

Environmental Impact Assessment Ordinance (Cap. 499), Section 5(7)
Environmental Impact Assessment Study Brief No. ESB-189/2008

PROJECT TITLE : HONG KONG SECTION OF
GUANGZHOU-SHENZHEN-HONG KONG EXPRESS RAIL LINK (XRL)
(hereinafter known as “the Project”)

NAME OF APPLICANT :
MTR CORPORATION LIMITED
(hereinafter known as “the Applicant”)

1. Background

- 1.1 An application (No. ESB-189/2008) for an Environmental Impact Assessment (EIA) study brief under section 5(1) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by the Applicant on 28 April 2008 with a Project Profile (No. PP-353/2008) (the Project Profile).
- 1.2 According to the Project Profile, the Project under current application (hereinafter known as the project) is to construct and operate a new railway system to provide a cross boundary railway link connecting to the mainland section of XRL. The Alignment map and ventilation shafts/emergency access points are shown in the Project Profile and are reproduced in Figures 1 and 2 in this study brief. The tunnel is located underground and its profile is given in the Project Profile and is reproduced in Figure 3 in this study brief. The development and operation of the Project will comprise the following:
- (i) The West Kowloon Terminus;
 - (ii) Approximately 26 kilometres of underground railway alignment from the West Kowloon Terminus northwards through urban Kowloon and extending into the New Territories. It passes beneath Sham Shui Po, Shek Kip Mei, Shek Kong, Ngau Tam Mei and Mai Po to the boundary crossing point at Huanggang;

- (iii) An underground depot and emergency rescue station located at the east of Shek Kong, with underground depot facilities to support stabling requirements as well as maintenance and repair to the Project's infrastructure;
 - (iv) Ventilation shafts and/or adits along the railway alignment to satisfy the tunnel ventilation requirements. The ventilation shafts will also act as Emergency Access Points for emergency services;
 - (v) Construction of the tunnel, adits and other associated railway infrastructures by techniques such as tunnel boring, cut and cover, and/or drill and blast;
 - (vi) Construction of the West Kowloon Terminus, underground depot and emergency rescue station, ventilation shafts and other associated infrastructures; and
 - (vii) Operation of the Project.
- 1.3 The Project is a designated project under Items A.2, A.4, A.7 and Q.1 of Part 1, Schedule 2 of the EIAO. In accordance with section 5(1)(a) of the EIAO, a person who is planning a designated project shall apply to the Director of Environmental Protection (the Director) for an EIA study brief to proceed with an EIA study for the Project.
- 1.4 Pursuant to section 5(7)(a) of the Environmental Impact Assessment Ordinance, the Director of Environmental Protection (the Director) issues this Environmental Impact Assessment (EIA) study brief to the Applicant to carry out an EIA study.
- 1.5 The purpose of this EIA study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and related activities that take place concurrently. This information will contribute to decisions by the Director on:

- (i) The overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project;
- (ii) The conditions and requirements for the detailed design, construction and operation of the Project to mitigate adverse environmental consequences wherever practicable; and
- (iii) The acceptability of residual impacts after the proposed mitigation measures are implemented.

2. Objectives of the EIA Study

2.1 The objectives of the EIA study are as follows:

- (i) To describe the Project, associated works, and any option(s) of alignment together with the requirements and environmental benefits for carrying out the Project;
- (ii) To identify any other individual Designated Project under Part I, Schedule 2 of the EIAO to be covered in the Project to ascertain whether the findings of this EIA Study have adequately addressed the environmental impacts of these projects;
- (iii) To identify and describe the elements of the community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the Project, including both the natural and man-made environment and the associated environmental constraints to and by the Project;
- (iv) To describe the alternative option(s) considered and the constraints leading to the selection of the proposed alignment; locations of the terminus, ventilation shafts, adits, depots and emergency rescue stations; locations and size of work sites and underground work construction methods; to describe the comparative benefit(s) and

dis-benefit(s) of the alternative option(s) ; to provide reasons for selecting the preferred option(s) for the above; and to describe the part environmental factors played in the whole selection process.

- (v) To identify and assess noise impacts, ecological impacts, water quality impacts, landscape and visual impacts, hazard to life, waste management implications, fisheries impacts, air quality impacts and impacts on sites of cultural heritage, and determine the significance of impacts on sensitive receivers and potential affected uses;
- (vi) To identify and quantify emission sources and determine the significance of impacts on sensitive receivers and potential affected uses;
- (vii) To identify and quantify waste management requirements and land contamination prevention requirements, and to propose measures to avoid in the first instance or mitigate these impacts;
- (viii) To identify and quantify any potential ecological impacts to flora, fauna and natural habitats and to propose measures to avoid in the first instance or mitigate these impacts;
- (ix) To identify and quantify any potential fisheries impacts arising from the construction and operation of the project, and to propose measures to avoid in the first instance or mitigate these impacts;
- (x) To identify any negative impacts on sites of cultural heritage, historic buildings and structures and to propose measures to avoid in the first instance or mitigate these impacts;
- (xi) To identify and quantify any potential landscape and visual impacts and to propose measures to avoid in the first instance or mitigate these impacts;

- (xii) To propose the provision of infrastructure or mitigation measures so as to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;
- (xiii) To investigate the feasibility, practicability, effectiveness and implications of the proposed infrastructure or mitigation measures;
- (xiv) To identify, predict and evaluate the residual environmental impacts (i.e. after practicable mitigation) and the cumulative effects expected to arise during the construction and operation phases of the Project in relation to the sensitive receivers and potential affected uses;
- (xv) To identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operation of the Project which are necessary to mitigate these environmental impacts and cumulative effects and reduce them to acceptable levels;
- (xvi) To investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures and to identify constraints associated with the mitigation measures recommended in the EIA study, as well as the provision of any necessary modification; and
- (xvii) To design and specify the environmental monitoring and audit requirements to ensure the implementation and effectiveness of the recommended environmental protection and pollution control measures.

3. Detailed Requirements of the EIA Study

3.1 The Purpose

The purpose of this study brief is to scope the key issues of the EIA study and to specify the environmental issues that are required to be reviewed and

assessed in the EIA report. The Applicant has to demonstrate in the EIA report that the criteria in the relevant sections of the Technical Memorandum on Environmental Impact Assessment Process (hereinafter referred to as “the TM”) issued under section 16 of the Environmental Impact Assessment Ordinance are fully complied with.

3.2 The Scope

The scope of this EIA study shall cover the Project proposed in the Project Profile and the works and facilities mentioned in Section 1.2 above. The EIA study shall also include other works and facilities in the Project not mentioned in Section 1.2 above, if any, such as Public Transport Interchange or new/altered roads. In such situation, the Applicant shall study the environmental issues according to the requirements in the relevant sections of the TM and documented in the EIA report, which shall be considered in accordance with Section 4.4.2(c) of the TM.

The EIA study shall address the key issues described below, together with any other key issues identified during the course of the EIA study and the cumulative environmental impacts of the Project, through interaction or in combination with other existing, committed, and planned and known potential developments and designated projects in the vicinity of the Project:

- (i) The potential air quality impacts during the constructional and operational stages of the Project.
- (ii) The potential hazard to life during the construction and operation of the Project if there is transport, storage or processing of dangerous goods defined in the Dangerous Goods Ordinance (Cap. 295) as well as transport, storage or processing of dangerous goods defined in the Gas Safety Ordinance (Cap. 51), related to potentially hazardous installation site(s) only;

- (iii) The potential hazard to life during the construction of the Project if there is overnight storage of explosives;
- (iv) The potential noise impacts on nearby existing and planned noise sensitive receivers during construction and operation of the Project. Reference can be made to any lessons learned from other similar railway projects, such as, East Rail Extensions - Tai Wai to Ma On Shan, Sheung Shui to Lok Ma Chau Spur Line, West Rail and the Kowloon Southern Link;
- (v) The potential water quality impacts arising from the construction and operation of the Project, including the impact to the underground water table due to the construction and operation of the Project, discharge during the construction stage, sewage treatment and disposal at facilities and discharge from any water-cooled air conditioning system during the operation stage, and the related potential ecological and fisheries impacts arising from the above impacts;
- (vi) The potential impacts of various types of waste arising, including excavated materials from constructing tunnel, terminus, depot, ventilation shafts and adits of the railway and, any other construction waste and chemical waste to be generated from the construction and operation of the Project;
- (vii) The potential land contamination impacts arising from the construction of the project;
- (viii) Terrestrial and aquatic ecological impacts, in particular the potential impacts to sites of conservation importance including, but not limited to the Mai Po Nature Reserve, Mai Po Inner Deep Bay Ramsar Site, Mai Po Egrettry SSSI, Inner Deep Bay SSSI, Wetland Conservation Area (WCA) and Wetland Buffer Area (WBA) (both were defined under Town Planning Board Guidelines TPB PG-No. 12B), abandoned agricultural fields at Shek Kong, the woodlands

near ventilation shaft at Lui Kung Tin, and important habitats such as fishponds, due to the construction and operation of the Project;

- (ix) The potential hydrological changes and the associated implications for the ecology of wetland habitats during both construction and operation stages;
- (x) The monitoring of ground water levels and the contingency plan to maintain the ground water levels;
- (xi) The potential risks of ground surface settlement or heaving along the tunnel section and the consequential impacts on the ecology;
- (xii) The mitigation measures proposed to compensate for temporary and/or permanent loss of sites of conservation importance and fishponds, if any, during both the construction and operation stages shall be considered in the light of best available information. In particular the benchmark ecological function of the fishponds within the WCA, WBA and the Mai Po Inner Deep Bay Ramsar Site shall be compared with the potential ecological function of the compensation areas after enhancement to demonstrate that the same kind of ecological function and capacity can be achieved through the measures to compensate for the ecological impacts;
- (xiii) The details of the design and implementation of the compensation areas, if any, including the fishponds for early enhancement before or during the construction stage;
- (xiv) The potential fisheries impacts arising from the construction and operation of the project;
- (xv) The potential impacts on sites of cultural heritage, historic buildings and structures likely to be affected by the construction works of the Project; and

- (xvi) The potential landscape and visual impacts on existing and planned sensitive receivers due to the construction and operation of the Project. The glare impacts from the project shall also be addressed.

3.3 Consideration of Alternative Layout and Construction Methods

3.3.1 The Background information of the Project

The Applicant shall provide information on the background for the construction and operation of this Project. The Applicant shall explain the purpose and objectives of the Project, and shall include a description of the potential environmental benefits of the Project.

3.3.2 Consideration of Alternative Alignment(s), Terminus, Ventilation Shaft(s), Depot and Emergency Rescue Station Option(s) and Train System

In addition to the proposed alignment and station option(s) mentioned in the Project Profile and Section 1.2 above, the Applicant shall describe the considerations given, when exploring various feasible alternative option(s) for alignment, terminus, depot, emergency rescue station, ventilation shaft and adit locations and trains system to avoid adverse environmental impacts to the maximum practical extent, if identified at any stage during the course of the EIA study and notwithstanding whether the adverse impacts are found before or after mitigation measures being taken into consideration. Adverse environmental impacts to and/or together with other projects, including but not limited to the “Proposed Comprehensive Development at Wo Shang Wai, Yuen Long” (adjacent to Palm Springs, Royal Palms and Wo Shang Wai), shall be avoided as far as possible. Encroachment onto sites of conservation importance shall be avoided as far as possible.

A comparison of the environmental benefits and dis-benefits of the proposed and alternative alignment, terminus, depot, ventilation shaft and adit location options shall be made to support the selection of the preferred option(s) which should avoid adverse environmental impacts to the

maximum practicable extent, in particular how the alternative options would avoid or minimise impacts on sites of conservation importance, cultural heritage items and reduce the construction and operation air and noise impacts. Operational considerations or other constraints affecting the selection of the preferred option(s) shall also be stated. The considerations given in the design(s), location(s) and site area(s) of the ventilation shafts, depot and terminus shall also be provided to justify the preferred option(s).

3.3.3 Construction Methodologies

The Applicant shall include in the EIA report details of the construction methodologies and programme, and assess to what extent the technologies to be employed are applicable, appropriate and proven technologies. The Applicant shall compare the environmental benefits and disbenefits of the various construction technologies including, but not limited to, at least Cut and Cover, Tunnel Boring Machine and drill-and-blast, recommend and justify the best practicable mitigation measures associated with the adoption of these methodologies for the Project's alignment, and demonstrate that the methodologies used are proven sound and adequate such that the environmental impacts can be avoided to the maximum practicable extent.

3.3.4 Consideration of Alternative Construction Methods, Sequences of Works, Work Site Requirements and Locations

Taking into consideration the potential cumulative effects during the construction period and the degree of the construction impacts on affected sensitive receivers, the EIA study shall explore alternative construction methods and sequence of works, work site size requirements (including Tunnel Boring Machine launching and retrieval sites) and work site locations for the Project, with a view to avoid prolonged adverse environmental impacts. A comparison of the environmental benefits and dis-benefits of applying different construction methods and sequence of works shall be made.

3.3.5 Selection of Preferred Option

- 3.3.5.1 Taking into consideration of the findings above, the Applicant shall justify the selection of the preferred option that will avoid or minimize adverse environmental effects arising from the Project to the maximum extent possible; and shall adequately describe the part that environmental factors played in arriving at the final selection of the construction methods, sequences of works, works site size requirements and work site locations of the Project. In particular, the preferred option shall avoid sites of conservation importance to the maximum extent possible.
- 3.3.5.2 The Applicant shall describe in details the construction programme, work site size requirement, work site locations including any work site(s) away from the railway alignment, construction method for various above ground and underground sections of the railway, station, depot, ventilation shafts and adits to be adopted.

3.4 Technical Requirements

The Applicant shall conduct the EIA study to address all environmental aspects of the activities described in the scope set out in section 3.2 above and taking into consideration findings from the requirements specified in section 3.3. The EIA study shall include the following technical requirements on specific impacts.

3.4.1 Air Quality Impact

- 3.4.1.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing air quality impact as stated in Section 1 of Annex 4 and Annex 12 of the TM respectively.
- 3.4.1.2 The study area shall include all areas within a distance of 500m from the Project alignment and boundaries of all associated areas under the Project, such as terminus, depot, emergency rescue station, access roads, adits, ventilation shafts, works sites, barging points and aboveground conveyor system if any. The assessment shall include at least the existing, planned and

committed sensitive receivers within the study area. Such assessment shall be based on the best available information at the time of the assessment.

3.4.1.3 The air quality impact assessment shall include the following:

- (i) Background and Analysis of Activities
 - (a) Provide background information relating to air quality issues relevant to the Project, e.g. description of the types of activities of the Project that may affect air quality during the constructional and operational stages.
 - (b) Give an account, where appropriate, of the consideration/measures that had been taken into consideration in the planning of the Project to abate the air pollution impact. That is, the Applicant shall consider alternative construction methods/phasing programmes and alternative modes of operation to minimize the constructional and operational air quality impacts respectively.
 - (c) Present background air quality levels in the study area for the purpose of evaluating cumulative constructional and operational air quality impacts.
- (ii) Identification of Air Sensitive Receivers (ASRs) and Examination of Emission/ Dispersion Characteristics
 - (a) Identify and describe existing and planned/committed ASRs that would likely be affected by the Project, including those identified on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans and Layout Plans and other relevant published land use plans. The Applicant shall select the assessment points of the identified ASRs that represent the worst impact point of these ASRs. A map clearly showing the location and description such as name of buildings, uses and

height of the selected assessment points shall be given. The separation distances of these ASRs from the nearest emission sources shall also be given.

- (b) Provide a list of air pollution emission sources, including any nearby emission sources which are likely to have impact related to the Project based on the analysis of the constructional and operational activities in Section 3.4.1.3(i)(a) above. Examples of construction stage emission sources include stock piling, blasting, construction plant, concrete batching plant and vehicular movements on unpaved haul roads on site. Confirmation of the validity of the assumptions and the magnitude of the activities (e.g. volume of construction materials handled and traffic volume on a haul road) shall be obtained from the relevant government departments/authorities and documented.

(iii) Constructional Phase Air Quality Impact

- (a) The Applicant shall follow the requirements stipulated under the Air Pollution Control (Construction Dust) Regulation to ensure that construction dust impacts are controlled within the relevant standards as stipulated in Section 1 of Annex 4 of the TM. A monitoring and audit programme for the construction phase shall be devised to verify the effectiveness of the control measures proposed so as to ensure proper construction dust control.
- (b) If the Project will give rise to significant construction dust impacts likely to exceed recommended limits in the TM at the ASRs despite the incorporation of the dust control measures proposed in accordance with Section 3.4.1.3(iii)(a) above, a quantitative assessment should be carried out to evaluate the construction dust impact at the identified ASRs. The Applicant shall follow the methodology set out in Section 3.4.1.3(v) below when carrying out the quantitative assessment.

- (c) The assessment shall cover the cumulative dust impacts due to the construction works of the Project and any other relevant concurrent projects identified during the course of assessment.

(iv) Operational Phase Air Quality Impact

The Applicant shall assess the expected air pollutant impacts at the identified ASRs based on an assumed reasonably worst-case scenario under normal operating conditions. If the Applicant anticipates a significant air quality impact that will likely cause exceedance of the recommended limits in the TM at the ASRs despite the incorporation of control/mitigation measures, a quantitative assessment by following the methodology set out in Section 3.4.1.3(v) below shall be carried out to evaluate the operational air quality impact at the identified ASRs.

(v) Quantitative Assessment Methodology

- (a) If quantitative assessment is to be carried out under Sections 3.4.1.3(iii)(b) or 3.4.1.3(iv), the Applicant shall apply the general principles enunciated in the modelling guidelines in Appendices A-1 to A-3 while making allowance for the specific characteristic of the Project. This specific methodology must be documented in such level of details, preferably assisted with tables and diagrams, to allow the readers of the EIA report to grasp how the model has been set up to simulate the situation under study without referring to the model input files. Detailed calculations of air pollutants emission rates for input to the modeling shall be presented in the EIA report. The Applicant must ensure consistency between the text description and the model files at every stage of submissions for review.
- (b) The Applicant shall identify the key/representative air pollutant parameters (types of pollutants and the averaging time concentrations) to be evaluated and provide explanation for

selecting such parameters for assessing the impact from the Project.

- (c) The Applicant shall calculate the cumulative air quality impact at the ASRs identified under Section 3.4.1.3 (ii) above and compare these results against the criteria set out in section 1 of Annex 4 in the TM. The predicted air quality impacts (both unmitigated and mitigated) shall be presented in the form of summary table(s) and pollution contours, to be evaluated against the relevant air quality standards and on any effect they may have on the land use implications. Plans of a suitable scale should be used to present pollution contours to allow buffer distance requirements to be determined properly.

(vi) Mitigation Measures for Non-compliance

The Applicant shall propose remedies and mitigating measures where the predicted air quality impact exceeds the criteria set in Section 1 of Annex 4 in the TM. These measures and any constraints on future land use planning shall be agreed with the relevant government departments/authorities and documented. The Applicant shall demonstrate quantitatively that the residual impacts after incorporation of the proposed mitigating measures will comply with the criteria stipulated in Section 1 of Annex 4 in the TM.

(vii) Submission of Model Files

All input and output file(s) of model run(s) shall be submitted to the Director in electronic format.

3.4.2 Hazard to Life

- 3.4.2.1 If the Project will use explosives, the Applicant shall describe the statutory/licensing requirements with respect to explosives under the Dangerous Goods Ordinance (Cap. 295). The Applicant shall also document

any guidelines and/or advice obtained from relevant departments/ authorities on the proposed transport and storage of explosives for the blasting activities.

3.4.2.2 If there is overnight storage of explosives magazine and the storage location is in close vicinity to populated areas and/or Potentially Hazardous Installation site, the Applicant shall carry out hazard assessment as follows:

- (i) Identify hazardous scenarios associated with the storage and transport of explosives and then determine a set of relevant scenarios to be included in a Quantitative Risk Assessment (QRA);
- (ii) Execute a QRA of the set of hazardous scenarios determined in (i), expressing population risks in both individual and societal terms;
- (iii) Compare individual and societal risks with the criteria for evaluating hazard to life stipulated in Annex 4 of the TM; and
- (iv) Identify and assess practicable and cost-effective risk mitigation measures.

The methodology to be used in the hazard assessment should be consistent with previous studies having similar issues.

3.4.2.3 If there is use of dangerous goods defined in the Dangerous Goods Ordinance (Cap. 295) or use of Dangerous Goods defined in the Gas Safety Ordinance (Cap. 51) within potentially hazardous installation site(s) in the construction or operation phase of this project, the Applicant shall carry out hazard assessment as follows :

- (i) Identify hazardous scenarios associated with the transport, storage and processing of dangerous goods and then determine a set of relevant scenarios to be included in a Quantitative Risk Assessment (QRA);;
- (ii) Execute a QRA of the set of hazardous scenarios determined in (i),

expressing population risks in both individual and societal terms;

- (iii) Compare individual and societal risks with the criteria for evaluating hazard to life stipulated in Annex 4 of the TM; and;
- (iv) Identify and assess practicable and cost-effective risk mitigation measures.

The methodology to be used in the hazard assessment should be consistent with previous studies having similar issues.

3.4.3 Noise Impact

3.4.3.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing both the construction and operation noise impacts arising from the Project as stated in Annexes 5 and 13 of the TM respectively. According to Section 4.4.2(h) of the TM, the Applicant shall review and consider any lessons learnt from other similar projects for incorporation in the current proposal to avoid in the first instance or minimize potential noise impacts.

3.4.3.2 The noise impact assessment shall include the following:

(i) Determination of Study Area

The study area shall include all areas within a distance of 300m from the Project alignment and boundaries of all associated areas under the Project, such as terminus, depot, emergency rescue station, access roads, adits, ventilation shafts, works sites, barging points and aboveground conveyor system if any. The study area may be reduced accordingly if the first layer of noise sensitive receivers (NSRs), closer than 300m from the project boundary, provides acoustic shielding to those receivers located further away and the Applicant shall document the reasons in the EIA report. The study area shall be expanded to include NSRs at greater distance which would be affected by the construction and operation of the project.

(ii) Provision of Background Information and Existing Noise Levels

The Applicant shall provide all background information relevant to the Project, including relevant previous or current studies. Unless required for determining the planning standards, such as those for planning of fixed noise sources, no existing noise levels are required except as set out below.

(iii) Identification of Noise Sensitive Receivers (NSRs)

- (a) The Applicant shall refer to Annex 13 of the TM when identifying the NSRs. The NSRs shall include all existing NSRs and all planned/committed noise sensitive developments and uses earmarked on the relevant Outline Zoning Plans, Outline Development Plans and Layout Plans, and other relevant published land use plans.
- (b) The Applicant shall select assessment points to represent all identified NSRs for carrying out quantitative noise assessment. A map shall be given showing the location of each and every selected assessment points.

(iv) Provision of an Emission Inventory of the Noise Sources

The Applicant shall provide inventory of noise sources including representative construction equipment assumed for assessing construction noise associated with, for example tunnelling and other construction works, and plant/ equipment/ railway/ rolling stock for operation noise assessment. The inventory shall assume appropriate railway traffic data for the purpose of assessment.

(v) Construction Noise Assessment

- (a) Based on the best available information, the assessment shall cover the cumulative noise impacts due to the construction works of the Project and other projects and works in the vicinity.

- (b) The Applicant shall carry out assessment of noise impact from construction (excluding percussive piling) of the Project during day time, i.e. 7 a.m. to 7 p.m., on weekdays other than general holidays in accordance with the methodology stipulated in paragraphs 5.3. and 5.4 of Annex 13 of the TM. The criteria in Table 1B of Annex 5 of the TM shall be adopted in the assessment.

- (c) For ground-borne noise impacts, the criteria and assessment methodology shall be considered in accordance with Section 4.4.2(c) of the TM and documented in the EIA report. Reference can be made to relevant previous studies such as the Kowloon Southern Link. Site measurements at appropriate locations may be required in order to obtain the empirical input parameters required in the ground-borne noise model.

- (d) To minimize the construction noise impact, alternative construction methods to replace percussive piling and blasting shall be considered as far as practicable. In case blasting cannot be avoided, it should be carried out, as far as practicable, outside the sensitive hours (7pm to 7am on Monday to Saturday and any time on a general holiday, including Sunday) and with the best practicable noise mitigation measures. For blasting that must be carried out during the above-mentioned sensitive hours, the noise impact associated with the removal of debris and rocks should be fully assessed and mitigation measures should be recommended to reduce the construction noise impact.

- (e) For tunnelling, noise impact (including air-borne noise and ground-borne noise) associated with the operation of powered mechanical equipment, in particular, tunnel boring machines or equivalent, shall be assessed. If the equipment, such as a tunnel boring machine and associated facilities, is used, the methodology/model for assessing ground-borne noise impact from these

equipments/facilities shall be considered in accordance with Section 4.4.2(c) of the TM and documented in the EIA report. Reference can be made to relevant previous studies such as the Kowloon Southern Link. Cumulative impacts with other projects shall be covered if appropriate.

- (f) If the unmitigated construction noise levels are found to exceed the relevant criteria, the Applicant shall propose practicable direct mitigation measures (including at least movable barriers, enclosures, quieter alternative methods, re-scheduling and restricting hours of operation of noisy tasks), particularly at open-cut areas, tunnel boring machine launching and retrieval shafts and tunnel portal(s), to minimize the impact. If the mitigated noise levels still exceed the relevant criteria, the duration of the noise exceedance shall be given.

- (g) The Applicant shall formulate a construction programme as far as practicable such that no work will be required in the restricted hours as defined under the Noise Control Ordinance (NCO). In case the Applicant needs to evaluate whether construction works during restricted hours as defined under the NCO are feasible or not in the context of programming construction works, reference should be made to the relevant technical memoranda issued under the NCO. Regardless of the results of construction noise impact assessment for restricted hours, the Noise Control Authority will process Construction Noise Permit (CNP) application, if necessary, based on the NCO, the relevant technical memoranda issued under the NCO, and the contemporary condition/situations of adjoining land uses and any previous complaints against construction activities at the site before making his decision in granting a CNP. This should be explicitly stated in the noise chapter and the conclusions and recommendations chapter in the EIA report.

(vi) Rail Noise Assessment

- (a) The Applicant shall assess the noise impacts from the proposed railway and trains during the operational phase, including worst case scenario, normal, abnormal, transient and emergency operations, if applicable, with respect to the acceptable levels contained in Table 1A in Annex 5 in the TM. The assessment methodology including the railway/train design noise level shall be considered in accordance with Section 4.4.2(c) of the TM and documented in the EIA report. Reference can be made to relevant previous studies such as the Kowloon Southern Link.
- (b) For operation ground-borne noise impact, the criteria and assessment methodology shall be considered in accordance with Section 4.4.2(c) of the TM and documented in the EIA report. Reference can be made to relevant previous studies such as the Kowloon Southern Link. The assessment shall also cover the cumulative ground-borne noise impact due to the Project and the railways in the vicinity (such as the Kowloon Southern Link). Site measurements at appropriate locations on a “like-to-like” basis (e.g. under similar situations) may be required in order to obtain the empirical input parameters required in the ground-borne noise model.
- (c) In assessing the noise level, the Applicant shall allow for deterioration in rail and rolling stock condition from brand new to an operating level and shall address the reasonable and worst case scenarios, taking into account any other planned noise sources. The Applicant shall present the noise levels in $Leq(30min)$, $Leq(24 hr)$ and L_{max} during the day and at night at the NSRs at various representative floor levels (in mPD) on tables and plans of suitable scale. The potential noise impact on existing and planned NSRs shall be quantified by estimating the total number of

dwelling and/or classrooms and other sensitive elements that will be exposed to levels exceeding the relevant planning criteria and statutory limits.

- (d) The Applicant shall make recommendations for noise amelioration/direct technical remedies for any existing or planned NSRs which would be subject to predicted cumulative noise level exceeding the relevant planning criteria and statutory limits in the appropriate design year.
 - (e) Apart from the recommendations made in Section 3.4.3.2.(vi)(d) above, the Applicant shall consider and propose the feasibility to allow capacity for possible future enhancement of noise amelioration/direct technical remedies for future NSRs, noise sensitive developments or land uses which may be subject to operation noise impact exceeding the relevant planning criteria and statutory limits during the operation phase.
 - (f) The Applicant shall propose a mechanism to validate the predicted operation noise levels against the actual operation noise levels during the testing and commissioning stage of the railway system. The mechanism shall include possible remedial action to cater with situation if the actual operation noise level is found exceeding the relevant planning criteria and statutory limits.
- (vii) Fixed Noise Source Assessment

If the Project includes any fixed noise sources, such as from depot, terminus, ventilation shafts (including such as ventilation systems and tunnel portals) or Public Transport Interchange, the following assessment shall be followed:

- (a) Assessment of Fixed Source Noise Levels – The Applicant shall calculate the expected noise using standard acoustic principles. Calculations for the expected noise shall be based on the assumed plant inventories and utilization schedule for the reasonable and worst case scenarios. The Applicant shall calculate the noise levels taking into account correction of tonality, impulsiveness and intermittency in accordance with the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites. The cumulative impacts due to the fixed noise sources proposed for the Project (such as the ventilation shafts) and other existing and planned noise sources shall also be assessed.

 - (b) Presentation of Noise Levels – The Applicant shall present the existing and future noise levels in Leq(30min) at the NSRs at various representative floor levels (mPD) on tables and plans of suitable scale. A quantitative assessment at the NSRs for the proposed fixed noise sources shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM.

 - (c) Proposal for Noise Mitigation Measures – To protect the affected NSRs, the Applicant shall propose direct technical remedies within the project limits in all situations where the predicted noise levels exceed the criteria set out in Table 1A of Annex 5 of the TM.
- (viii) Assessment of Side Effects and Constraints

The Applicant shall identify, assess and propose means to avoid or minimize any consequential adverse impacts from the construction of noise impact mitigation measures (for example, the need for carrying out noisy construction work during noise sensitive hours)

and to resolve any potential constraints due to the inclusion of the recommended direct technical remedies.

(ix) Evaluation of Constraints on Planned Noise Sensitive Developments/Land Uses

- (a) For planned noise sensitive uses which will still be affected even with all practicable direct technical remedies in place, the Applicant shall propose, evaluate and confirm the practicality of additional measures within the planned noise sensitive uses boundary and shall make recommendations on how these noise sensitive uses should be designed for the information of and agreement by relevant parties.
- (b) The Applicant shall take into account the agreed environmental requirements/constraints identified by the study to assess the development potential of the concerned sites, and shall make such information known to and agreed by the relevant parties.

3.4.4 Water Quality Impact

3.4.4.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing water pollution as stated in Annexes 6 and 14 of the TM respectively.

3.4.4.2 The study area for the water quality impact assessment shall include the Victoria Harbour (Phase 1, 2 and 3), Western Buffer, Tolo Harbour Supplementary and Deep Bay Water Control Zones stipulated under the Water Pollution Control Ordinance (WPCO, Cap. 358), and all areas within a distance of 500m from the Project alignment and boundaries of all associated areas under the Project, such as terminus, depot, emergency rescue station, access roads, adits, ventilation shafts, works sites, barging points and aboveground conveyor system if any. This study area could be extended to

include other areas such as stream courses and the associated water system(s), existing and new drainage system in the vicinity being impacted by the Project if found justifiable.

3.4.4.3 The Applicant shall identify and analyse physical, chemical and biological disruptions of marine water, inland water or groundwater system(s), drainage system, catchment area(s), stormwater channel(s) and coastal water(s) arising from the construction and operation of the Project.

3.4.4.4 The Applicant shall predict, quantify and assess the water quality impacts arising from the Project on the water system(s) and sensitive receivers by appropriate techniques. These techniques shall be considered in accordance with Section 4.4.2(c) of the TM and documented in the EIA report. Reference can be made to relevant previous studies such as Lok Ma Chau Spur Line and Kowloon Southern Link. Potential impacts shall include but not limited to (1) construction and operation of the possible barging point, spent cooling water discharge; (2) change in groundwater levels along the tunnel section during both construction and operation stages; and (3) sewage, wastewater, pumped groundwater, tunnel effluents and surface runoff from the Project.

3.4.4.5 The Applicant shall address water quality impacts due to the construction and operational stages of the Project. Essentially, the assessment shall address the following:

- (i) Collection and review of background information on the existing and planned water systems, and their respective catchments and sensitive receivers which might be affected by the Project.
- (ii) Characterization of water quality of the water systems and respective catchments and sensitive receivers which might be affected by the Project based on existing best available information or through appropriate site survey and tests as appropriate.

- (iii) Identification and analysis of relevant existing and planned activities, beneficial uses and water sensitive receivers related to the affected water system(s). The Applicant shall refer to, *inter alia*, those developments and uses specified in the relevant Draft / Preliminary Outline Development Plans, Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans, Layout Plans and other published land use plans.
- (iv) Identification of pertinent water quality objectives and establishment of other appropriate water quality criteria or standards for the water system(s) and the sensitive receivers as mentioned in (i), (ii) & (iii) above, and including ecological sensitive receivers for the assessments covered in Section 3.4.6.
- (v) Identification of any alternation of water courses, natural streams, manmade ponds, drainage systems, wetland, change of hydrology and flow regimes, change of groundwater levels, change of catchment types or areas.
- (vi) Review of specific design, construction methods and configurations of the terminus, tunnel, depot, emergency rescue station, ventilation shaft and adit locations of the railway systems; and operation of the Project.
- (vii) Identification, analysis and quantification of existing and likely future water pollution sources including point discharges and non-point sources to surface water runoff, sewage and polluted discharge generated from the Project, and spent cooling water discharge.
- (viii) Establishment and provision of a pollution load inventory on the quantities and characteristics of existing and likely future water pollution sources identified in (vii) above. Field investigation and laboratory tests shall be conducted as appropriate to fill in any major information gaps.

Impact Prediction

- (ix) Prediction and quantification of impacts on the water system(s) and sensitive receivers due to those alterations and changes identified in (v) above and the pollution sources identified in (vii) above. Possible impacts include changes in hydrology, flow regime, groundwater level, water quality and the effects on the aquatic organism due to such changes shall be assessed. The prediction shall take into account and include likely different construction stages or sequences, and different operation stages.
- (x) If contaminated groundwater is identified in the land contamination assessment covered in Section 3.4.5.3, the potential impacts during construction stage should be evaluated and properly addressed.
- (xi) If seawater will be used in cooling systems and spent cooling effluent shall be discharged into marine water, prediction and quantification by mathematical modelling shall be required to assess the impacts on the water system and sensitive receivers, in respect of thermal and chemical discharge. The water quality modelling specifications in Appendix B of this Study Brief could be used as a guideline subject to amendment in respect of the model calibration area and the fine grid model area. If the spent cooling water discharge will not be significant in terms of discharge rate and impact on sensitive waters or sensitive receiver, the Applicant may propose alternative assessment methodology.
- (xii) Assessment of the cumulative impacts due to other related concurrent and planned projects, activities or pollution sources that may have a bearing on the environmental acceptability of the Project.
- (xiii) Assessment and evaluation of any potential impacts on the identified water system(s), respective catchments and sensitive receivers due to sewage, wastewater and pumped groundwater arising from the Project. Any effluent generated will require appropriate collection,

treatment and disposal to within standards and objectives and criteria established in (iv) above.

- (xiv) Assessment and evaluation of any potential impacts arising from tunnel / seepage drainage and track runoff. Appropriate measures shall be recommended to reduce the identified impacts arising during operation. The assessment should include the volume of anticipated wastewater / water seepage to be discharged from the stations / tunnel so as to facilitate assessment in accordance with Section 6.5 in Annex 14 of the TM.
- (xv) Assessment and evaluation of any potential stormwater and surface runoff impacts on the water system(s), respective catchments and sensitive receivers during both construction and operation stages as to reduce the water quality impacts to within standards, objectives and criteria established in (iv) above. Best management practices shall be recommended to reduce any potential impacts arising from stormwater drainage system and surface runoff.

Mitigation

- (xvi) Proposal of effective and practicable infrastructure upgrading or provision, water pollution prevention and mitigation measures including those for contaminated groundwater to be implemented during the construction and operation stages to reduce the water quality impacts to within acceptable levels of standards. No net increase of pollution load to Deep Bay catchment should be ensured. Requirements to be incorporated in the Project contract document shall also be proposed.
- (xvii) Evaluation and quantification of residual impacts on the affected water system(s) and the sensitive receivers with regard to the appropriate water quality criteria, standards or guidelines.

3.4.5 Waste Management Implications, including Land Contamination Impact

Waste Management Implications

3.4.5.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing waste management implications as stated in Annexes 7 and 15 of the TM respectively.

3.4.5.2 The assessment of waste management implications shall cover the following:

(i) Analysis of Activities and Waste Generation

The Applicant shall identify the quantity, quality and timing of the waste and chemical waste arising as a result of the construction and operation activities of the Project, based on the sequence and duration of these activities. The Applicant shall illustrate how practicable the design, general layout, construction methods and programme have been adopted to minimize the generation of public fill/inert Construction and Demolition Materials (C&DM) and maximise the use of public fill/inert C&DM for other construction works.

(ii) Proposal for Waste Management

(a) Prior to considering the disposal options for various types of wastes, the Applicant shall evaluate the opportunities for reducing waste generation, on-site or off-site re-use and recycling. Measures that can be taken in the planning and design stages, for example, by modifying the design approach and in the construction stage for maximizing waste reduction, shall be separately considered.

(b) After considering the opportunities for reducing waste generation and maximizing re-use, the applicant shall estimate the types and quantities of the wastes required to be disposed of as a consequence and describe in detail the disposal options for the wastes. The disposal options recommended for each type of wastes shall take into account the result of the assessment in item (c)

below. The Applicant shall state clearly in the EIA report the transportation methods, routings and the frequency of the trucks/vessels involved, any barging point or conveyor system to be used, the stockpiling areas and the disposal outlets for the wastes identified; and

(c) The Applicant shall address in detail the impacts caused by handling (including stockpiling, labelling, packaging & storage), collection, transportation and disposal of wastes and propose appropriate mitigation measures. This assessment shall cover the following areas :

- potential hazard;
- air and odour emissions;
- noise;
- wastewater discharge;
- public transport; and
- landscape and visual impacts, if any.

(iii) Dredging/Excavation, Filling and Dumping

(a) The Applicant shall identify and quantify as far as practicable all dredging/excavation, fill extraction, filling, reclamation, sediment/mud transportation and disposal activities and requirements. Potential fill source and dumping ground to be involved shall also be identified. Field investigation, sampling and chemical and biological laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. Prior to the commencement of the tests, the Applicant shall propose the ranges of parameters to be analyzed; the number, type and methods of sampling; sample preservation; chemical and biological

laboratory test methods to be used for consideration in accordance with Section 4.4.2(c) of the TM and documented in the EIA report. The categories of sediment/mud which are to be disposed of in accordance with a permit granted under the Dumping at Sea Ordinance (DASO) shall be identified by both chemical and biological tests and their quantities shall be estimated. If the presence of any serious contamination of sediment/mud which requires special treatment/disposal is confirmed, the Applicant shall identify the most appropriate treatment and/or disposal arrangement and demonstrate its feasibility. The Applicant shall provide supporting document, such as agreement by the relevant facilities management authorities, to demonstrate the viability of any treatment/disposal plan.

- (b) The Applicant shall identify and evaluate the best practical dredging/excavation methods to minimize dredging/excavation and dumping requirements and demand for fill sources based on the criterion that existing sediment/mud shall be left in place and not to be disturbed as far as possible.

Land Contamination Assessment

3.4.5.3 If any contaminated land use as stated in Section 3.1 of Annex 19 in the TM is identified, the Applicant shall carry out the land contamination assessment as detailed from sub-sections (i) to (vi) below:

- (i) The Applicant shall follow the guidelines for evaluation and assessing potential land contamination issues as stated in Section 3.1 of Annex 19 in the TM.
- (ii) The study area for the land contamination impact shall include any potential land contamination site(s) within the Project alignment and boundaries of all associated areas under the Project, such as terminus, depot, emergency rescue station, access roads, adits, ventilation shafts, works sites, barging points and aboveground conveyor system

if any, and any other potential contaminated site(s) identified in this EIA study.

- (iii) The Applicant shall provide a clear and detailed account of the present land use (including description of the activities, chemicals and hazardous substances handled with clear indication of their storage and location by reference to a site layout plan), the relevant past landuse history in relation to possible land contamination and the present of any contaminated materials requiring disposal, in particular those contaminated by dioxins (including accident records, change of landuse and the like).
- (iv) During the execution of the EIA study, the Applicant shall submit a contamination assessment plan (CAP) to the Director prior to conducting an actual contamination impact assessment of the land/site/materials requiring disposal. The CAP shall include proposals on sampling and analysis required and shall aim at determining the nature and extent of the contamination of the land/site/materials requiring disposal.
- (v) Based on the CAP, the Applicant shall conduct a contamination impact assessment, compile a contamination assessment report (CAR) to document the findings and submit the CAR to the Director. If land contamination is confirmed, the Applicant shall prepare a remediation action plan (RAP) to formulate necessary remedial measures and disposal methods for the contaminated materials. The CAR and the RAP shall be documented in the EIA report. The RAP shall also include supporting documents to demonstrate the Plan's viability, such as agreement by the relevant facilities management authorities.
- (vi) If there is / are potential contaminated site(s) inaccessible for preparing sampling and analysis during the course of the EIA study as required under section 3.4.5.3(iv) of this study brief, e.g. due to site access problem, the Applicant's CAP shall include:

- a review of the available information;
- an initial contamination evaluation of this/these site(s) and possible remediation methods;
- a confirmation of whether the contamination problem at this/these site(s) would be surmountable;
- a sampling and analysis proposal which shall aim at determining the nature and the extent of the contamination of this/these site(s); and
- a schedule of submission of revised CAP (if necessary), CAR and RAP upon this/these site(s) is/are accessible.

3.4.5.4 To prevent contamination problems arising in future due to the operation of the depot in the Shek Kong site or other alternative site, the Applicant shall:

- (i) Identify the possible sources of contamination in their operations; and
- (ii) Formulate appropriate structural/engineering design(s), adopt appropriate operational practices, waste management strategies and precautionary measures for prevention of contamination problems.

3.4.6 Ecological Impact

3.4.6.1 The Applicant shall follow the criteria and guidelines as stated in Annex 8 and Annex 16 of the TM for evaluating and assessing ecological impact.

3.4.6.2 The study area for the purpose of ecological assessment shall include all areas within a distance of 500m from the boundaries of the railway alignment and all associated areas under the Project, such as terminus, depot, emergency rescue station, access roads, adits, ventilation shafts, works sites, barging points and aboveground conveyor system if any, and the areas likely to be impacted by the Project.

3.4.6.3 In the ecological impact assessment, the Applicant shall examine the flora, fauna and other components of the ecological habitats within the study area

including those highlighted in Section 3.2(viii), with an aim to protect, maintain or rehabilitate the natural environment. In particular, the project shall avoid impacts on recognized sites of conservation importance and other ecological sensitive areas. The assessment shall identify and quantify the potential ecological impacts associated with the Project and including the impacts of any haul roads and temporary access.

3.4.6.4 The assessment shall include the following –

- (i) Review of the findings of relevant studies and collating all the available information regarding the ecological characters of the study area;
- (ii) Evaluation of the information collected and identification of any information gap relating to the assessment of potential ecological impacts to the terrestrial and aquatic environment;
- (iii) Carrying out necessary field surveys (the duration of which shall be at least 6 months) and investigations to verify the information collected, fill the information gaps identified and fulfill the objectives of the EIA study;
- (iv) Establishing a general ecological profile of the study area, taking into consideration the variations across wet and dry seasons, and describing the characteristics of each habitat found; major information to be provided shall include –
 - (a) Description of the physical environment, including all recognized sites of conservation importance and assess whether these sites will be affected by the Project and its associated works;
 - (b) Preparation of habitat maps of suitable scale (1:1000 to 1:5000) showing the types and locations of habitats in the study area;

- (c) Definition and characterization of the ecological characteristics of each habitat type, including size, vegetation type, species present, dominant species found, species diversity and abundance, community structure, seasonal patterns and inter-dependence of the habitats and species, and presence of any features of ecological importance;
 - (d) Presentation of representative colour photos of each habitat type and of any important ecological features identified; and
 - (e) Listing the species found that are rare, endangered and/or listed under local legislation, international conventions for conservation of wildlife/habitats or red data books.
- (v) Investigation and description of the existing wildlife uses of various habitats with special attention to those wildlife groups and habitats identified as having conservation interests including but not limited to –
- (a) Fish ponds;
 - (b) Natural stream course and meanders;
 - (c) Freshwater marshes;
 - (d) Woodlands;
 - (e) Mammals in particular Eurasian Otter (*Lutra lutra*);
 - (f) Avifauna in particular waterfowls such as Greater Painted Snipe (*Rostratula benghalensis*);
 - (g) Any other habitats and wildlife groups identified as

having special conservation interests by the study.

- (vi) Description of all recognized sites of conservation importance in the study area and its vicinity and assessment of whether the project will cause any adverse on-site or off-site impacts to these sites;

- (vii) Identification and quantification, with the use of suitable methodology, of any direct, indirect, on-site, off-site, primary, secondary and cumulative ecological impacts such as destruction of habitats, reduction of species abundance/diversity, loss of feeding, nesting or/and breeding grounds, reduction of ecological carrying capacity and habitat fragmentation. The following shall be addressed in particular—
 - (a) The ecological impacts of loss of areas of conservation interest such as natural stream courses, fishponds, freshwater marshes and woodlands, on temporary and permanent basis, due to the construction and operation of the Project;

 - (b) The ecological impacts due to disturbance during the construction and operational stages of the project such as increase in noise, dust, effluent discharges or other deterioration of environmental quality.

 - (c) The potential hydrological disruptions such as draw down of water table and any consequential ecological impacts on the wetlands; and the potential risks of ground surface settlement or heaving along the tunnel section and resulting ecological impacts;

- (d) The ecological impacts due to any sedimentation to the inter-tidal mudflats, fish ponds and Inner Deep Bay during the construction stage;

- (e) The cumulative impacts of the project and other existing, committed and proposed developments in accordance with section 4.3.3 of the TM. These "existing, committed and proposed developments" shall include but not limited to the "Proposed Comprehensive Development at Wo Shang Wai, Yuen Long" (adjacent to Palm Springs, Royal Palms and Wo Shang Wai), based on the best available information at the time of the assessment.

The Applicant shall explain in the EIA report and evaluate whether any of the above developments have a bearing on the environmental acceptability of the project. In the event of encroachment, the EIA report shall demonstrate that the same kind of ecological function and capacity can be achieved through the mitigation measures;

- (viii) An evaluation on the significance and acceptability of the ecological impacts identified using criteria defined in the TM or other appropriate method to be considered in accordance with Section 4.4.2(c) of the TM;

- (ix) Recommendation of all possible alternatives, such as modifications of alignment and location of ventilation shaft, and practicable mitigation measures to avoid, minimize and/or compensate for any adverse ecological impacts identified. The mitigation measures may include, but not limited to, reinstatement of habitats temporarily affected by the proposed development to its original state and if possible with some enhancement features, or on-site and/or off-site wetland compensation;

- (x) Evaluation of the feasibility and effectiveness of the recommended mitigation measures and definition of the scope, type, location, implementation arrangement, resources requirement, subsequent management and maintenance of such measures;
- (xi) Determination and quantification as far as possible of the residual ecological impacts after implementation of the proposed mitigation measures;
- (xii) An evaluation on the severity and acceptability of the residual ecological impacts using criteria defined in the TM or other appropriate criteria to be considered in accordance with Section 4.4.2(c) of the TM;
- (xiii) Recommendation on the need for any ecological monitoring programme.

3.4.7 Fisheries Impact

3.4.7.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing fisheries impact as stated in Annexes 9 and 17 of the TM respectively.

3.4.7.2 The study area for the purpose of this fisheries impact assessment shall include all areas within a distance of 500m from the boundaries of the railway alignment and all associated areas under the Project, such as terminus, depot, emergency rescue station, access roads, adits, ventilation shafts, works sites, barging points and aboveground conveyor system if any. This study area shall be extended to include other areas with fish ponds and associated water system(s) if they are found also being impacted by the construction or operation of the Project during the course of the EIA study. Special attention should be given to the pond culture resources and activities at Mai Po.

3.4.7.3 The fisheries impact assessment shall provide the following information:-

- (i) Description of the physical environmental background;
- (ii) Description and quantification of existing pond culture activities;
- (iii) Description and quantification of existing fisheries resources (e.g. major fisheries products and stocks);
- (iv) Identification of parameters (e.g. water quality parameters) and areas that are important to fisheries;
- (v) Identification and quantification any direct/indirect impacts to fisheries, such as permanent resumption and temporary occupation of fish ponds, deterioration of water quality of fish ponds and the surrounding streams, hydrological disruptions such as draw-down of water table, blocking of access to the surrounding fish ponds, disturbance by construction noise and vibration, and possible restriction on pond culture related activities such as excavation (including formation and ploughing) due to the operation of the tunnel underneath;
- (vi) Evaluation of impacts and make proposals for effective mitigation measures with details on justification, description of scope and programme, feasibility as well as staff and financial implications including those related to subsequent management and maintenance requirements of the proposals; and
- (vii) Review of the need for monitoring during the construction and operation phase of the project and, if necessary, propose a monitoring and audit programme.

3.4.8 Landscape and Visual Impact

- 3.4.8.1 The Applicant shall follow the criteria and guidelines as stated in Annexes 10 and 18 of the TM for conducting Landscape and Visual Impacts Assessments for the Project, including evaluating and assessing impacts of

all above-ground structures and works areas associated with the Project. The landscape and visual impacts during both construction and operation phases within the study area shall be assessed. Should glare impacts be identified for the project, they shall also be assessed.

- 3.4.8.2 The study area for landscape impact assessment shall include all areas within a distance of 500m from the Project alignment and boundaries of all associated areas under the Project, such as terminus, depot, emergency rescue station, access roads, adits, ventilation shafts and aboveground conveyor system if any.
- 3.4.8.3 The study area for the visual impact assessment shall be defined by the visual envelopes of all above ground structures, such as terminus, depot, railway, ventilation shafts and temporary structures such as hoardings and work sites.
- 3.4.8.4 The Applicant shall review relevant outline development plan(s), outline zoning plan(s), layout plan(s), other published land use plans, planning briefs and studies which may identify areas of high landscape value and recommend green belt and areas with sensitive landscape designations, and visually sensitive areas/ receivers. Any guidelines on landscape strategy, landscape framework, urban design concept, building height profiles, designated view corridors, open space network and landscape link that may affect appreciation of the Project shall also be reviewed. The aim is to gain an insight to the future outlook of the area affected so as to assess whether the Project can fit into the surrounding setting. Any conflict with statutory town plan(s) shall be highlighted and appropriate follow-up action shall be recommended.
- 3.4.8.5 The Applicant shall describe, appraise, analyze and evaluate the existing landscape resources and character of the study area. A system shall be derived for judging landscape impact significance as required under the TM. The sensitivity of the landscape framework and its ability to accommodate change shall be particularly focused on. The Applicant shall identify the degree of compatibility of the Project with the existing and planned landscape setting. The landscape impact assessment shall quantify the

potential landscape impact as far as possible so as to illustrate the significance of such impacts arising from the project. Clear mapping of the landscape impact is required.

3.4.8.6 The Applicant shall carry out a tree survey as part of the Landscape Impact Assessment and the impacts on existing mature trees, protected tree species and trees of amenity value shall be addressed.

3.4.8.7 In view of the primarily underground nature of the Project, the assessment of visual impacts shall be conducted in two stages.

- (i) Visual Impact Assessment (VIA) scoping study - the Applicant shall prepare an initial assessment to define the scope for the VIA. The scoping study shall highlight all Project items, that is, all above-ground structures and / or works area which would have potential visual impacts with regard to their compatibility within the local visual context, type and number of visual sensitive receivers (VSRs) affected, viewing distance and potential blockage of view. The scoping study shall recommend those Project items which shall be subjected to VIA in accordance with Section 3.4.8.7(ii) based on the extent of their potential visual impacts. Such Project items shall include, but not limited to the West Kowloon Terminus, ventilation shafts at Wo Shang Wai, Tsat Sing Kong and Lui Kung Tin, the depot at Shek Kong, and other large scale railway related facilities which are incompatible in the local context. For other Project items which would have some visual impacts, but their visual impacts of which are localized and could be mitigated by broad design / landscaping mitigation measures, the Applicant shall identify and justify if considered no need for detailed VIA. However, alternative design schemes in accordance with Section 3.4.8.8 shall be studied and shall form part of the approval for the VIA.
- (ii) Detailed VIA for the Project items identified in (i) above should be prepared in accordance with Annexes 10 and 18 of the TM of

EIAO and the EIAO Guidance Note No. 8/2002. The assessment shall include the following:

- (a) Identification and plotting of visual envelope of the Project items within the study areas.
- (b) Identification of the key groups of sensitive receivers within the visual envelope of the Project items with regard to views from both ground level and elevated vantage points.
- (c) Description of the visual compatibility of the Project items with the surrounding and planned setting, and interference with key views of the adjacent areas; and
- (d) The severity of visual impacts in terms of distance, nature and number of sensitive receivers shall be identified. The visual impacts of the Project items with and without mitigation measures shall be assessed so as to demonstrate the effectiveness of the proposed mitigation measures.

3.4.8.8 The Applicant shall recommend mitigation measures to minimize adverse visual impacts of the Project items, including alternative location, scale (including size, bulk and height), built-form, architectural design, external finishings including material, texture and colour schemes. The design principle shall be to minimize visual intrusion and maximize visual compatibility with the existing and planned surrounding visual context. Justifications for the preferred design option(s) need to be provided in the VIA.

3.4.8.9 The Applicant shall evaluate the merits of total and partial preservation of the existing landscape. Alternative rail alignment, station design, ventilation shafts and construction methods that would avoid or reduce the identified landscape and visuals impacts shall first be considered and be evaluated for comparison before adopting other mitigation or compensatory measures to alleviate the impacts. The mitigation measures proposed shall not only be

concerned with damage reduction but shall also include consideration of potential enhancement of the existing landscape. The Applicant shall recommend mitigation measures to minimize the adverse effects identified above, including provision of a landscape design.

3.4.8.10 The Applicant shall recommend mitigation measures to minimize the adverse effects identified above, including provision of a landscape design. The mitigation measures shall also include the preservation of vegetation, transplanting of trees of good amenity value, provision of screen planting, re-vegetation of disturbed lands, compensatory planting, re-provisioning of amenity areas and open spaces, sensitive landscape treatment on slope works and any measures to mitigate the disturbance of the existing land use.

3.4.8.11 The Applicant shall identify parties for the management and maintenance of any proposed mitigation measures to ensure their effectiveness throughout the operation phase of the project. A practical programme and funding proposal for the implementation of the recommended measures shall also be worked out.

3.4.8.12 The Applicant shall provide annotated illustration materials such as colour perspective drawing, plans and section/elevation diagrams, annotated oblique aerial photographs, photographs taken at vantage points, and/or computer-generated photomontages particularly from but not limited to the most severely affected vantage points to illustrate the landscape and visual impacts of the Project in four stages, i.e. existing conditions, unmitigated impacts at Day 1, mitigated impacts at Day 1 and residual impact at Year 10. Options of design schemes should be illustrated with photomontages to show the visual impact on the surrounding areas. True colour samples may be requested. The Applicant shall record the technical details in preparing the illustration, which may need to be submitted for verification of the accuracy of the illustration.

3.4.9 Impact on Sites of Cultural Heritage

3.4.9.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing the cultural heritage impacts as stated in Annexes 10 and 19 of the

TM respectively, “Guidelines for Cultural Heritage Impact Assessment” in Appendix C-1 and “Guidelines for Marine Archaeological Investigation” (MAI) in Appendix C-2, whenever applicable.

3.4.9.2 The study area shall include all areas within a distance of 500m from the Project alignment and boundaries of all associated areas under the Project, such as terminus, depot, emergency rescue station, access roads, adits, ventilation shafts, works sites, barging points and aboveground conveyor system if any.

3.4.9.3 The cultural heritage impact assessment shall include the following:

(i) Archaeological Impact Assessment (AIA)

(a) The Applicant shall engage qualified archaeologist(s) who shall have obtained a License from the Antiquity Authority under the Antiquities and Monuments Ordinance (Cap 53) to review the archaeological potential (both terrestrial and aquatic if applicable) of the study area taking the results of previous archaeological investigations and other background of the site into account. In case the existing information is inadequate or where the Project or associated works has not been adequately studied before, the archaeologist(s) shall conduct the investigations (both terrestrial and aquatic if applicable) to assemble data.

(b) Particular attention shall be paid to address possible impact to the following archaeological sites:

- i. Pat Heung Sheung Tsuen Archeological Site
- ii. Tsat Sing Kong Archeological Site
- iii. Ngau Tam Mei Archeological Site

- iv. Mai Po Archeological Site
 - v. Lei Cheng Uk Han Tomb
 - vi. Yuen Shan Archaeological Site
- (c) The details of the archaeological impact assessment shall be submitted to the Antiquities Authority and the Director prior to the commencement of the assessment for consideration in accordance with Section 4.4.2(c) of the TM and documented in the EIA report. Reference can be made to relevant previous studies.
- (d) Based on existing and collected data, the Applicant shall evaluate whether the proposed development(s) associated with the Project and associated works is(are) acceptable from archaeological preservation point of view. In case adverse impact on archaeological resources cannot be avoided, appropriate mitigation measures should be designed.
- (e) The Applicant shall draw necessary reference to relevant sections of the “Guidelines for Cultural Heritage Impact Assessment” in Appendix C-1 and “Guidelines for Marine Archaeological Investigation” (MAI) in Appendix C-2, whenever applicable.
- (ii) Built Heritage Impact Assessment
- (a) The Applicant shall conduct a built heritage impact assessment (BHIA), taking the results of previous BHIA and other background of the site into account, to identify the known and unknown heritage items within the study area that may be affected by the Project and its associated works to assess the direct and indirect impacts on the identified heritage items. Appropriate mitigation measures should be recommended in the

BHIA.

(b) Particular attention shall be paid to address possible impact to the following graded historical buildings:

- i. Kowloon West II Battery
- ii. Shophouses at Nos. 269 & 271 Yu Chau Street
- iii. Hung Shing Temple, Tin Hau Temple at Yee Kuk Street
- iv. Yau Ma Tei Police Station
- v. Yau Ma Tei Wholesale Fruit Market
- vi. Shophouses at Nos. 117, 119, 121, 123 & 125 Nam Cheong Street
- vii. Sam Tai Tsz Temple and Pak Tai Temple, Sham Shui Po
- viii. Sham Shui Po Public Dispensary
- ix. Mo Tai Temple, Sham Shui Po
- x. "Lui Seng Chun", 119 Lai Chi Kok Road, Tai Kok Tsui
- xi. Mei Ho House, Shek Kei Mei Estate

- xii. North Kowloon Magistracy
 - xiii. Historical structures at Jubilee Reservoir
 - xiv. Pat Heung Temple, Pat Heung
 - xv. Lai Ancestral Hall at Tsz Tong Tsuen, Pat Heung
- (c) The Applicant shall demonstrate that all reasonable efforts have been made to consider alternative location(s) for the Emergency Rescue Station at Shek Kong to be away as far as possible from the Pat Heung Temple and Lai Ancestral Hall at Tsz Tong Tsuen, Pat Heung, or mitigation measures through visual enhancement and modification of layout and design of the Emergency Rescue Station shall be recommended and implemented by the Applicant accordingly to relieve the identified impacts.
- (d) The Applicant shall draw necessary reference to relevant sections of the “Guidelines for Cultural Heritage Impact Assessment” in Appendix C-1.
- (iii) To facilitate efficient retrieval, the Applicant shall provide in the EIA report a summary to include the assessment methodologies and key assessment assumptions adopted in this EIA study and the limitations of these assessment(s) methodologies/assumptions. The proposed use of any alternative assessment tool(s) or assumption(s) have to be justified by the Applicant, with supporting documents based on cogent, scientific and objectively derived reason(s) for consideration in accordance with Section 4.4.2(c) of the TM. This summary and the related supporting documents shall be provided in the form of an Appendix to the EIA study report.
- (iv) The information of all the identified archaeological sites, historic buildings and structures including their ownership, historical

background, 1:1000 scale location plans, photographs and the like together with the nearby work areas shall be provided. A Master Layout Plan highlighting the location of both the proposed work areas and all identified heritage items is also required. A full bibliography and the source of information consulted should be provided to assist the evaluation of the quality of the evidence.

- (v) The Applicant shall also identify all other heritage items that may be adversely affected by the Project. The inventory shall include known and potential archaeological sites, pre-1950 buildings and structures, post-1950 buildings and structure of high architectural and historical significance, and historic landscape features (e.g. sites of historical events, sites providing a significant historical record, a setting for buildings/monuments of architectural/archaeological importance, historic field patterns, tracks, fish ponds and cultural elements (i.e. fung shui woodlands and clan graves).
- (vi) The Applicant shall assess the extent to which those heritage items might be directly and indirectly affected and recommend possible alternatives (such as modification of layout and design of the project) and practicable monitoring and mitigation measures to avoid or keep the adverse impacts on the heritage items to the minimum. Besides, a checklist including all affected heritage items, impacts identified, recommended mitigation measures as well as the implementation agent and timing and duration of the implementation shall also be included in the EIA report.
- (vii) In case where the sources of information on heritage items prove to be inadequate or where the project area has not been adequately studied before, field surveys and site investigations shall be conducted by the Applicant to assemble the necessary data. Regarding the assessment study on cultural heritage, it shall be conducted by qualified persons with proven records of archaeological and historical building research works in Hong Kong. The archaeological survey shall be carried out by a qualified archaeologist who shall obtain a License from the Antiquity

Authority before undertaking the field evaluation under the Antiquities and Monuments Ordinance (Cap.53).

3.4.10 Summary of Environmental Outcomes

The Applicant shall include in the EIA report a summary of the key environmental outcomes arising from the EIA study, including the population and environmentally sensitive areas protected, environmentally friendly designs recommended, key environmental problems avoided, compensation areas included and the environmental benefits of environmental protection measures recommended.

4. Environmental Monitoring and Audit (EM&A) Requirements

- 4.1 The Applicant shall define the scope of the EM&A requirements for the project in the EIA study. The Applicant shall also consider and propose real-time reporting of monitoring data for the Project through a dedicated internet website as appropriate, and the setting up of a community liaison office to enhance communication with the public on the environmental impacts and mitigation measures for the Project.
- 4.2 Subject to confirmation of EIA findings, the Applicant shall comply with requirements as stipulated in Annex 21 of the TM.
- 4.3 The Applicant shall prepare a project implementation schedule (in the form of a checklist as shown in Appendix D to this EIA study brief) containing all the EIA study recommendations and mitigation measures with reference to the implementation programme. The Project Implementation Schedule shall include the explicit agreement reached between the Applicant and relevant parties on the responsibility for funding, implementation, management and maintenance of mitigation measures. Alternatively, the Project Implementation Schedule shall include an undertaking from the Applicant to assume the responsibility of those mitigation measures until an agreement is reached between the Applicant and relevant parties on the funding, implementation, management and maintenance of mitigation measures.

5. Duration of Validity

The Applicant shall notify the Director of the commencement of the EIA study. If the EIA study does not commence within 36 months after the date of issue of this EIA study brief, the Applicant shall apply to the Director for a fresh EIA study brief before commencement of the EIA study.

6. Report Requirements

6.1 In preparing the EIA report, the Applicant shall refer to Annex 11 of the TM for the contents of an EIA report. The Applicant shall also refer to Annex 20 of the TM, which stipulates the guidelines for the review of an EIA report.

6.2 The Applicant shall supply the Director with the following number of copies of the EIA report and the executive summary:

- (i) 60 copies of the EIA report in English and 80 copies of the executive summary (each bilingual in both English and Chinese) as required under section 6(2) of the EIAO to be supplied at the time of application for approval of the EIA report.
- (ii) when necessary, addendum to the EIA report and the executive summary submitted in (i) above as required under section 7(1) of the EIAO, to be supplied upon advice by the Director for public inspection.
- (iii) 20 copies of the EIA report in English and 50 copies of the executive summary (each bilingual in both English and Chinese) with or without Addendum as required under section 7(5) of the EIAO, to be supplied upon advice by the Director for consultation with the Advisory Council on the Environment.

- 6.3 The Applicant shall, upon request, make additional copies of above documents available to the public, subject to payment by the interested parties of full costs of printing.
- 6.4 In addition, to facilitate public inspection of the EIA report via the EIAO Internet Website, the Applicant shall provide electronic copies of both the EIA report and the executive summary prepared in HyperText Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 1.3 or later). For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EIA report and the executive summary shall be included in the beginning of the document. Hyperlinks to all figures, drawings and tables in the EIA report and executive summary shall be provided in the main text from where the respective references are made. All graphics in the report shall be in interlaced GIF format.
- 6.5 The electronic copies of the EIA report and the executive summary shall be submitted to the Director at the time of application for approval of the EIA report.
- 6.6 When the EIA report and the executive summary are made available for public inspection under s.7(1) of the EIAO, the content of the electronic copies of the EIA report and the executive summary must be the same as the hard copies and the Director shall be provided with the most updated electronic copies.
- 6.7 To promote environmentally friendly and efficient dissemination of information, both hardcopies and electronic copies of future EM&A reports recommended by the EIA study shall be required.
- 6.8 To facilitate public involvement in the EIA process, the Applicant shall produce 3-dimensional electronic visualizations of the major findings (in particular the road traffic noise prediction (if any), water quality and landscape and visual impacts) and elements of the EIA report, including baseline environmental information, the environmental situations with or without the project, key mitigated and unmitigated environmental impacts, and key recommended environmental mitigation measures so that the public can understand the Project and the associated environmental issues. The visualizations shall be based on

the EIA report and released to the public. The 3-dimensional visualizations shall be developed and constructed such that they can be accessed and viewed by the public through an internet browser at a reasonable speed and without the need for software license requirement at the client's end. The visualizations shall be deposited in 10 copies of CD-ROM or DVD±R.

7. Other Procedural Requirements

- 7.1 If there is any change in the name of Applicant for this EIA study brief during the course of the EIA study, the Applicant must notify the Director immediately.
- 7.2 If there is any key change in the scope of the Project mentioned in Section 1.2 of this EIA study brief and in the Project Profile, the Applicant must seek confirmation from the Director in writing on whether or not the scope of issues covered by this EIA study brief can still cover the key changes, and the additional issues, if any, that the EIA study must also address. If the changes to the Project fundamentally alter the key scope of the EIA study brief, the Applicant shall apply to the Director for a fresh EIA study brief.

--- END OF EIA STUDY BRIEF ---

June 2008
Environmental Assessment Division,
Environmental Protection Department

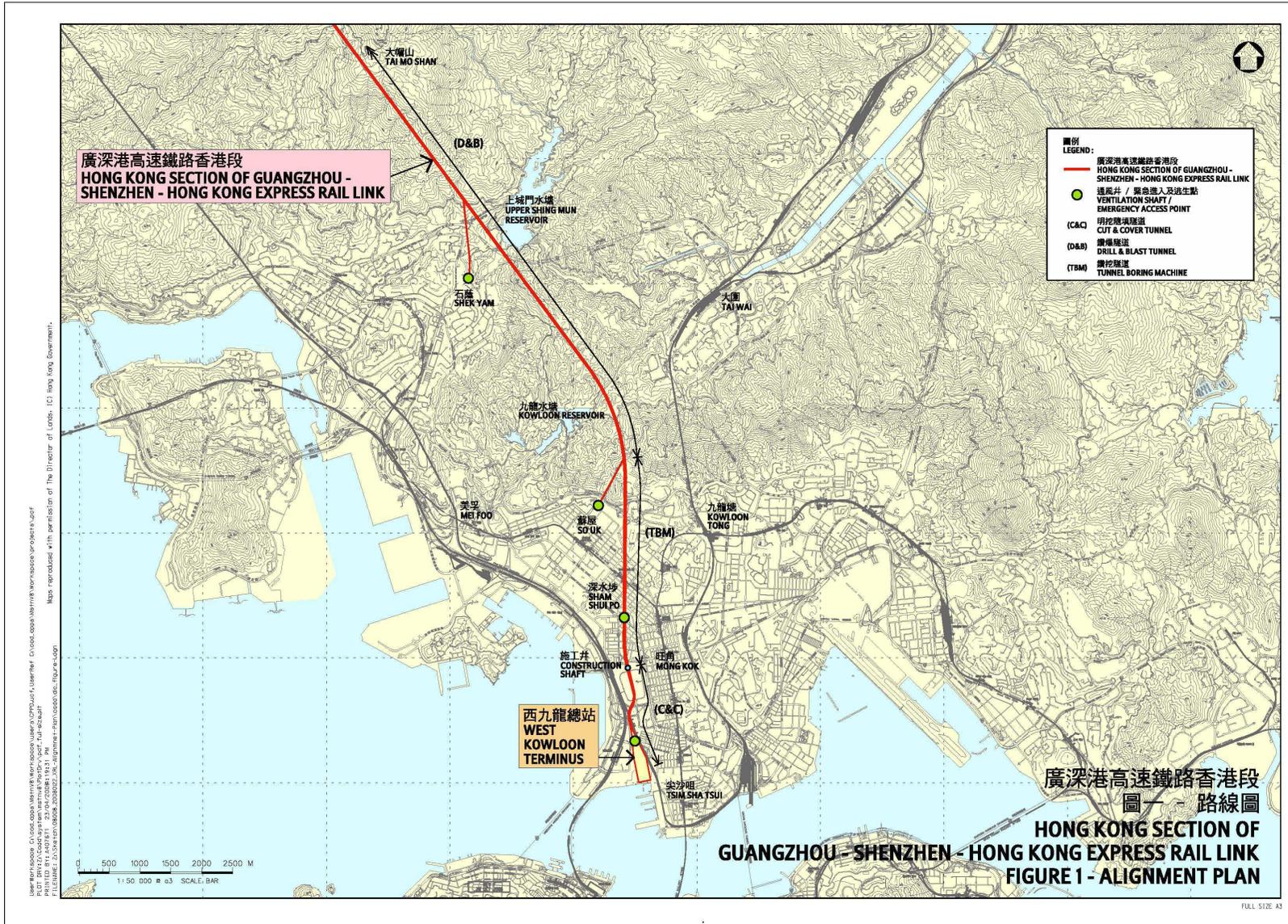


Figure 1: Alignment Plan
 Project Title: Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link

EIA Study Brief No.: ESB-189/2008
 Note: This figure is based on Figure 1 of the Project Profile PP-353/2008

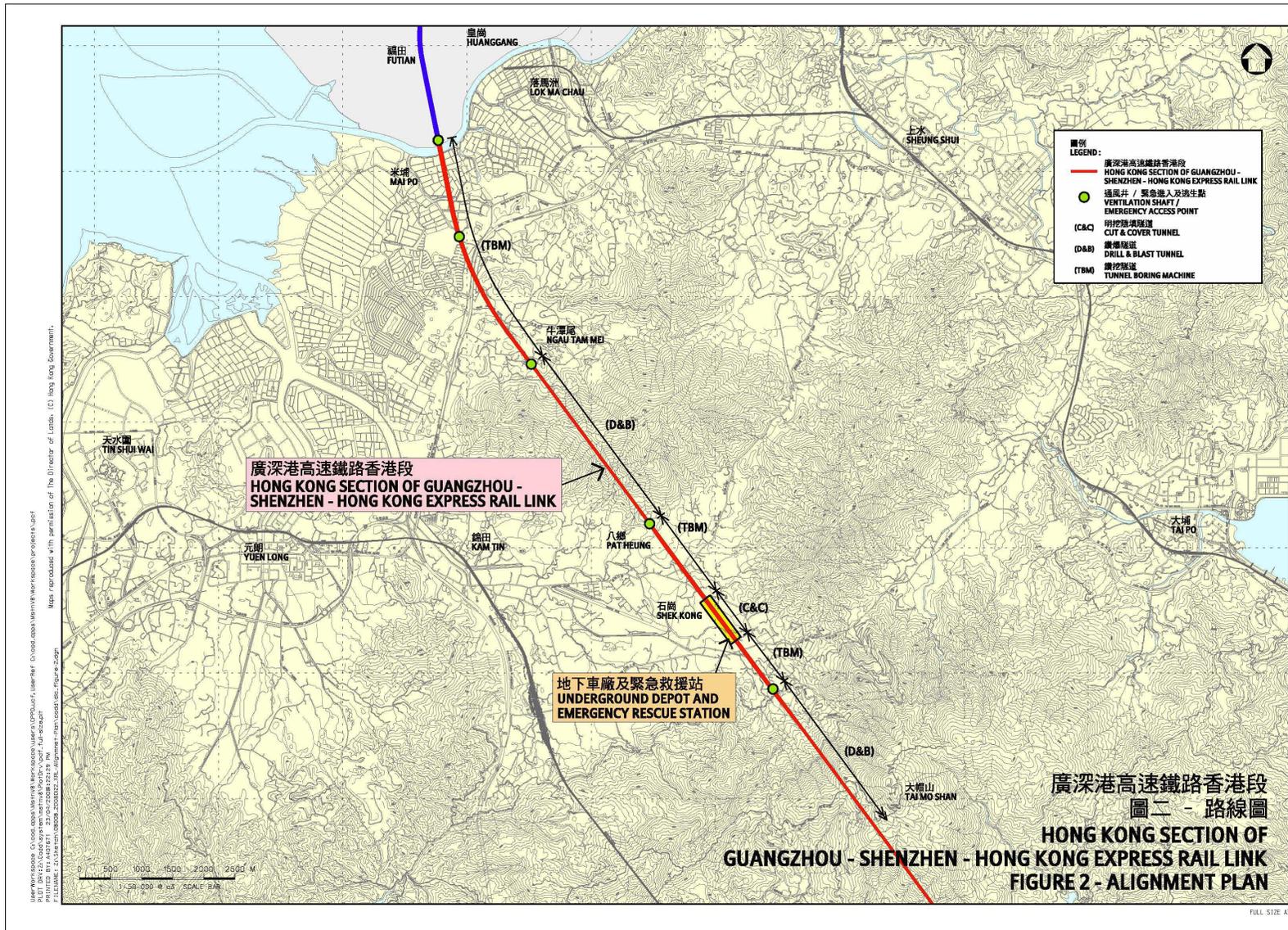


Figure 2: Alignment Plan
 Project Title: Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link

EIA Study Brief No.: ESB-189/2008

Note: This figure is based on Figure 2 of the Project Profile PP-353/2008

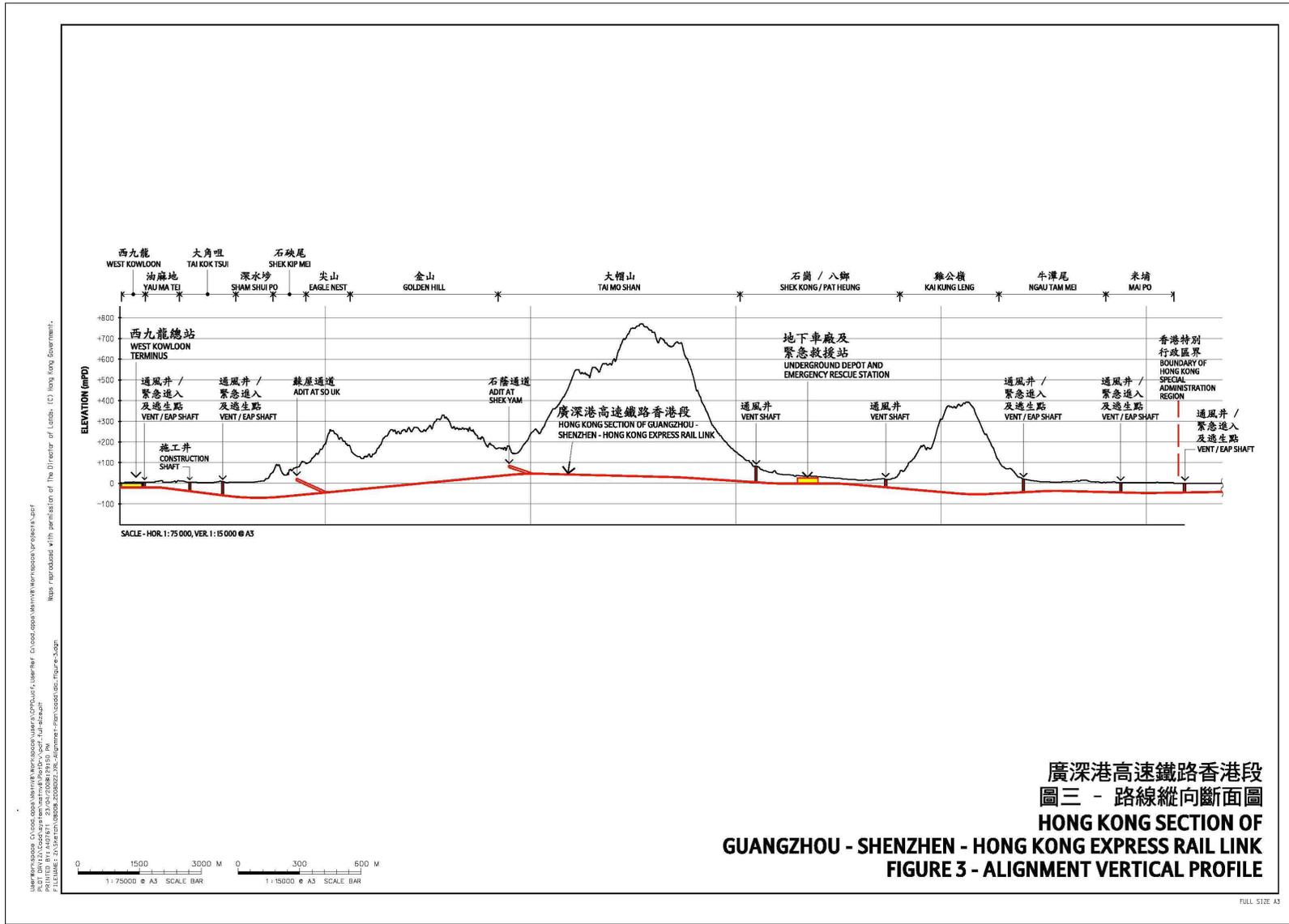


Figure 3: Alignment Vertical Profile
 Project Title: Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link

EIA Study Brief No.: ESB-189/2008

Note: This figure is based on Figure 3 of the Project Profile PP-353/2008

APPENDIX A-1

Guidelines on Choice of Models and Model Parameters in Air Quality Assessment

[The information contained in this Appendix is only meant to assist the Applicant in performing the air quality assessment. The Applicant must exercise professional judgment in applying this general information for the Project.]

1. Introduction

1.1 To expedite the review process by the Authority and to assist project proponents or environmental consultants with the conduct of air quality modelling exercise which are frequently called for as part of environmental impact assessment studies, this paper describes the usage and requirements of a few commonly used air quality models.

2. Choice of Models

2.1 The models which have been most commonly used in air quality impact assessments, due partly to their ease of use and partly to the quick turn-around time for results, are of Gaussian type and designed for use in simple terrain under uniform wind flow. There are circumstances when these models are not suitable for ambient concentration estimates and other types of models such as physical, numerical or mesoscale models will have to be used. In situations where topographic, terrain or obstruction effects are minimal between source and receptor, the following Gaussian models can be used to estimate the near-field impacts of a number of source types including dust, traffic and industrial emissions.

<u>Model</u>	<u>Applications</u>
FDM	for evaluating fugitive and open dust source impacts (point, line and area sources)
CALINE4	for evaluating mobile traffic emission impacts (line sources)
ISCST3	for evaluating industrial chimney releases as well as area and volumetric sources (point, area and volume sources); line sources can be approximated by a number of volume sources.

These frequently used models are also referred to as Schedule 1 models (see attached list).

- 2.2 Note that both FDM and CALINE4 have a height limit on elevated sources (20 m and 10m, respectively). Source of elevation above these limits will have to be modelled using the ISCST3 model or suitable alternative models. In using the latter, reference should be made to the 'Guidelines on the Use of Alternative Computer Models in Air Quality Assessment' in Appendix A-3.
- 2.3 The models can be used to estimate both short-term (hourly and daily average) and long-term (annual average) ambient concentrations of air pollutants. The model results, obtained using appropriate model parameters (refer to Section 3) and assumptions, allow direct comparison with the relevant air quality standards such as the Air Quality Objectives (AQOs) for the relevant pollutant and time averaging period.

3. Model Input Requirements

3.1 Meteorological Data

3.1.1 At least 1 year of recent meteorological data (including wind speed, wind direction, stability class, ambient temperature and mixing height) from a weather station either closest to or having similar characteristics as the study site should be used to determine the highest short-term (hourly, daily) and long-term (annual) impacts at identified air sensitive receivers in that period. The amount of valid data for the period should be no less than 90 percent.

3.1.2 Alternatively, the meteorological conditions as listed below can be used to examine the worst case short-term impacts:

Day time: stability class D; wind speed 1 m/s (at 10m height); worst-case wind angle; mixing height 500 m

Night time: stability class F; wind speed 1 m/s (at 10m height); worst case wind angle; mixing height 500 m

This is a common practice with using CALINE4 model due to its inability to handle lengthy data set.

3.1.3 For situations where, for example, (i) the model (such as CALINE4) does not allow easy handling of one full year of meteorological data; or (ii) model run time is a

concern, the followings can be adopted in order to determine the daily and annual average impacts:

- (i) perform a frequency occurrence analysis of one year of meteorological data to determine the actual wind speed (to the nearest unit of m/s), wind direction (to the nearest 10°) and stability (classes A to F) combinations and their frequency of occurrence;
- (ii) determine the short term hourly impact under all of the identified wind speed, wind direction and stability combinations; and
- (iii) apply the frequency data with the short term results to determine the long term (daily / annual) impacts.

Apart from the above, any alternative approach that will capture the worst possible impact values (both short term and long term) may also be considered.

3.1.4 Note that the anemometer height (relative to a datum same for the sources and receptors) at which wind speed measurements were taken at a selected station should be correctly entered in the model. These measuring positions can vary greatly from station to station and the vertical wind profile employed in the model can be grossly distorted from the real case if incorrect anemometer height is used. This will lead to unreliable concentration estimates.

3.1.5 An additional parameter, namely, the standard deviation of wind direction, σ_{θ} , needs to be provided as input to the CALINE4 model. Typical values of σ_{θ} range from 12° for rural areas to 24° for highly urbanised areas under 'D' class stability. For semi-rural such as new development areas, 18° is more appropriate under the same stability condition. The following reference can be consulted for typical ranges of standard deviation of wind direction under different stability categories and surface roughness conditions.

Ref.(1): Guideline On Air Quality Models (Revised), EPA-450/2-78-027R, United States Environmental Protection Agency, July 1986.

3.2 Emission Sources

All the identified sources relevant to a process plant or a study site should be entered in the model and the emission estimated based on emission factors compiled in the

AP-42 (Ref. 2) or other suitable references. The relevant sections of AP-42 and any parameters or assumptions used in deriving the emission rates (in units g/s, g/s/m or g/s/m²) as required by the model should be clearly stated for verification. The physical dimensions, location, release height and any other emission characteristics such as efflux conditions and emission pattern of the sources input to the model should also correspond to site data.

If the emission of a source varies with wind speed, the wind speed-dependent factor should be entered.

Ref.(2): Compilation of Air Pollutant Emission Factors, AP-42, 5th Edition, United States Environmental Protection Agency, January 1995.

3.3 Urban/Rural Classification

Emission sources may be located in a variety of settings. For modelling purposes these are classified as either rural or urban so as to reflect the enhanced mixing that occurs over urban areas due to the presence of buildings and urban heat effects. The selection of either rural or urban dispersion coefficients in a specific application should follow a land use classification procedure. If the land use types including industrial, commercial and residential uses account for 50% or more of an area within 3 km radius from the source, the site is classified as urban; otherwise, it is classified as rural.

3.4 Surface Roughness Height

This parameter is closely related to the land use characteristics of a study area and associated with the roughness element height. As a first approximation, the surface roughness can be estimated as 3 to 10 percent of the average height of physical structures. Typical values used for urban and new development areas are 370 cm and 100 cm, respectively.

3.5 Receptors

These include discrete receptors representing all identified air sensitive receivers at their appropriate locations and elevations and any other discrete or grid receptors for supplementary information. A receptor grid, whether Cartesian or Polar, may be used to generate results for contour outputs.

3.6 Particle Size Classes

In evaluating the impacts of dust-emitting activities, suitable dust size categories relevant to the dust sources concerned with reasonable breakdown in TSP ($< 30 \mu\text{m}$) and RSP ($< 10 \mu\text{m}$) compositions should be used.

3.7 NO_2 to NO_x Ratio

The conversion of NO_x to NO_2 is a result of a series of complex photochemical reactions and has implications on the prediction of near field impacts of traffic emissions. Until further data are available, three approaches are currently acceptable in the determination of NO_2 :

- (a) Ambient Ratio Method (ARM) - assuming 20% of NO_x to be NO_2 ; or
- (b) Discrete Parcel Method (DPM, available in the CALINE4 model); or
- (c) Ozone Limiting Method (OLM) - assuming the tailpipe NO_2 emission to be 7.5% of NO_x and the background ozone concentration to be in the range of 57 to $68 \mu\text{g}/\text{m}^3$ depending on the land use type (see also the EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts' in Appendix A-2).

3.8 Odour Impact

In assessing odour impacts, a much shorter time-averaging period of 5 seconds is required due to the shorter exposure period tolerable by human receptors. Conversion of model computed hourly average results to 5-second values is therefore necessary to enable comparison against recommended standard. The hourly concentration is first converted to 3-minute average value according to a power law relationship which is stability dependent (Ref. 3) and a result of the statistical nature of atmospheric turbulence. Another conversion factor (10 for unstable conditions and 5 for neutral to stable conditions) is then applied to convert the 3-minute average to 5-second average (Ref. 4). In summary, to convert the hourly results to 5-second averages, the following factors can be applied:

<u>Stability Category</u>	<u>1-hour to 5-sec Conversion Factor</u>
A & B	45
C	27
D	9
E & F	8

Under 'D' class stability, the 5-second concentration is approximately 10 times the hourly average result. Note, however, that the combined use of such conversion factors together with the ISCST results may not be suitable for assessing the extreme close-up impacts of odour sources.

Ref.(3): Richard A. Duffee, Martha A. O'Brien and Ned Ostojic, 'Odor Modeling – Why and How', Recent Developments and Current Practices in Odor Regulations, Controls and Technology, Air & Waste Management Association, 1991.

Ref.(4): A.W.C. Keddie, 'Dispersion of Odours', Odour Control – A Concise Guide, Warren Spring Laboratory, 1980.

3.9 Plume Rise Options

The ISCST3 model provides by default a list of the U.S. regulatory options for concentration calculations. These are all applicable to the Hong Kong situations except for the 'Final Plume Rise' option. As the distance between sources and receptors are generally fairly close, the non-regulatory option of 'Gradual Plume Rise' should be used instead to give more accurate estimate of near-field impacts due to plume emission. However, the 'Final Plume Rise' option may still be used for assessing the impacts of distant sources.

3.10 Portal Emissions

These include traffic emissions from tunnel portals and any other similar openings and are generally modelled as volume sources according to the PIARC 91 (or more up-to-date version) recommendations (Ref. 5, section III.2). For emissions arising from underpasses or any horizontal openings of the like, these are treated as area or point sources depending on the source physical dimensions. In all these situations, the ISCST3 model or more sophisticated models will have to be used instead of the CALINE4 model. In the case of portal emissions with significant horizontal exit velocity which cannot be handled by the ISCST3 model, the impacts may be estimated by the TOP model (Ref. 6) or any other suitable models subject to prior agreement with EPD. The EPD's 'Guidelines on the Use of Alternative Computer Models in Air Quality Assessment' should also be referred to in Appendix A-3.

Ref.(5): XIXth World Road Congress Report, Permanent International Association of Road Congresses (PIARC), 1991.

Ref.(6): N. Ukegunchi, H. Okamoto and Y. Ide "Prediction of vehicular emission pollution around a tunnel mouth", Proceedings 4th International Clean Air Congress, pp. 205-207, Tokyo, 1977.

3.11 Background Concentrations

Background concentrations are required to account for far-field sources which cannot be estimated by the model. These values, to be used in conjunction with model results for assessing the total impacts, should be based on long term average of monitoring data at location representative of the study site. Please make reference to the paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts' in Appendix A-2 for further information.

3.12 Output

The highest short-term and long-term averages of pollutant concentrations at prescribed receptor locations are output by the model and to be compared against the relevant air quality standards specified for the relevant pollutant. Contours of pollutant concentration are also required for indicating the general impacts of emissions over a study area. Copies of model files in electronic format should also be provided for EPD's reference.

Schedule 1

Air Quality Models Generally Accepted by Hong Kong Environmental Protection Department for Regulatory Applications as at 1 July 1998 : *

Industrial Source Complex Dispersion Model - Short Term Version 3 (ISCST3) or the latest version developed by U.S. Environmental Protection Agency

California Line Source Dispersion Model Version 4 (CALINE4) or the latest version developed by Department of Transportation, State of California, U.S.A.

Fugitive Dust Model (FDM) or the latest version developed by U.S. Environmental Protection Agency

* EPD is continually reviewing the latest development in air quality models and will update this Schedule accordingly.

APPENDIX A-2

Guidelines on Assessing the 'TOTAL' Air Quality Impacts

[The information contained in this Appendix is only meant to assist the Applicant in performing the air quality assessment. The Applicant must exercise professional judgment in applying this general information for the Project.]

1. Total Impacts - 3 Major Contributions

1.1 In evaluating the air quality impacts of a proposed project upon air sensitive receivers, contributions from three classes of emission sources depending on their distance from the site should be considered. These are:

Primary contributions:	project induced
Secondary contributions:	pollutant-emitting activities in the immediate neighbourhood
Other contributions: (Background contributions)	pollution not accounted for by the previous two

2. Nature of Emissions

2.1 Primary contributions

In most cases, the project-induced emissions are fairly well defined and quite often (but not necessarily) the major contributor to local air quality impacts. Examples include those due to traffic network, building or road construction projects.

2.2 Secondary contributions

Within the immediate neighbourhood of the project site, there are usually pollutant emitting activities contributing further to local air quality impacts. For most local scale projects, any emission sources in an area within 500m radius of the project site with notable impacts should be identified and included in an air quality assessment to cover the short-range contributions. In the exceptional cases where there is one or more significant sources nearby, the study area may have to be extended or alternative estimation approach employed to ensure these impacts are reasonably accounted for.

2.3 Background contributions

The above two types of emission contributions should account for, to a great extent, the air quality impacts upon local air sensitive receivers, which are often amenable to estimation by the 'Gaussian Dispersion' type of models. However, a background air quality level should be prescribed to indicate the baseline air quality in the region of the project site, which would account for any pollution not covered by the two preceding contributions. The emission sources contributing to the background air quality would be located further afield and not easy to identify. In addition, the transport mechanism by which pollutants are carried over long distances (ranging from 1km up to tens or hundreds of kms) is rather complex and cannot be adequately estimated by the 'Gaussian' type of models.

3. Background Air Quality - Estimation Approach

3.1 The approach

In view of the difficulties in estimating background air quality using the air quality models currently available, an alternative approach based on monitored data is suggested. The essence of this approach is to adopt the long-term (5-year) averages of the most recent monitored air quality data obtained by EPD. These background data would be reviewed yearly or biennially depending on the availability of the monitored data. The approach is a first attempt to provide a reasonable estimate of the background air quality level for use in conjunction with EIA air quality assessment to address the cumulative impacts upon a locality. This approach may be replaced or supplemented by superior modelling efforts such as that entailed in PATH (Pollutants in the Atmosphere and their Transport over Hong Kong), a comprehensive territory-wide air quality modelling system currently being developed for Hong Kong. Notwithstanding this, the present approach is based on measured data and their long term regional averages; the background values so derived should therefore be indicative of the present background air quality. In the absence of any other meaningful way to estimate a background air quality for the future, this present background estimate should also be applied to future projects as a first attempt at a comprehensive estimate until a better approach is formulated.

3.2 Categorisation

The monitored air quality data, by 'district-averaging' are further divided into three categories, viz, Urban, Industrial and Rural/New Development. The background

pollutant concentrations to be adopted for a project site would depend on the geographical constituency to which the site belongs. The categorisation of these constituencies is given in Section 3.4. The monitoring stations suggested for the 'district-averaging'(arithmetic means) to derive averages for the three background air quality categories are listed as follows:

Urban: Kwun Tong, Sham Shui Po, Tsim Sha Tsui and Central/Western
 Industrial: Kwun Tong, Tsuen Wan and Kwai Chung
 Rural/New Development: Sha Tin, Tai Po, Junk Bay, Hong Kong South and Yuen Long

The averaging would make use of data from the above stations wherever available. The majority of the monitoring stations are located some 20m above ground.

3.3 Background pollutant values

Based on the above approach, background values for the 3 categories have been obtained for a few major air pollutants as follows:

POLLUTANT	URBAN	INDUSTRIAL	RURAL / NEW DEVELOPMENT
NO ₂	59	57	39
SO ₂	21	26	13
O ₃	62	68	57
TSP	98	96	87
RSP	60	58	51

All units are in micrograms per cubic metre. The above values are derived from 1992 to 1996 annual averages with the exception of ozone which represent annual average of daily hourly maximum values for year 1996.

In cases where suitable air quality monitoring data representative of the study site such as those obtained from a nearby monitoring station or on-site sampling are not available for the prescription of background air pollution levels, the above tabulated values can be adopted instead. Strictly speaking, the suggested values are only appropriate for long term assessment. However, as an interim measure and until a better approach is formulated, the same values can also be used for short term

assessment. This implies that the short term background values will be somewhat under-estimated, which compensates for the fact that some of the monitoring data are inherently influenced by secondary sources because of the monitoring station location.

Indeed, if good quality on-site sampling data which cover at least one year period are available, these can be used to derive both the long term (annual) and short term (daily / hourly) background values, the latter are usually applied on an hour to hour, day to day basis.

3.4 Site categories

The categories to which the 19 geographical constituencies belong are listed as follows:

DISTRICT	AIR QUALITY CATEGORY
Islands	Rural / New Development
Southern	Rural / New Development
Eastern	Urban
Wan Chai	Urban
Central & Western	Urban
Sai Kung	Rural / New Development
Kwun Tong	Industrial
Wong Tai Sin	Urban
Kowloon City	Urban
Yau Tsim	Urban
Mong Kok	Urban
Sham Shui Po	Urban
Kwai Tsing	Industrial
Sha Tin	Rural / New Development
Tsuen Wan	Industrial
Tuen Mun	Rural / New Development
Tai Po	Rural / New Development
Yuen Long	Rural / New Development
Northern	Rural / New Development

3.5 Provisions for 'double-counting'

The current approach is, by no means, a rigorous treatment of background air quality but aims to provide an as-realistic-as-possible approximation based on limited field data. 'Double-counting' of 'secondary contributions' may be apparent through the use of such 'monitoring-based' background data as some of the monitoring stations are of close proximity to existing emission sources. 'Primary contributions' due to a proposed project (which is yet to be realized) will not be double-counted by such an approach. In order to avoid over-estimation of background pollutant concentrations, an adjustment to the values given in Section 3.3 is possible and optional by multiplying the following factor:

$$(1.0 - E_{\text{Secondary contributions}}/E_{\text{Territory}})$$

where E stands for emission.

The significance of this factor is to eliminate the fractional contribution to background pollutant level of emissions due to 'secondary contributions' out of those from the entire territory. In most cases, this fractional contribution to background pollutant levels by the secondary contributions is minimal.

4. Conclusions

- 4.1 The above described approach to estimating the total air quality impacts of a proposed project, in particular the background pollutant concentrations for air quality assessment, should be adopted with immediate effect. Use of short term monitoring data to prescribe the background concentrations is no longer acceptable.

APPENDIX A-3

Guidelines on the Use of Alternative Computer Models in Air Quality Assessment

[The information contained in this Appendix is only meant to assist the Applicant in performing the air quality assessment. The Applicant must exercise professional judgment in applying this general information for the Project.]

1. Background

1.1 In Hong Kong, a number of Gaussian plume models are commonly employed in regulatory applications such as application for specified process licences and environmental impact assessments (EIAs). These frequently used models (as listed in Schedule 1 attached; hereafter referred to as Schedule 1 models) have no regulatory status but form the basic set of tools for local-scale air quality assessment in Hong Kong.

1.2 However, no single model is sufficient to cover all situations encountered in regulatory applications. In order to ensure that the best model available is used for each regulatory application and that a model is not arbitrarily applied, the project proponent (and/or its environmental consultants) should assess the capabilities of various models available and adopt one that is most suitable for the project concerned.

1.3 Examples of situations where the use of an alternative model is warranted include:

- (i) the complexity of the situation to be modelled far exceeds the capability of the Schedule 1 models; and
- (ii) the performance of an alternative model is comparable or better than the Schedule 1 models.

1.4 This paper outlines the demonstration / submission required in order to support the use of an alternative air quality model for regulatory applications for Hong Kong.

2. Required Demonstration / Submission

2.1 Any model that is proposed for air quality applications and not listed amongst the Schedule 1 models will be considered by EPD on a case-by-case basis. In such cases, the proponent will have to provide the followings for EPD's review:

- (i) Technical details of the proposed model; and
- (ii) Performance evaluation of the proposed model

Based on the above information, EPD will determine the acceptability of the proposed model for a specific or general applications. The onus of providing adequate supporting materials rests entirely with the proponent.

2.2 To provide technical details of the proposed model, the proponent should submit documents containing at least the following information:

- (i) mathematical formulation and data requirements of the model;
- (ii) any previous performance evaluation of the model; and
- (iii) a complete set of model input and output file(s) in commonly used electronic format.

2.3 On performance evaluation, the required approach and extent of demonstration varies depending on whether a Schedule 1 model is already available and suitable in simulating the situation under consideration. In cases where no Schedule 1 model is found applicable, the proponent must demonstrate that the proposed model passes the screening test as set out in USEPA Document "Protocol for Determining the Best Performing Model" (Ref. 1).

Ref.(1): William M. Cox, 'Protocol for Determining the Best Performing Model'; Publication No. EPA-454/R-92-025; U.S. Environmental Protection Agency, Research Triangle Park, NC.

2.4 For cases where a Schedule 1 model is applicable to the project under consideration but an alternative model is proposed for use instead, the proponent must demonstrate either that

- (i) the highest and second highest concentrations predicted by the proposed model are within 2 percent of the estimates obtained from an applicable Schedule 1 model (with appropriate options chosen) for all receptors for the project under consideration; or
- (ii) the proposed model has superior performance against an applicable Schedule 1 model based on the evaluation procedure set out in USEPA Document "Protocol for Determining the Best Performing Model" (Ref.

- 1).
- 2.5 Should EPD find the information on technical details alone sufficient to indicate the acceptability of the proposed model, information on further performance evaluation as specified in Sections 2.3 and 2.4 above would not be necessary.
- 2.6 If the proposed model is an older version of one of the Schedule 1 models or was previously included in Schedule 1, the technical documents mentioned in Section 2.2 are normally not required. However, a performance demonstration of equivalence as stated in Section 2.4 (i) would become necessary.
- 2.7 If EPD is already in possession of some of the documents that describe the technical details of the proposed model, submission of the same by the proponent is not necessary. The proponent may check with EPD to avoid sending in duplicate information.

Schedule 1

Air Quality Models Generally Accepted by Hong Kong Environmental Protection Department for Regulatory Applications as at 1 July 1998 : *

Industrial Source Complex Dispersion Model - Short Term Version 3 (ISCST3) or the latest version developed by U.S. Environmental Protection Agency

California Line Source Dispersion Model Version 4 (CALINE4) or the latest version developed by Department of Transportation, State of California, U.S.A.

Fugitive Dust Model (FDM) or the latest version developed by U.S. Environmental Protection Agency

* EPD is continually reviewing the latest development in air quality models and will update this Schedule accordingly.

APPENDIX B

Hydrodynamic and Water Quality Modelling Requirements

Modelling Software General

1. The modelling software shall be fully 3-dimensional capable of accurately simulating the stratified condition, salinity transport, and effects of wind and tide on the water body within the model area.
2. The modelling software shall consist of hydrodynamic, water quality, sediment transport, thermal and particle dispersion modules. All modules shall have been proven with successful applications locally and overseas.
3. The hydrodynamic, water quality, sediment transport and thermal modules shall be strictly mass conserved at all levels.
4. An initial dilution model shall be used to characterize the initial mixing of the effluent discharge, and to feed the terminal level and size of the plume into the far field water quality modules where necessary. The initial dilution model shall have been proven with successful applications locally and overseas.

Model details – Calibration & Validation

1. The models shall be properly calibrated and validated against currently available field data before their use in this study in the Hong Kong waters, the Pearl Estuary and the Dangan (Lema) Channel.
2. Tidal data shall be calibrated and validated in both frequency and time domain manner.
3. For the purpose of calibration and validation, the model shall run for not less than 15 days of real sequence of tide (excluding model spin up) in both dry and wet seasons with due consideration of the time required to establish initial conditions.
4. In general the hydrodynamic models shall be calibrated to the following criteria:

<u>Criteria</u>	<u>Level of fitness with field data</u>
• tidal elevation (@)	< 8 %
• maximum phase error at high water and low water	< 20 minutes
• maximum current speed deviation	< 30 %
• maximum phase error at peak speed	< 20 minutes
• maximum direction error at peak speed	< 15 degrees
• maximum salinity deviation	< 2.5 ppt
@ Root mean square of the error including the mean and fluctuating components shall meet the criteria at no less than 80% of the monitoring stations in the model domain	

5. The consultants shall be responsible for acquiring/developing and calibration of the models for use in this study themselves. They might make reference to the models developed under the Update on Cumulative Water Quality and Hydrological Effect of Coastal Developments and Upgrading of Assessment Tool (Agreement No. CE 42/97). They might also propose to use other models subject to agreement with EPD.

Model details – Simulation

1. The water quality modelling results shall be qualitatively explainable, and any identifiable trend and variations in water quality shall be reproduced by the model. The water quality model shall be able to simulate and take account of the interaction of dissolved oxygen, phytoplankton, organic and inorganic nitrogen, phosphorus, silicate, BOD, temperature, suspended solids, contaminants release of dredged and disposed material, air-water exchange, *E. coli* and benthic processes. It shall also simulate salinity. Salinity results simulated by hydrodynamic models and water quality models shall be demonstrated to be consistent.
2. The sediment transport module for assessing impacts of sediment loss due to marine works shall include the processes of settling, deposition and re-erosion. The values of the modelling parameters shall be agreed with EPD. Contaminants release and DO depletion during dredging and dumping shall be simulated by the model.

3. The thermal model shall be based on the flow field produced by the hydrodynamic model. It shall incorporate the physical processes of thermal / cooled water discharge and abstraction flow, buoyancy effect of the thermal plume, and surface heat exchange. Dispersion of biocides in the discharge shall also be simulated with appropriate decay rates.
4. The models shall at least cover the Hong Kong waters, the Pearl Estuary and the Dangan Channel to incorporate all major influences on hydrodynamic and water quality. A fine grid model may be used for detailed assessment of this study. It shall either be linked to a far field model or form part of a larger model by gradual grid refinement. The coverage of the fine grid model shall be properly designed such that it is remote enough so that the boundary conditions would not be affected by the project. The model coverage area shall be agreed with EPD.
5. In general, grid size at the area affected by the project shall be less than 400 m in open waters and less than 75 m around sensitive receivers. The grid shall also be able to reasonably represent coastal features existing and proposed in the project. The grid schematization shall be agreed with EPD.

Modelling assessment

1. The assessment shall include the construction and operation phases of the project. Where appropriate, the assessment shall also include maintenance dredging. Scenarios to be assessed shall cover the baseline condition and scenarios with various different options proposed by the Applicant in order to quantify the environmental impacts and improvements that will be brought about by these options. Corresponding pollution load, bathymetry and coastline shall be adopted in the model set up.
2. Hydrodynamic, water quality, sediment transport and thermal modules, where appropriate, shall be run for (with proper model spin up) at least a real sequence of 15 days spring-neap tidal cycle in both the dry season and the wet season.
3. The results shall be assessed for compliance of Water Quality Objectives.

4. The impact on all sensitive receivers shall be assessed.
5. Cumulative impacts due to other projects, activities or pollution sources within a boundary to the agreement of EPD shall also be predicted and quantified.

- END -

APPENDIX C-1

Guidelines for Cultural Heritage Impact Assessment

(as at 14 May 2008)

Introduction

The purpose of the guidelines is to assist the understanding of the requirements in assessing impact on archaeological and built heritage. The guidelines will be revised by the Antiquities and Monuments Office (AMO) of the Leisure and Cultural Services Department from time to time, where appropriate, and when required.

A comprehensive Cultural Heritage Impact Assessment (CHIA) includes a baseline study, an impact assessment study associated with the appropriate mitigation measures.

(1) Baseline Study

1.1 A baseline study shall be conducted:

- a. to compile a comprehensive inventory of heritage sites within the proposed project area, which include:
 - (i) all archaeological sites (including marine archaeological sites);
 - (ii) all pre-1950 buildings and structures;
 - (iii) selected post-1950 buildings and structures of high architectural and historical significance and interest; and
 - (iv) cultural landscapes include places associated with historic event, activity, or person or exhibiting other cultural or aesthetic values, such as sacred religious sites, battlefields, a setting for buildings or structures of architectural or archaeological importance, historic field patterns, clan graves, old tracks, *fung shui* woodlands and ponds, and etc.
- b. to identify the direct and indirect impacts on the heritage sites at the planning stage in order to avoid causing any negative effects. The impacts

include the direct loss, destruction or disturbance of an element of cultural heritage, impact on its settings or impinging on its character through inappropriate siting or design, potential damage to the physical fabric of archaeological remains, historic buildings or historic landscapes through air pollution, change of ground water level, vibration, ecological damage, new recreation or other daily needs to be caused by the new development. The impacts listed are merely to illustrate the range of potential impacts and not intended to be exhaustive.

1.2 The baseline study shall also include a desk-top research and a field evaluation.

1.3. Desk-top Research

1.3.1 Desk-top research should be conducted to analyse, collect and collate extant information. It shall include but not limited to:

- a. List of declared monuments protected by the Antiquities and Monuments Ordinance (Chapter 53).
- b. Graded historic buildings and sites.
- c. Government historic sites identified by the Antiquities and Monuments Office (AMO).
- d. Lists and archives kept in the Reference Library of the Antiquities and Monuments Office of the Leisure and Cultural Services Department including archaeological sites, declared monuments, proposed monuments, deemed monuments and recorded historical building & structures identified by the AMO.
- e. Publications on local historical, architectural, anthropological, archaeological and other cultural studies, such as, Journals of the Royal Asiatic Society (Hong Kong Branch), Journals of the Hong Kong Archaeological society, Antiquities and Monuments Office Monograph Series and so forth.
- f. Other unpublished papers, records, archival and historical documents through public libraries, archives, and the tertiary institutions, such as the Hong Kong Collection and libraries of the Department of Architecture of the University of Hong Kong and the Chinese University of Hong Kong, Public Records Office, photographic library of the Information Services Department and so forth.
- g. Any other unpublished archaeological investigation and excavation

reports kept by the AMO.

- h. Historical documents in the Public Records Office, the Land Registry, District Lands Office, District Office and the Hong Kong Museum of History and so forth.
- i. Cartographic and pictorial documents. Old and recent maps and aerial photos searched in the Maps and Aerial Photo Library of the Lands Department.
- j. Existing geological information (for archaeological desk-top research).
- k. Discussion with local informants.

1.4 Field Evaluation

1.4.1 General

The potential value of the project area with regard the cultural heritage could be established easily where the area is well-documented. However, it does not mean that the area is devoid of interest if it lacks information. In these instances, a site visit and consultations with appropriate individuals or organisations should be conducted by those with expertise in local heritage to clarify the situation.

1.4.2 Field survey on historic buildings and structures

- a. Field scan of all the historic buildings and structures within the project area.
- b. Photographic recording of each historic building or structure including the exterior (the elevations of all faces of the building premises, the roof, close up for the special architectural details) and the interior (special architectural details), if possible, as well as the surroundings, the associated cultural landscape features and the associated intangible cultural heritage (if any) of each historic building or structure.
- c. Interview with local elders and other informants on local historical, architectural, anthropological and other cultural information related to the historic buildings and structures.
- d. Historical and architectural appraisal of the historic buildings and structures, their associated cultural landscape and intangible cultural

elements.

1.4.3 Archaeological Survey

- a. Appropriate methods for pricing and valuation of the archaeological survey, including by means of a Bill of Quantities or a Schedule of Rates should be considered in preparing specifications and relevant documents for calling tenders to carry out the archaeological survey. The specifications and relevant documents should be sent to the Antiquities and Monuments Office for agreement prior to calling tenders to conduct the archaeological survey.
- b. A licence shall be obtained from the Antiquities Authority for conducting an archaeological survey. It takes at least two months to process the application.
- c. A detailed archaeological survey programme should be designed to assess the archaeological potential of the project area. The programme should clearly elaborate the strategy and methodology adopted, including what particular question(s) can be resolved, how the archaeological data will be collected and recorded, how the evidence will be analyzed and interpreted and how the archaeological finds and results will be organized and made available. Effective field techniques should also be demonstrated in the programme. The programme should be submitted to the Antiquities and Monuments Office for agreement prior to applying for a licence.
- d. The following methods of archaeological survey (but not limited to) should be applied to assess the archaeological potential of the project area:
 - (i) Definition of areas of natural land undisturbed in the recent past.
 - (ii) Field scan of the natural land undisturbed in the recent past in detail with special attention paid to areas of exposed soil which were searched for artifacts.
 - (iii) Conduct systematic auger survey and test pitting. The data

collected from auger survey and test pitting should be able to establish the horizontal spread of cultural materials deposits.

- (iv) Excavation of test pits to establish the vertical sequence of cultural materials. The hand digging of 1 x 1 m or 1.5 x 1.5 m test pits to determine the presence or absence of deeper archaeological deposits and their cultural history.
- (v) The quantity and location of auger holes and test pits should be agreed with the Antiquities and Monuments Office prior to applying for a licence.
- (vi) A qualified land surveyor should be engaged to record reduced levels and coordinates as well as setting base points and reference lines in the course of the field survey.

e. A Marine Archaeological Investigation (MAI) following *Guidelines for MAI* may be required for projects involving disturbance of seabed.

1.4.4 If the field evaluation identifies any additional heritage sites within the study area which are of potential historic or archaeological importance and not recorded by AMO, the findings should be reported to the AMO as soon as possible.

1.5 The Report of Baseline Study

1.5.1 The study report should have concrete evidence to show that the process of the above desk-top and field survey has been satisfactorily completed. This should take the form of a detailed inventory of the heritage sites supported by full description of their significance. The description should contain detailed geographical, historical, archaeological, architectural, anthropological, ethnographic and other relevant data supplemented with illustrations below and photographic and cartographic records, if required.

1.5.2 A master layout plan showing all the identified archaeological and built heritage within the study area should be provided in the report. All the identified heritage sites should be properly numbered with their locations

indicated on the master layout plan.

1.5.3 Historic Buildings/ Structures/ Sites

- a. A map in 1:1000 scale showing the boundary of each historic item.
- b. Photographic records of each historic item.
- c. Detailed recording form of each historic item including its construction year, previous and present uses, architectural characteristics, as well as legends, historic persons and events, cultural landscape features and cultural activities associated with the structure.
- d. A cross-referenced checklist including the reference number of each historical item, their photo and drawing reference, as well as the page number of the detailed recording form of each identified historical item for easy cross-checking of individual records.

1.5.4 Archaeological Sites

- a. A map showing the boundary of each archaeological site as supported and delineated by field walking, augering and test-pitting;
- b. Drawing of stratigraphic section of test-pits excavated which shows the cultural sequence of a site.
- c. Reduced levels, coordinates, base points and reference lines should be clearly defined and certified by a qualified land surveyor.
- d. *Guidelines for Archaeological Reports* should be followed (Annex 1).

1.5.5 A full bibliography and the source of information consulted should be provided to assist the evaluation of the quality of the evidence. To facilitate verification of the accuracy, the AMO will reserve the right to examine the full details of the research materials collected under the baseline study.

1.6 Finds and Archives

- 1.6.1 Archaeological finds and archives should be handled following *Guidelines for Handling of Archaeological Finds and Archives (Annex 2)*.

(2) Impact Assessment Study

2.1 Identification of impact on heritage

- 2.1.1 The impact assessment study must be undertaken to identify the impacts on the heritage sites which will be affected by the proposed development subject to the result of desktop research and field evaluation. The prediction of impacts and an evaluation of their significance must be undertaken by expert(s) in local heritage.
- 2.1.2 During the assessment, both the direct impacts such as loss or damage of important features as well as indirect impacts should be clearly stated, such as adverse visual impact on built heritage, landscape change to the associated cultural landscape features of the built heritage, temporary change of access to the heritage sites during the work period, change of ground level or water level which may affect the preservation of the archaeological and built heritage *in situ* during the implementation stage of the project.
- 2.1.3 The evaluation of heritage impact assessment may be classified into five levels of significance based on type and extent of the effects concluded in the CHIA study:
- a. Beneficial impact: the impact is beneficial if the project will enhance the preservation of the heritage site(s) such as improving the flooding problem of the historic building after the sewerage project of the area;
 - b. Acceptable impact: if the assessment indicates that there will be no significant effects on the heritage site(s);
 - c. Acceptable impact with mitigation measures: if there will be some adverse effects, but these can be eliminated, reduced or offset to a large extent by specific measures, such as conduct a follow-up Conservation Proposal or Conservation Management Plan for the affected heritage site(s) before commencement of work in order to avoid any inappropriate and unnecessary interventions to the building;
 - d. Unacceptable impact: if the adverse effects are considered to be too excessive and are unable to mitigate practically;

- e. Undetermined impact: if the significant adverse effects are likely, but the extent to which they may occur or may be mitigated cannot be determined from the study. Further detailed study will be required for the specific effects in question.
- 2.1.4 Preservation in totality must be taken as the first priority as it will be a beneficial impact and will enhance the cultural and socio-economical environment if suitable measures to integrate the heritage site into the proposed project are carried out.
- 2.1.5 If, due to site constraints and other factors, only preservation in part is possible, this must be fully justified with alternative proposals or layout designs which confirm the impracticability of total preservation.
- 2.1.6 Total destruction must be taken as the very last resort in all cases and shall only be recommended with a meticulous and careful analysis balancing the interest of preserving local heritage as against that of the community as a whole. Assessment of impacts on heritage sites shall also take full account of, and follow where appropriate, paragraph 4.3.1(c), item 2 of Annex 10, items 2.6 to 2.9 of Annex 19 and other relevant parts of the Technical Memorandum on Environmental Impact Assessment Process.

2.2 Mitigation Measures

- 2.2.1 It is always a good practice to recognize the heritage site early in the planning stage and site selection process, and to avoid it, i.e. preserve it in-situ, or leaving a buffer zone around the site.
- 2.2.2 Mitigation is not only concerned with minimizing adverse impact on the heritage site but also should give consideration of potential enhancement if possible (such as to improve the access to the built heritage or enhance the landscape and visual quality of built heritage).
- 2.2.3 Mitigation measures shall not be recommended or taken as *de facto* means to avoid preservation of heritage sites. They must be proved beyond all possibilities to be the only practical course of action. Heritage sites are to be in favour of preservation unless it can be

demonstrated that there is a need for a particular development which is of paramount importance and outweighs the significance of a heritage site.

- 2.2.4 If avoidance of the heritage site is not possible, amelioration can be achieved by minimizing the potential impacts and the preservation of the heritage site, such as physically relocating it. Measures like amendments of the sitting, screening and revision of the detailed design of the development are required to lessen its degree of exposure if it causes visual intrusion to the heritage site and affects the character and integrity of the heritage site.
- 2.2.5 A rescue programme, when required, may involve preservation of the historic building or structure together with the relics inside, and its historic environment through relocation, detailed cartographic and photographic survey or preservation of an archaeological site “by record”, i.e. through excavation to extract the maximum data as the very last resort.

2.3 The Impact Assessment Report

- 2.3.1 A detailed description and plans should be provided to elaborate on the heritage site(s) to be affected. Besides, please also refer to paragraph 4.3.1(d), items 2.10 to 2.14 of Annex 19 and other relevant parts of the Technical Memorandum, other appropriate presentation methods for mitigation proposals like elevations, landscape plan and photomontage shall be used in the report extensively for illustrating the effectiveness of the measures.
- 2.3.2 To illustrate the landscape and visual impacts on built heritage, as well as effects of the mitigation measures, choice of appropriate presentation methods is important. These methods include perspective drawings, plans and section/ elevation diagrams, photographs on scaled physical models, photo-retouching and photomontage. These methods shall be used extensively to facilitate communication among the concerned parties.
- 2.3.3 The implementation programme for the agreed mitigation measures should be able to be executed and should be clearly set out in the report

together with the funding proposal. These shall form an integral part of the overall redevelopment project programme and financing of the proposed redevelopment project. Competent professionals must be engaged to design and carry out the mitigation measures.

2.3.4 For contents of the implementation programme, reference can be made to Annex 20 of the Technical Memorandum on Environmental Impact Assessment Process. In particular, item 6.7 of Annex 20 requires to define and list out clearly the proposed mitigation measures to be implemented, by whom, when, where, to what requirements and the various implementation responsibilities. A comprehensive plan and programme for the protection and conservation of the partially preserved heritage site, if any, during the planning and design stage of the proposed project must be addressed in details.

2.3.5 Supplementary information to facilitate the verification of the findings shall be provided in the report including but not limited to:

- a. layout plan(s) in a proper scale illustrating the location of all heritage sites within the study area, the extent of the work area together with brief description of the proposed works;
- b. all the heritage sites within the study area should be properly numbered, cross-reference to the relevant drawings and plans.
- c. an impact assessment cross-referenced checklist of all the heritage sites within the study area including heritage site reference, distance between the heritage site and work area, summary of the possible impact(s), impact level, summary of the proposed mitigation measure(s), as well as references of the relevant plans, drawings and photos; and
- d. a full implementation programme of the mitigation measures for all affected heritage sites to be implemented with details, such as by whom, when, where, to what requirements and the various implementation responsibilities of individual parties.

Annex 1

Guidelines for Archaeological Reports **(As at November 2007)**

I. General

1. All reports should be written in a clear, concise and logical style.
2. The reports should be submitted in A4 size and accompanying drawings of convenient sizes.
3. Draft reports should be submitted to the Antiquities and Monuments Office (AMO) for comments within two months after completion of archaeological work unless otherwise approved by AMO.
4. The draft reports should be revised as required by AMO and relevant parties. The revised reports should be submitted to AMO within three weeks after receiving comments from AMO and relevant parties.
5. At least 3 hard copies of the final reports should be submitted to AMO for record purpose.
6. At least 2 digital copies of the final reports in both Microsoft Word format and Acrobat (.PDF) format without loss of data and change of appearance compared with the corresponding hard copy should be submitted to AMO. The digital copies should be saved in a convenient medium, such as compact discs with clear label on the surface and kept in protective pockets.

II. Suggested Format of Reports

1. Front page:
 - Project/Site name
 - Nature of the report
e.g. (Draft/Final)
Archaeological Investigation/Survey Report
Archaeological Impact Assessment Report
Watching Brief Report
Rescue Excavation Report
Post-excavation Report
 - Organization
 - Date of report
2. Contents list
Page number of each section should be given.
3. Non-technical summary (both in English and Chinese with not less than 300 words each)

This should outline in plain, non-technical language, the principal reasons for the archaeological work, its aims and main results, and should include reference to authorship and commissioning body.

4. Introduction
This should set out background leading to the commission of the reports. The location, area, scope and date of conducting the archaeological work must be given. The location of archaeological work should be shown on maps in appropriate scales and with proper legends.
5. Aims of archaeological work
These should reflect the aims set in the project design.
6. Archaeological, historical, geological and topographical background of the site
Supporting aerial photos and maps (both old and present) in appropriate scales, with proper legends and with the site locations clearly marked on should be provided.
7. Methodology
The methods used including any variation to the agreed project design should be set out clearly and explained as appropriate.
8. Result
This should outline the findings, known and potential archaeological interests by period and/or type. Their significance and value with reference/inclusion of supporting evidence should be indicated. For impact assessment, the likely effect of the proposed development on the known or potential archaeological resource should be outlined.
9. Conclusion
This should include summarization and interpretation of the result.
10. Recommendation
Recommendations on further work and the responsible party as well as a brief planning framework should be outlined.
11. Reference and bibliography
A list of all primary and secondary sources used should be given. Director and members of the archaeological team and author of the report should be listed.
12. Supporting illustrations
They should be clearly numbered and easily referenced to the text. They should be scanned and saved in TIFF or JPEG formats.
 - A. Maps
Archaeological work locations, such as auger hole and test pit locations (with relevant coordinates certified by a qualified surveyor), should be clearly shown on maps in appropriate scales,

with proper legends, grid references (in 8 digits) and captions.

B. Drawings of test pits, archaeological features and finds

The below scales should be followed:

Cross section and profile drawings of test pits	1:20
Archaeological feature drawings	1:10
Finds drawings	1:1

If drawings of the above stated scales are not appropriate to be incorporated into the report under certain occasions, reduced copy of the drawings with the same scales are acceptable. Proper captions, legends and indication of reduced size should be given.

C. Photos of site and finds

All photos should be at least in 3R size with proper captions and scales. They should be clearly numbered and easily referenced to the text. They should be scanned and saved in TIFF or JPEG formats.

13. Supporting data in appendices

These should consist of essential technical details to support the result. These may include stratigraphy record of test pits and auger holes, record of general and special finds discovered with description, quantity and context number/stratigraphical sequence, index of field archives.

14. Comment and Response

All comments and responses from AMO and relevant parties should be attached.

III. Green Measures

1. All reports should be of single line spacing and printed on both sides of the paper.
2. Excessive page margins should be avoided. A top/bottom margin of 2 cm and left/right margin of 2.5 cm are sufficient.
3. Use of blank paper should be avoided as far as possible.
4. Suitable font type of font size 12 should be used generally in balancing legibility and waste reduction objective.

Annex 2

Guidelines for Handling of Archaeological Finds and Archives (As at Oct 2006)

General

1. Site Code

The Licensee should contact the Central Archaeological Repository (CAR) of the Antiquities and Monuments Office (AMO) [Contact Person: Mr. Michael TANG, Tel: 2384 5446; Email: mkstang@lcsd.gov.hk] about the allocation of site code before the commencement of the project to avoid duplicate of site code assignment.

I. Archaeological Finds

2. Cleaning

Every excavated finds should be properly cleaned before handing over to the CAR of the AMO.

3. Marking

- All the excavated finds should be cleaned before marking object number.
- “Sandwich” technique¹ should be adopted for marking permanent identification number on an object.
- Every special finds should be marked with site code, context number and object number, etc.
- All representative samples collected from general finds should be marked.
- For the finds which is too small, has unstable surface, or leather,

¹ *Steps for “Sandwich” technique*

1. First of all, the object should be marked in appropriate area and size that does not impact important diagnostic or aesthetic parts of the object.
2. Clean the area to be marked.
3. Apply a thin coat of clear reversible lacquer on the area. Use white lacquer if the object is dark in colour. Let the base coat dry completely.
4. Use a permanent water-based ink to write the object number on top of the base coat. Let ink dry completely.
5. Apply a top coat of clear varnish.
6. Let the marking dry completely before packing.

textiles or wood, it should not be marked/labeled directly and should be bagged separately or attached with tags by tying. The tag should contain information about the object number, context number and site code, etc.

4. Labeling and bagging
 - A label should be attached on each bag.
 - Information about the object number, context number, test-pit number, site code and bag number should be stated clearly on the label.
 - Finds excavated within the same context should be bagged together. However, if they have been categorized according to their types, materials or characteristics, separate bagging is required.
5. Conservation
 - To refit and reconstruct pottery vessels by appropriate adhesive. A heat and waterproof adhesive, e.g. product of H. Marcel Guest Ltd., is recommended.
 - Any adhesives which are not reversible or will damage artefacts, e.g. the pottery vessel should not be applied on the finds.
6. Finds register

A clear finds register with information about the finds description, quantity, form, weight, dimensions and field data should be prepared for handover to the CAR.

II. Field Archives and Laboratory Records

7. Field archives include field diary, context recording sheet, special finds recording sheet, soil sample/sample recording sheet, map, survey sheet and video/visual records etc. Laboratory records also form part of the archaeological archives, which include finds processing record, conservation record, finds drawings and photos, records of typological analysis and objects card etc.
8. All the aforesaid archives should be handed over to the CAR after the compilation of the excavation report. Attention should be drawn to the followings:
 - All the field archives should be submitted together with their indexes.
 - The video footage should be submitted together with a detailed script introducing the content of the video record.
 - All the slides, colour/black & white negatives and digital photographs should be submitted together with their contact prints and indexes.

Handover of Finds

9. Packing

- Every special finds should be protected with tissue paper, bubble sheet or P.E. foam with shock-proofed packing. No packing material other than the aforesaid items should be used.
- All the general finds should be stored in heavy duty plastic container with shock-proofed packing.
- The heavy duty plastic container, e.g. product of the Star Industrial Co., Ltd. (No. 1849 or 1852), is recommended.
- For oversized finds, prior advice on packing method should be sought from the AMO.

10. Handover procedure

- The Licensee should arrange to transport the finds and archives to the CAR upon the completion of the finalized excavation report.
- Separate handover forms for finds and archives should be signed by the representatives of the Licensee and the AMO.

APPENDIX C-2

Guidelines for Marine Archaeological Investigation (MAI)

(As at Nov 2006)

The standard practice for MAI should consist of four separate tasks, i.e. (1) Baseline Review, (2) Geophysical Survey, (3) Establishing Archaeological Potential and (4) Remote Operated Vehicle (ROV)/Visual Diver Survey/Watching Brief.

(1) Baseline Review

- 1.1 A baseline review should be conducted to collate the existing information in order to identify the potential for archaeological resources and, if identified, their likely character, extent, quality and value.
- 1.2 The baseline review will focus on known sources of archive data. It will include:
 - a. Geotechnical Engineering Office (GEO) – the Department holds extensive seabed survey data collected from previous geological research.
 - b. Marine Department, Hydrographic Office - the Department holds a substantial archive of hydrographic data and charts.
 - c. The Royal Naval Hydrographic Department in the UK - the Department maintains an archive of all survey data collected by naval hydrographers.
- 1.3 The above data sources will provide historical records and more detailed geological analysis of submarine features which may have been subsequently masked by more recent sediment deposits and accumulated debris.

(2) Geophysical Survey

2.1 Extensive geophysical survey of the study area should deploy high resolution boomer, side scan sonar, and an echo sounder and multi beam swath bathymetry and high resolution multi beam sonar. The multi beam data must be presented as processed digital terrain models to facilitate the archaeological analysis. . The data received from the survey would be analysed in detail to provide:

- a. Exact definition of the areas of greatest archaeological potential.
- b. Assessment of the depth and nature of the seabed sediments to define which areas consist of suitable material to bury and preserve archaeological material.
- c. Detailed examination of the boomer and side scan sonar records to map anomalies in and on the seabed which may be archaeological material.
- d. Detailed examination of the multi beam swath sonar data to assess the archaeological potential of the sonar contacts.

(3) Establishing Archaeological Potential

- 3.1 The data examined during Task 1 and 2 will be analysed to provide an indication of the likely character and extent of archaeological resources within the study area. This would facilitate formulation of a strategy for investigation.
- 3.2 The results would be presented as a written report and charts. If there is no indication of archaeological material there would be no need for further work.

- 3.3 Charts should be presented at 1:500 scale and show each survey contact. Its dimensions and exact location should also be shown.

(4) Remote Operated Vehicle (ROV)/Visual Diver Survey/Watching Brief

- 4.1 Subject to the outcome of Task 1, 2 and 3, accepted marine archaeological practice would be to plan a field evaluation programme to acquire more detailed data on areas identified as having archaeological potential. The areas of archaeological interest can be inspected by ROV or divers. ROV or a team of divers with both still and video cameras would be used to record all seabed features of archaeological interest.
- 4.2 Owing to the heavy marine traffic in Hong Kong, the ROV/visual diver survey may not be feasible to achieve the target. If that is the case, an archaeological watching brief is the most appropriate way to monitor the dredging operations in areas of identified high potential to obtain physical archaeological information.
- 4.3 A sampling strategy for an archaeological watching brief would be prepared based on the results of Task 1, 2 and 3 to focus work on the areas of greatest archaeological potential. Careful monitoring of the dredging operations would enable immediate identification and salvage of archaeological material. If archaeological material is found, the AMO should be contacted immediately to seek guidance on its significance and appropriate mitigation measures would be prepared.
- 4.4 If Task 4 is undertaken, the results would be presented in a written report with charts.

Report

Three copies of the final report should be submitted to the AMO for record.

APPENDIX D

Project Implementation Schedule

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to Address	Who to implement the measure?	Location of the measures	When to implement the measures?	What requirements or standards for the measures to achieve?