

**EXECUTIVE SUMMARY**

Kowloon-Canton Railway Corporation

**Tai Wai to Ma On Shan EIA:**

*Executive Summary*

October 1999

Environmental Resources Management

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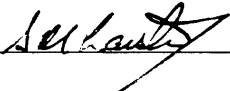
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Reference C1890

For and on behalf of Environmental Resources Management
Approved by: <u>Steve Laister</u>
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Position: <u>Consultant's Representative</u>
Date: <u>13 October 1999</u>

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## **1. INTRODUCTION**

This executive summary presents the key findings resulting from the Environmental Impact Assessment (EIA) of the proposed Tai Wai to Ma On Shan Rail Extension to KCRC's East Rail. The EIA has considered the impacts associated with the construction and operation of the railway, and the principal findings are set out below.

### **1.1 Scope of the Study**

The Kowloon-Canton Railway Corporation (KCRC) commissioned Environmental Resources Management Hong Kong Limited (ERM-Hong Kong Ltd) to undertake an EIA of the proposed Tai Wai to Ma On Shan Extension (the MOS Extension). ERM-Hong Kong has drawn upon a wealth of specialist and technical expertise, both internally and externally, to provide a comprehensive assessment of the potential environmental impacts in accordance with the requirements of the Study Brief and the Technical Memorandum on the Environmental Impact Assessment Ordinance (EIAO).

The EIA Report includes a detailed assessment of the environmental impacts arising from the construction and operation of the MOS Extension and identifies the potential impacts relating to air quality, noise, water quality, waste management, landscape and visual resources, archaeology and cultural resources and land contamination. A description of the ecological conditions along the alignment is also presented.

In addition, a hazard assessment of the Towngas pipeline has been undertaken and appropriate recommendations made.

### **1.2 Project Description**

The MOS Extension will run from Tai Wai in the west, to Lee On in the east of the New Territories (*see Figures 1.2a-c*). The new railway line will provide a fast, efficient and direct service linking the rapidly growing areas in NENT via the existing East Rail Network to the central business districts of Kowloon and Hong Kong Island.

The MOS Extension will involve the construction and operation of approximately 11.4 km of railway track, nine new stations (at Tai Wai, Sha Tin Tau, Sha Kok Street, City One, Shek Mun, Chevalier Garden, Heng On, Ma On Shan and Lee On), a depot at Tai Wai, and two infeed substations.

### **1.3 Consideration of Alternatives**

As a result of the Government's Railway Development Strategy, a feasibility study was undertaken into the development of an intermediate capacity railway extension to Ma On Shan. The study made reference to the tentative alignment of the railway reserve as shown on both the Shatin and the Ma On Shan Outline Zoning Plans.

## **Introduction**

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KCRC thoroughly reviewed the outputs from the preceding study and concluded that their proposal should follow same alignment and remain within the railway reserve shown on the Outline Zoning Plans.

A number of minor alignment alterations have been considered. For example, a reversed curve alignment was originally proposed that followed the southern bank of the Shing Mun River between Sha Tin Tau and Tai Wai stations. However, the proposed tight radii posed both operational and potential environmental problems including speed restrictions, a greater potential for noise from wheel squeal and more frequent maintenance requirements which had night-time noise implications.

To avoid these potential problems, two alternative alignments were considered. The first of these took the tracks close to the northern bank of the Shing Mun River, and concerns were expressed over the noise and visual impacts. This alignment was therefore not considered any further. The second alternative took the tracks through the bend of the Shing Mun River. Although this alignment moves the tracks northwards, it was shown that it could mitigate the operating constraints and be constructed and operated in compliance with the required environmental criteria. As a consequence, this second alternative has been adopted and assessed during the EIA process.

Minor alterations to the alignment have arisen during the latest technical studies due, most significantly, to the decision to construct island platform stations wherever possible, and to use viaducts with a similar cross section to that proposed for West Rail in order to reduce structure-borne noise.

An underground option has been considered in previous studies and it was indicated that an underground option could be constructed by either cut and cover construction or by a combination of bored tunnelling and cut and cover construction.

From an environmental perspective, there are advantages to operating an underground railway; particularly the near elimination of noise and visual impacts. These benefits will be experienced by the community for the operating lifetime of the MOS Extension.

The construction of an underground option, and in particular those sections that may be required to be constructed by cut and cover working, has the potential to result in more environmental impacts than the construction of the above ground option. In particular, the construction of an underground option has the potential to give rise to greater noise, dust and visual impacts, and spoil disposal issues. However, these impacts would, when considered in relation to the operating lifetime of the railway, only be experienced over a short period of time. Therefore, it can be concluded that an underground option could offer overall long-term environmental benefits to the community.

However, in addition to the consideration of environmental factors, the selection of either an above ground or underground alternative is based on numerous considerations, including the constraints posed by design, construction, operation, safety and cost. The

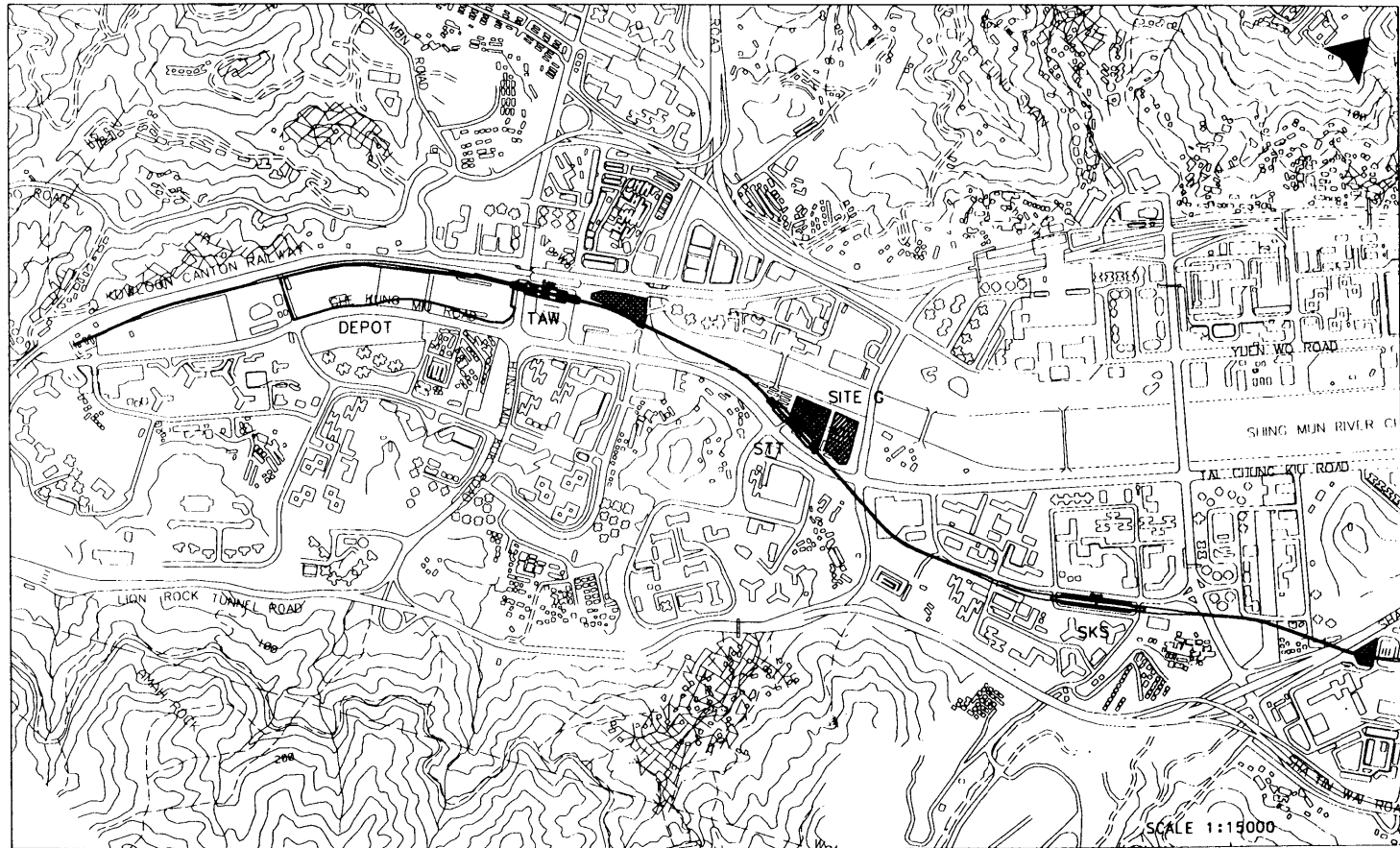


FIGURE 1.2a

TAI WAI TO MA ON SHAN ALIGNMENT

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- KEY
- At grade section of railway
  - Viaduct section of railway
  - Station
  - Systems Related Worksites
  - Construction worksites

Environmental  
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FIGURE 1.2b

TAI WAI TO MA ON SHAN ALIGNMENT

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- KEY
- At grade section of roadway
  - - - Viaduct section of roadway
  - ▭ Station
  - ▨ Systems Related Worksites
  - Construction worksites

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Management



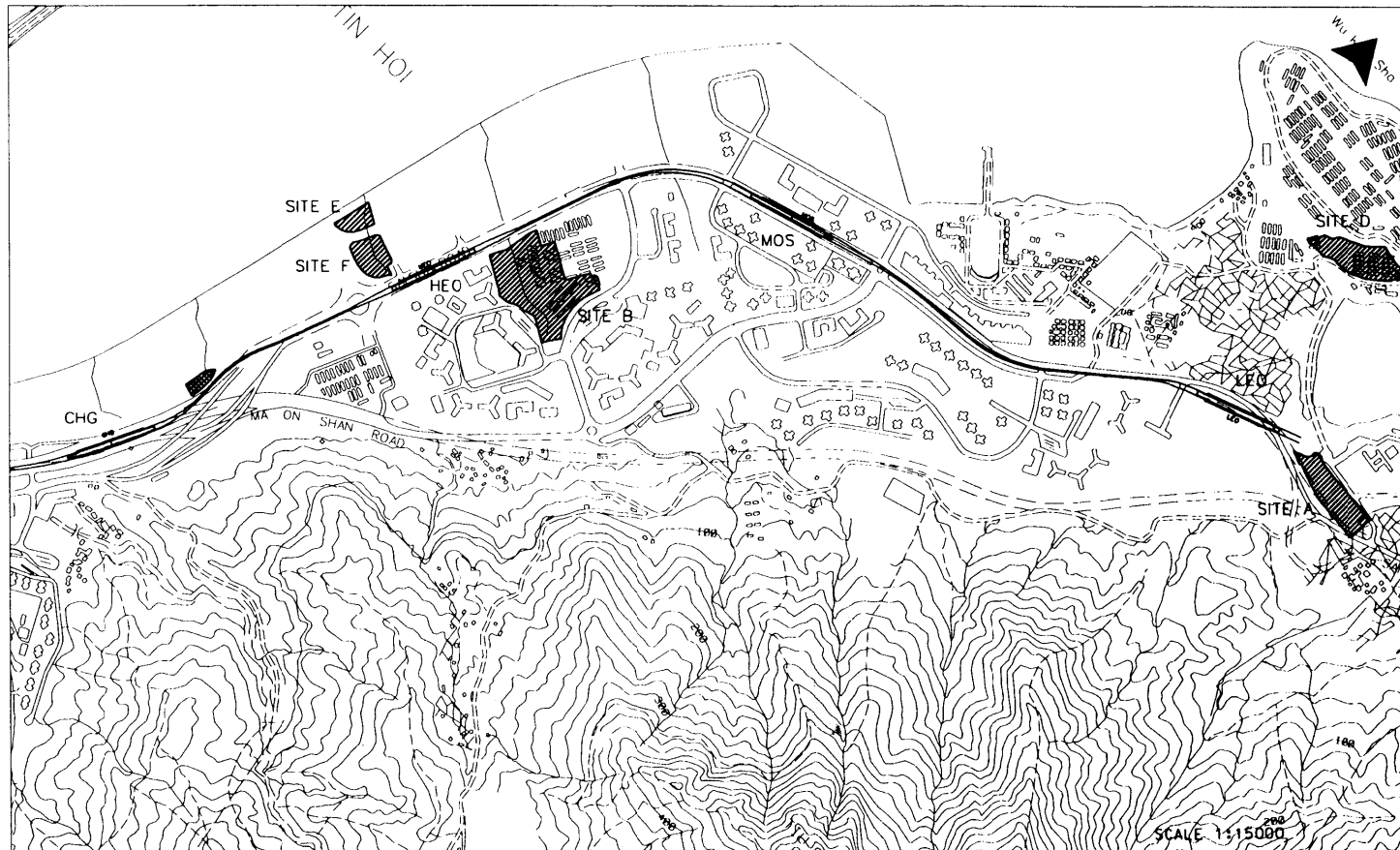


FIGURE 1.2c

TAI WAI TO MA ON SHAN ALIGNMENT

- KEY
- - - At grade section of railway
  - Viaduct section of railway
  - Station
  - ▨ Systems Related Worksites
  - Construction worksites

Environmental  
Resources  
Management



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decision on whether an underground option is feasible needs to consider all of these facets, and to make a overall judgement

With due consideration to all the constraints, it was concluded that the underground option, was significantly less attractive. On balance, it was therefore recommended that the above ground option be pursued.

#### **1.4 Cumulative Impacts and "Cross-Media" Issues**

A number of situations that may give rise to cumulative impacts have been considered in the assessment. However, it should be recognised that the potential for cumulative impacts is influenced not only by the coincidence in time and space of particular types of activities, but also by such factors as their relative intensity, nature of impact, diurnal variation, specific location and relative distance from sensitive receivers. In many cases this means that one particular activity or source is dominant in the assessment of cumulative impacts, especially in relation to noise.

For the MOS Extension, the following cumulative impact situation has been carefully assessed and, where necessary, appropriate mitigation measures have been formulated:

- Cumulative noise impacts from the various construction work sites along the full length of the MOS Extension.

The EIA has also examined a number of situations in which there are potential interactions or connections between different mediums of the environment or different parts of the assessment for this project, including:

- Potential air and water pollution impacts from the storage, handling and reuse of excavated materials; and
- The visual impacts of noise mitigation measures.

These "cross-media" issues have been evaluated within the air quality, water and landscape and visual sections of this EIA report.

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## **2. KEY ENVIRONMENTAL ISSUES**

### **2.1 Introduction**

A number of key impacts and issues were identified during the course of the EIA Study. These included impacts that were significant because of their nature or scale, and elements of work the assessment of which was highlighted as requiring further work. The findings of the EIA in relation to these issues are summarised below.

### **2.2 Noise Issues**

#### **2.2.1 *Baseline Conditions***

The existing ambient noise levels along the majority of the alignment is dominated by local road traffic noise. However, at Tai Wai the baseline conditions are influenced by the presence of the existing KCRC East Rail, while at Shek Mun the industrial area also makes a contribution to the ambient levels.

As the alignment passes through a predominantly urban environment, the identified noise sensitive receivers include residential uses, educational institutions, hospitals, homes for the aged, centres for the performing arts and hostels.

#### **2.2.2 *Construction Noise Impacts***

Unmitigated construction noise is predicted to give rise to exceedances of the daytime noise criteria at most of the NSRs along the alignment. Noise emissions can be minimised through the implementation of good site practice, the use of quiet plant and temporary noise barriers, by limiting the number of operating construction plant, and by prohibiting the occurrence of simultaneously noisy construction activities on site. These measures will produce an overall reduction in construction noise levels and ensure compliance with the requirements of the EIAO TM at most locations.

Residual impacts will, however, occur at some schools, health centres and residential premises. To further mitigate these impacts it is recommended that the existing glazing systems of the affected schools and health centres are reviewed and up-graded if necessary.

It is also recommended that the Contractors review, and where practicable, alter their construction methodology to meet the required noise criteria. Where the criteria cannot be achieved, it is recommended that trigger levels are agreed with the EPD and that monitoring is undertaken to identify any exceedances of the criteria so that corrective action can be implemented. Through the adoption of this practice, it is considered that residual impacts can be either reduced to an acceptable level, or, if unavoidable, kept to a minimum practicable duration.

### **2.2.3 Operational Noise**

With the implementation of the recommended mitigation measures, including the use of the Multi-plenum System, the full enclosure of track crossovers and the strict specification of noise levels for vehicle air-conditioning units, noise from the operation of the proposed railway will comply with the required noise criteria.

As the Tai Wai Depot will be enclosed, noise from its operations and the associated plant are not predicted to give rise to impacts. However, to ensure compliance with the noise criteria designers will need to ensure that these facilities are designed not to exceed the maximum sound power levels defined for fixed plant.

## **2.3 Air Quality**

### **2.3.1 Baseline Conditions**

EPD's 1997 air quality survey of Shatin classified the study area as being urban in character, with the main sources of pollution arising from vehicle emissions, and to a lesser degree, emissions arising from the Shek Mun Industrial Area. The majority of land uses in the vicinity of the work sites are residential, recreational and institutional.

### **2.3.2 Air Quality Impacts**

The assessment has identified the main dust generating activities to be the handling of excavated materials, concrete batching and vehicle movements within the construction site. These activities have the potential to cause direct impacts to the ASRs located close to the alignment. However, provided the recommended mitigation measures are implemented as stated in the Air Pollution (Construction Dust) Regulation, no unacceptable air quality impacts are anticipated as a result of the construction of MOS Extension.

## **2.4 Water Quality Issues**

### **2.4.1 Baseline Conditions**

At its southern end, the proposed MOS extension falls within the catchment of the Shing Mun River and passes through the Siu Lek Yuen and Tai Shui Hang Nullahs. In 1997, the water quality in the Tai Wai Nullah was classified as "fair", whereas the water quality within the main channel of the Shing Mun River and the Siu Lek Yuen Nullah was classified as "good".

To the north, the alignment falls within the Tolo Harbour and Channel WCZ and the adjacent major water bodies include a number of small streams / nullahs which drain towards inner Tolo Harbour; and Tolo Harbour itself. Whilst there are no EPD river water quality monitoring stations for the streams / nullahs, marine water quality sampling stations do exist for the Tolo Harbour. The 1997 water quality monitoring results for the

marine stations indicated that the water quality within the Harbour Subzone was worst nearest the Shing Mun River and the Shatin Sewage Treatment Works.

#### **2.4.2 Water Quality Impacts**

The construction works have the potential to give rise to water quality impacts including those related to construction run-off, drainage, the dredging and marine disposal of riverine deposits and sewage effluent from the construction work force. The EIA considered these potential impacts in detail and proposed appropriate mitigation to effectively control any impacts to within permitted WPCO criteria. There should be no insurmountable residual impacts.

With the implementation of all the proposed mitigation measures, there are not predicted to be any potential water quality impacts arising from the operation of the proposed rail development.

### **2.5 Waste Management Issues**

The construction activities will result in the generation of a variety of wastes including excavated material, construction and demolition waste, chemical waste and general refuse.

The key to minimising the impact of construction waste is through the implementation of a waste management plan, which provides effective management of chemical/industrial and other potentially hazardous wastes, and a strong preference for waste minimisation, reuse and recycling rather than landfill disposal. Potential impacts can be avoided and controlled to acceptable levels provided that the recommended waste management methods and practices are implemented.

### **2.6 Ecology Resources**

An ecological impact assessment was not required by the Study Brief, although the requirement to provide a description of the ecological conditions along the alignment was specified. This was prepared based on literature review and field studies.

The surveys confirmed that there have been no significant changes to the baseline conditions since the completion of the Tai Wai to Ma On Shan Preliminary Environmental Review (PER) which previously concluded that virtually no natural habitats were identified as being impacted upon by the proposed railway alignment, except a woodland near Wong Uk where a small edge area with low ecological value would be lost; this was concluded as constituting a low impact. As the baseline conditions have not changed, the PER's conclusions remain valid and the construction of the MOS Extension is predicted to give rise to low ecological impacts.

## **2.7 Landscape and Visual Issues**

### **2.7.1 Baseline Conditions**

The existing environment is predominately urban in nature, with high rise residential and commercial blocks close to and on both sides of the alignment. Outside the urban areas, the alignment is bordered on both sides by the wooded slopes of the Lion Rock Country Park and Ma On Shan Country Park to the south-east and Needle Hill and Cove Hill to the north-west. The alignment runs broadly parallel to the Shing Mun River Channel terminating at Lee On which is situated on the eastern shores of Tolo Harbour.

Due to the elevated nature of the majority of the route the visual envelope will be extensive at certain locations. However, the high rise residential and commercial blocks close to the alignment will restrict the middle and long distance views of the route within the urban areas.

### **2.7.2 Landscape and Visual Impacts**

The assessment has indicated that significant temporary visual and landscape impacts are anticipated during the construction phase of the MOS Extension. There are limited opportunities to mitigate such impacts and therefore landscape and visual impacts will remain even after the implementation of mitigation measures including the control of night-time lighting, the erection of decorative hoardings and, the minimisation of temporary building heights. The residual impacts should, however, be considered in the context of the local environment near the alignment, which is one of ongoing urban renewal and new urban development. In this context, and due to the relatively short period over which the impacts will be experienced, it is considered that the impacts from construction are acceptable.

During the operational phase, the impacts are predicted to be high on the physical landscape due to the loss of amenity trees. In addition, the above-grade stations, sections of viaduct and the proposed noise barriers will generate high visual impacts upon some sensitive receivers. The introduction of the stations and viaducts will also change the landscape. However, the predicted impacts can be reduced to acceptable levels through the implementation of the proposed landscape and visual impact mitigation measures including the careful detailing of the external appearance of all above-ground structures, the avoidance of high safety fences along the railway, the implementation of extensive tree and shrub planting along the alignment beneath and alongside the viaduct, and the use of climbing plants to soften the appearance of viaduct columns.

## **2.8 Archaeology and Cultural Resources**

### **2.8.1 Baseline Conditions**

The assessment identified no important sites or features of archaeological interest along the alignment. However, two known archaeological sites (the Wu Kai Sha and Sai O archaeological sites) are located within the study area.

A number of historic buildings have also been identified in close proximity to the alignment. These comprise the Che Kung Temple, the Stewards High Rock Christian Camp, a typical 'Hakka' walled village at Tsang Tai Uk and the Wong Clan Ancestral at Wong Uk.

### **2.8.2 Archaeology and Cultural Impacts**

The assessment concluded that there would be no direct impacts to the known archaeological sites of Wu Kwai Sha and Sai O. However, as some areas of archaeological potential have been identified, it is recommended that archaeological excavation is undertaken during the detailed design phase and in advance of the construction works for the areas affected by the viaduct footings east of the Sai Sha Road at Lee On, and at Sha Tin Wai Hill.

A feeder station is proposed in the Ma On Shan - Lee On area, possibly within the area of archaeological potential, east of the Sai Sha Road. The positioning of the feeder station will be determined during the detailed design stage following consultation with CLP. The proposed location of the feeder station shall be critically evaluated in terms of the potential impacts to heritage resources and, if appropriate, the intended location will be subject to archaeological field evaluation prior to a final decision being taken as to its location.

## **2.9 Land Contamination**

The assessment has identified several sites which have the potential to give rise to land contamination concerns, these include a number of commercial petrol stations, a vehicle maintenance centre at the proposed site of Shek Mun Station and a facility at the Hong Kong School of Motoring. However, as each petrol filling station is located outside the works boundary, the potential for the migration of contaminants onto the work site was considered extremely low. The facilities at the vehicle maintenance centre and the Hong Kong School of Motoring were noted to be small, with only two filling pumps located at the School of Motoring, therefore, the potential for contamination was considered to be minimal.

As landuses have been identified which have the potential to give rise to land contamination concerns, a CAP has been prepared to ensure that a proper investigation is undertaken and evaluated.

## **2.10 Hazard Assessment Issues**

The Study Brief required an assessment of the hazards related to the presence of the Towngas pipeline system. The potential hazards to the high pressure pipeline system were considered as they pose the greatest risk. During the construction phase potential hazards to the pipeline were found to include accidental damage during excavation works, damage due to excessive loading or vibration, and the relocation of the pipeline due to

## Key Environmental Issues

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unavoidable conflicts with the proposed location of the viaduct foundations. It is expected that HKCG will adopt the necessary safety measures for such pipeline relocations.

The hazards posed by the construction of the railway could threaten the integrity of the pipeline and it is therefore recommended that suitable procedural and safety management measures should be developed during the detailed design and construction process to minimise such hazards. In addition, the construction safety plan that will be developed by KCRC's contractor should include a detailed assessment of the construction hazards and define appropriate controls. The development and implementation of this plan and the associated measures will ensure that the construction risks conform to the acceptability criteria of the EIAO TM.

During the operational phase, the hazards posed to the high pressure gas pipeline due to the presence of railway are not expected to be significant. However, there exists the potential for damage to the pipeline due to stray current and vibration impacts. Consequently, appropriate engineering measures should be adopted to minimise stray current effects on the pipeline. Consequently, appropriate engineering measures should be adopted to minimise stray current and vibration effects on the pipeline.

The risks posed to the rail passengers due to the proximity of the pipeline will be low and 'acceptable'. Nevertheless, it is recommended that procedures are developed to avoid trains approaching the scene of a gas pipeline related incident.

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### **3. FUTURE REQUIREMENTS**

#### **3.1 Environmental Monitoring and Audit**

To ensure that the mitigation measures recommended within the EIA Report are carried forward and implemented at the appropriate stage of the project, an Implementation Schedule has been produced. For each of the mitigation measures the Implementation Schedule defines the stage and location at which the measure should be implemented together with the responsible agent. An Environmental Management System has also been proposed as a means of ensuring the full implementation of the mitigation measures.

During the construction phase, the EIA proposes that each Contractor will be required to implement an Environmental Management Plan (EMP) to define the mechanisms for achieving the environmental requirements.

In addition, Environmental Monitoring and Audit (EM&A) Manuals will be produced for both the construction and operational phases of the Project. The construction EM&A Manual shall stipulate details of the construction monitoring required, and the actions that shall be taken in the event of exceedances of the environmental criteria, whilst the operational EM&A shall address the requirements that need to be implemented during the operational phase.

It is recommended that monitoring is undertaken to assess the effectiveness of the mitigation measures. During the construction phase, environmental monitoring of construction dust, noise and water quality is recommended at defined sensitive locations along the alignment. Auditing of on-site practices is recommended to ensure that the recommended mitigation measures are fully implemented.

During the operational phase, noise monitoring is recommended in order to determine the maintenance requirements for rolling stock. If an exceedance of a reference noise level is detected then investigations will be undertaken to diagnose the fault and implement appropriate remedial action.

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#### **4. OVERALL CONCLUSIONS**

With the exception of construction noise, the implementation of the recommended mitigation measures will ensure that there are no residual environmental impacts from the construction or operation of the MOS Extension.

Residual construction noise impacts are, however, predicted after the implementation of all currently practicable mitigation measures. Further measures have been recommended, including the review and up-grade of existing glazing systems at affected schools and health centres, and the review, and where practicable, the alteration by the Contractors of their construction methodology. Where the criteria cannot be achieved, trigger levels should be agreed with the EPD and monitoring undertaken to identify and quickly rectify any exceedances of the agreed criteria. Through the adoption of this practice, it is considered that residual impacts can be either reduced to an acceptable level, or, if unavoidable, kept to a minimum practicable duration.

The mitigation measures recommended in the EIA represent accepted measures which may be employed to ensure compliance with statutory requirements, Government guidelines and other environmental standards agreed with the EPD. The EM&A programme which will be adopted during the construction and operation of the MOS Extension will also help ensure compliance with statutory and recommended criteria.

It must, however, be noted that until the detailed design stage is completed, areas of uncertainty will remain, notably:

- prior to the finalisation of the preferred work method statements, by the successful contractors, the precise construction programme, working arrangements and plant to be used on site, and hence the resulting construction impacts, can not be comprehensively defined; and
- the precise details of the proposed project will not be known until the detailed design is completed and hence operational impacts may alter from those identified during the EIA.

It is recommended that these areas be reviewed prior to the commencement of the works and that any material changes to the assumptions made in the EIA process be subject of re-assessment.

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