

### 13. CONCLUSIONS AND RECOMMENDATIONS

#### 13.1 Introduction

In this section an overview of the EIA Study is provided, and the EIA findings in relation to key issues are presented and summarised, and, where required, recommendations for further work are discussed.

The MOS Extension alignment runs through the heavily developed urban areas of Shatin and Ma On Shan, as well as the intervening areas of lower density development which contain many residential properties. The numbers of sensitive receivers that may be affected by the construction and operation of the MOS Extension are relatively high.

#### 13.2 Overview of the EIA

##### 13.2.1 Objectives

The objectives of the EIA, as defined in the MOS Extension Study Brief issue by the EPD, were to describe the proposed project and associated works, identify and describe the potential impacts and potentially affected populations and environmental resources, provide a detailed assessment of the environmental issues and impacts, make recommendations for their resolution and mitigation, describe residual impacts, and ensure that mitigation measures were integrated within the engineering design process. The assessment work, findings and recommendations described in this EIA Report meet these objectives.

##### 13.2.2 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 has 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.

### 13.3 Key Environmental Issues of the EIA

A number of key impacts and issues have been identified within this EIA Report due to either the nature or scale of the impact, the recommended mitigation measures, or because a major element of the assessment could not be completed at this time. This section provides a summary of these key environmental issues.

#### 13.3.1 Construction Noise

Unmitigated construction noise impacts from all sections of the alignment are predicted to exceed the daytime noise limits established under the EIAO TM at many identified sensitive receivers along the alignment. A package of mitigation measures has, therefore, been designed to control construction noise impacts and these are described below.

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 placement and orientation of noisy plant away from sensitive receivers;
- the use and correct fitting of silencers, mufflers and acoustic shields; and
- regular maintenance of plant and equipment.

A series of further mitigation measures have been identified which will provide increasing levels of noise reduction which should normally be sufficient to control daytime noise impacts to within the established 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, moveable noise barriers should be used to reduce operational plant noise at source; and
- Mitigation Stage 3 - as well as a combination quiet plant and moveable barriers, the number plant operating simultaneously should be limited.

After the implementation of the above mitigation, residual impacts are likely at some schools, health centres and residential premises. It is recommended that the existing glazing systems at the schools and health centres are reviewed and up-graded if necessary.

In order to reduce the impacts at the residential premises, it is recommended that the contractors develop alternative construction methodologies. Should it be impracticable to

achieve the require noise criteria through these practices, it is recommended that practical trigger levels are agreed with the EPD, and that strict monitoring is undertaken to identify any exceedances of the agreed criteria such 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 levels in accordance with the EIAO TM, or if unavoidable, kept to a minimum practicable duration.

### 13.3.2 Operational Noise

Noise impacts from the operational railway are a major concern, particularly at night (between 2300 and 0700 hours) when the statutory noise criteria are most stringent. In order to achieve the night-time criteria, a package of noise mitigation measures centred around the use of the Multi-plenum system, which was developed for West Rail, has been proposed by KCRC.

The Multi-plenum noise attenuation system comprises three components:

- a plenum beneath the train involving the use of vehicle skirts and under-car absorption;
- a plenum located beneath a walkway on both sides of the track; and
- edge walls with sound absorption.

In addition to the use of the Multi-plenum system, in order to meet the night-time noise criteria, the package of noise mitigation measures requires the use, in some areas, of floating slab track, and track side noise barriers. However, KCRC will provide floating slab track for the entire elevated alignment on viaduct. Within stations, the Multi-plenum System with the standard edge wall provision for walkway safety and a complementary noise specification for vehicle air-conditioning units will be required.

Full enclosures will be required to control airborne noise from crossovers. These shall be integrated with the Multi-plenum System.

The Multi-plenum System is very effective in controlling airborne noise at source and its use will therefore result in minimum noise barrier heights and enclosure requirements. Similarly, the acoustically optimised structural design of the viaduct and track support system means that structure-borne noise levels will be reduced to the minimum.

The operational noise assessment has demonstrated that, with the implementation of the recommended mitigation measures, the proposed scheme will comply with the NCO and the EIAO TM.

Noise impacts from the Tai Wai Depot and associated plant will be controllable with mitigation measures including the proposed full enclosure of the Depot. Noise from fixed plant will be limited by maximum sound power levels defined within this EIA and used as a target by the detailed designers to ensure the Noise Control Ordinance and EIAO TM criteria will be met. This can only be undertaken once the design of the plant housing or boundary treatments are known.

Provided the above recommendations are taken during the detailed design phase no residual impacts are expected.

### 13.3.3 Landscape and Visual

Unmitigated adverse landscape and visual impacts are predicted from the construction of the MOS Extension. Whilst landscape impacts can be largely overcome by careful planning, some residual visual impacts from construction works will remain even after mitigation. These 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.

Boundary fences should be erected around construction sites before the commencement of the works to reduce the potential visual impacts and to prevent tipping, vehicle movements and egress of personnel off site. All work sites, particularly those where vegetation has been removed, shall be reinstated to a standard as good as, or better than the original state, at the earliest opportunity.

The proposed development would, in general, generate high impacts on the physical landscape due to the loss of amenity trees, particularly mature specimens. The proposed elevated stations, and viaducts would generate varying visual impacts on the surrounding areas and their populations depending on the horizontal and vertical proximity of the Visually Sensitive Receivers (VSRs) to the railway. A large proportion of the population live in flats that would be sufficiently elevated above the railway viaduct that they would not be able to see the railway unless they stood directly at their windows and looked straight down. Consequently they would suffer only low to negligible visual impact. On the other hand, VSR's in low-rise developments and the lower floors of high-rise developments would potentially suffer greater impacts due to an increased potential to see the railway from their homes.

However, there is a significant potential to mitigate the impacts on the lower floors of developments through the implementation of the proposed landscape and visual mitigation measures including:

- The external appearance of all above-ground structures should be carefully detailed in terms of form, colour and finishes such that they are visually integrated as much as possible into the surrounding landscape. This applies, in particular to the stations, viaduct structures and the proposed noise mitigation structures as these elements would be the most visually dominant elements;
- The use of high safety fences along the railway should be avoided wherever possible to minimise adverse visual intrusion on the landscape;
- Tree and shrub planting should be implemented within the railway reserve, below the viaduct so, as to compensate for lost trees and to soften the visual impact of the viaduct. Climbing plants should be used to soften the appearance of viaduct columns.

It is considered that implementation of the proposed visual impact mitigation measures would reduce predicted impacts to acceptable levels and the railway would become an accepted part of the urban scene. Therefore it is considered that, in terms of Annex 10 of the EIAO TM, that the landscape and visual impacts are acceptable with mitigation measures.

#### 13.3.4 Air Quality

Due to the close proximity of a number of ASRs to the worksites there are likely to be dust impacts associated with the construction of the railway. As the buffer distance requirements between some of the ASRs and the work site boundary will not satisfy those stipulated in the HKPSG, unmitigated cumulative dust impacts are predicted from the construction of the stations, alignment and depots.

A series of measures have been identified to control dust levels from general construction activities to within statutory limits. 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
- frequent watering or covering of exposed areas of ground and prompt site restoration.

These measures should be used as general good practice on all construction sites to ensure that potential dust emissions are controlled and impacts upon sensitive receivers minimised.

Environmental Monitoring & Audit is recommended for ensuring the efficacy of the proposed dust mitigation measures during the construction phase.

Air quality impacts during the operational phase of the MOS Extension are not considered to be of concern as limited potential sources have been identified. The design of the ventilation systems for the stations and the bus termini should be carefully considered to ensure that the established criteria are met.

#### 13.3.5 Water Quality

##### *Construction*

The dredging of riverine deposits has the potential to cause water quality impacts, although with the implementation of the recommended mitigation measures, these should be adequately controlled. Similarly, potential problems could arise from the release of unmitigated construction site runoff. However, under the Water Pollution Control Ordinance all sites will be required to obtain a discharge licence. In meeting the discharge requirements, the contractor will prevent adverse impacts upon receiving water bodies. Sewage effluent arising from the construction workforce also has the potential to cause adverse impacts if dealt with in an inappropriate manner, however, with the

implementation of the recommended mitigation measures, no adverse impacts are predicted.

#### *Operation*

Stormwater runoff related impacts from stations and the depot should be effectively controlled through the design and implementation of appropriate drainage system(s) including silt traps and oil interceptors prior to discharge to stormwater drains.

Wastewater generated by the detergent wash plant in the proposed depot will be collected and transferred to a dedicated on-site treatment plant. The treated effluents and any other wastewater generated from the depot and stations will have to meet the criteria specified in the TM, prior to discharge to sewers.

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.

### 13.3.6 Historic and Cultural Resources

#### *Construction*

The assessment of impacts to historic and cultural resources has indicated no direct impacts to the known archaeological sites of Wu Kwai Sha and Sai O. However, as the assessment has identified the presence of some areas of archaeological potential, it is recommended that archaeological excavation is undertaken in advance of 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. With the implementation of the recommended mitigation measures, no residual impacts are predicted for the identified historic buildings, structures or landscape features identified along the MOS Extension alignment during the construction phase.

#### *Operation*

No cultural or heritage impacts are predicted in relation to the operation of the MOS Extension.

### 13.3.7 Hazard Assessment

#### *Construction*

The potential hazards identified during the construction phase of the MOS Extension have principally been identified as accidental damage to the pipeline during excavation works, or damage to the pipeline caused by excessive loading or vibration associated with the use of heavy plant or piling activities. In addition, where there is an unavoidable conflict between the current location of the pipeline and the proposed location of the viaduct foundations, then the pipeline will need to be re-located. It is expected that HKCG will adopt the necessary safety measures for such relocations.

The hazards posed by the construction of the railway could threaten the integrity of the pipeline. It is therefore recommended that suitable procedural and safety management measures are developed, in accordance with the guidelines issued by EMSD and HKCG, to minimise these hazards. KCRC should co-ordinate closely with HKCG during the detailed design and construction process. In addition, the construction safety plan to be developed by KCRC's contractor, in accordance with KCRC's safety management system, should include a detailed assessment of the construction hazards and specify appropriate controls to reduce the risks. 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.

### *Operation*

During the operational phase, approximately 2.3 km of the high pressure gas pipeline will lie within 100 m of the proposed MOS Extension alignment, with 15 m of the pipeline being within 5 m of the alignment where the pipeline crosses under a section of the railway viaduct.

The risks associated with the operation of the MOS Extension have been evaluated for persons using the railway and associated stations in the vicinity of the high pressure gas pipeline, and also for the general population in the vicinity of the new railway.

The hazards posed to the high pressure gas pipeline due to the presence of the operational railway are not expected to be significant and have been shown to meet the risk criteria of the EIAO TM. 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 and vibration effects on the pipeline.

The risks posed to the rail passengers due to the proximity of the pipeline was also found to be low and 'acceptable'. Nevertheless, it is recommended that procedures are developed to enable the immediate reporting of any gas leakages or fires to the train control centre to enable the driver to be notified as quickly as possible and therefore avoid approaching the scene of the incident.

### 13.3.8 Environmental Monitoring & Auditing (EM&A)

During the construction phase of the MOS Extension environmental monitoring will be necessary to assess the effectiveness of measures implemented to mitigate potential air quality, water quality and noise impacts. Regular environmental auditing is also recommended to ensure that potential impacts from other sources are adequately addressed through the implementation of the mitigation measures defined in this EIA Report.

Noise monitoring, most likely comprising a permanent monitoring location situated close to the Depot, is recommended during the operational phase in order to determine the maintenance requirements for rolling stock operating on the MOS Extension. If an

exceedance of a reference noise level is detected then investigations will be undertaken to diagnose the fault and implement appropriate remedial action.

#### 13.4 Further Work Associated with the EIA Process

As a result of the investigations undertaken for this EIA Study, a number of items of work have been identified which cannot be fully resolved at this time and will therefore require further investigation at a later stage of the Project's development. These areas of further works are highlighted below.

##### 13.4.1 Operational Noise

###### *Fixed Plant Noise*

Noise from fixed plant will be limited by outlet sound power levels defined in the EIA to ensure the Noise Control Ordinance and EIAOTM criteria will be met. The final design of this equipment will be undertaken during the detailed design phase to meet these target criteria.

To achieve these limits, the designers may have to employ screening and/or enclosures, with louvred outlets, within the site boundary.

This requirement, which cannot be resolved at this current stage of the Project's development, has been defined in the Implementation Schedule along with procedures required to maintain rolling stock and track noise levels.

###### *Cumulative Train Rolling Noise*

KCRC has elected to consider further mitigation of East Rail within the corridor shared with MOS as subsequent study to this EIA. This will enable the Corporation opportunity to implement wider control of rail noise and achieve improved cost effectiveness in its deployment of noise control measures. The study will be undertaken by KCRC during the detailed design phase of MOS to fully review the appropriate integration of retroactive noise mitigation for East Rail with mitigation proposed for MOS. The study will seek a holistic solution to achieve full compliance of cumulative noise with the *Noise Control Ordinance* and will be submitted to EPD for approval.

##### 13.4.2 Historic and Cultural Resources

As a number of sites of archaeological potential have been identified in the vicinity of the alignment, it is recommended that field excavation is undertaken in advance of construction works.

Full excavation of the pier supports east of Sai Sha Road at Lee On, and at Sha Tin Wai Hill is recommended in advance of construction.



The proposed location of the feeder station in the Ma On Shan - Lee On area will be determined during the detailed design stage and 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.

#### 13.4.3 Land Contamination

Although several petrol filling stations and a vehicle maintenance centre at the proposed site of Shek Mun Station have been identified within the study area, contaminated land issues have not been identified as a concern since, apart from the small scales facility associated with the Hong Kong School of Motoring and the vehicle maintenance centre, each of the commercial petrol filling stations is located outside of, and in some cases a considerable distance from the construction work areas. In addition, as there are no records of any reported spillages or leakages from the identified facilities it is considered highly unlikely that there would have been any migration of contaminants from the petrol stations to the work site in quantities significant to cause negative impacts. Therefore, the potential impacts are considered negligible.

However, as landuses with the potential to cause land contamination have been identified, a Contamination Assessment Plan (CAP) has been prepared in accordance with Annex 19 of the EIAO TM. The CAP recommends that the potential for contamination is assessed through opportunistic site investigations undertaken as part of the geotechnical/ground investigation during the detailed engineering design works. The results of these investigations will determine whether contaminated land is, in fact, an issue that needs to be addressed further. If the presence of contaminants is confirmed then there may be a need to update or amend the current CAP in light of the findings, and perform further investigations.

#### 13.5 Overall Conclusions

With the exception of the residual impacts from construction noise, the implementation of the recommended mitigation measures will ensure that all other potential impacts are controlled to within the required criteria during the construction or operation of the MOS Extension.

The recommended mitigation measures 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.