy will be confirmed during commissioning testing.

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 II of the TKE, which cannot be avoided or reduced to acceptable levels by the implementation of appropriate mitigation measures.
- 4.1.2 The landfill gas and leachate hazard assessment for Area 86 is due for completion in the early part of 1998 and preliminary findings will be reported as soon as possible. It is the Consultant's experience, however, that the findings of the hazard assessment will not prevent the TKE from going ahead, but simply determine the level of engineering works that may be required to ensure that adequate protection is provided for the depot and station.

4.2 Recommendations

- 4.2.1 The measures for mitigation recommended in the DEIA 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.
- 4.2.2 The MTRC contracts should require the contractor to reassess the likely impacts of the works 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.
- 4.2.3 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 TKE Phase II construction stage are outlined in Volume II, the Main Report, and should be incorporated into the first revision of the initial version of the EM&A Manual (*Volume III of the TKE Phase I Report*) and should be set out in the relevant engineering contracts.
- 4.2.4 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.
- 4.2.5 The Detailed Design Consultancy for the station, depot and railway will identify engineering requirements to deal with any potential landfill gas and/or leachate impacts. The scope of the Detailed Design Consultancy will also include the development of effective control measures to protect occupants of the proposed Area 86 development from adverse air quality, noise and vibration impacts from the operational railway; it will also cover the development of any necessary water treatment plant to deal with aqueous discharges from the depot.

