

**Environmental Impact Assessment Ordinance (Cap. 499)  
Section 5 (7)**

**Environmental Impact Assessment Study Brief No. ESB-156/2006**

**Project Title: Central Kowloon Route  
(hereinafter known as the “Project”)**

**Name of Applicant: Highways Department  
(hereinafter known as the “Applicant”)**

**1. BACKGROUND**

The Application

- 1.1 An application (No.ESB-156/2006) 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 29 September 2006 with a project profile (No.PP-300/2006) (hereinafter referred as “the Project Profile”).
- 1.2 A study brief (No. ESB-096/2002) for the same project, but based on a dual-2 lane tunnel configuration, was issued under the EIAO on 18 February 2002. The current application for a new study brief was made as the study brief (No. ESB-096/2002) expired in 2005 and there is change to the project scope.
- 1.3 The Project under the current application (hereinafter known as the “Project”) is to construct and operate a dual-3 lane tunnel, across the Kowloon Peninsula linking the West Kowloon Reclamation in the west and the proposed Kai Tak Development in the east. The Project will connect the West Kowloon Highway at Yau Ma Tei Interchange to the future Trunk Road T2 at Kai Tak Development and Tseung Kwan O – Lam Tin Tunnel, forming a strategic highway link to serve the existing and planned developments in West Kowloon, East Kowloon and Tseung Kwan O. The indicative alignment of the Project is shown in the Project Profile and reproduced in Figure 1 of this Study Brief. The construction and operation of the Project will comprise:
  - a) provision of elevated and at-grade slip road connections between the tunnel and the road network on the West Kowloon Reclamation, including modifications to the Yau Ma Tei Interchange;
  - b) construction of tunnel ramps, a tunnel portal and a ventilation building west of Ferry Street;
  - c) cut and cover tunnel between Ferry Street and Shanghai Street;
  - d) bored tunnel between Shanghai Street and To Kwa Wan Road;
  - e) central ventilation building at the junction of Chung Hau Street and Fat Kwong Street, near Sheung Lok Street;
  - f) construction of a supply-air-only ventilation building at the junction of To Kwa Wan Road and San Ma Tau Street;
  - g) cut and cover tunnel between To Kwa Wan Road and Kowloon City Ferry Pier
  - h) tunnel between Kowloon City Ferry Pier and Kai Tak Runway (probably in the form of an immersed tube tunnel); and

- i) cut and cover tunnel or depressed road between Kai Tak Runway and the Interchange with Kai Cheung Road, Kai Fuk Road and Road T2 on the proposed Kai Tak Development;
  - j) a ventilation building and an administration building near the tunnel portal in the proposed Kai Tak Development;
  - k) replacement of a section of at-grade Hoi Wang Road by an elevated road;
  - l) provision of connection roads at eastern end;
  - m) re-alignment of drainage culverts on the West Kowloon Reclamation affected by the tunnel;
  - n) demolition and reprovisioning (if required) of the Yau Ma Tei Police Station, Yau Ma Tei Jockey Club Polyclinic and Yau Ma Tei Specialist Clinic Extension, Yau Ma Tei Multi-storey Car Park Building, Kowloon Government Offices and other minor government facilities; and
  - o) demolition of industrial buildings at the junction of To Kwa Wan Road and San Ma Tau Street.
- 1.4 The Project is a designated project under Item A.1 and A.7 of Part 1 Schedule 2 of the EIAO: “A road which is an expressway, trunk road, primary distributor road or district distributor road including new roads, and major extensions or improvements to existing roads” and “a road or railway tunnel more than 800m in length between portals. The Project may also include changes to associated roads that constitute material change(s) to exempted project(s) to be identified under Section 2 (xii) below.
- 1.5 Pursuant to section 5(7)(a) of the EIAO, the Director of Environmental Protection (the Director) issues this Environmental Impact Assessment (EIA) study brief to the Applicant to carry out an EIA study.

#### Purpose of the EIA

- 1.6 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 taking place concurrently. This information will contribute to decisions by the Director on:
- (i) the acceptability of adverse environmental consequences that are likely to arise as a result of the Project and associated works;
  - (ii) the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and
  - (iii) the acceptability of residual impacts after the proposed mitigation measures are implemented.

#### Interfacing Projects

- 1.7 The eastern landfall of the Project will be on the proposed Kai Tak Development which is a Schedule 3 EIA under the EIA Ordinance. An EIA Study Brief for Kai Tak Development (No. ESB-152/2006) was issued to Civil Engineering and Development Department, which also covers part of the Central Kowloon Route. For the purpose of this EIA Study, the Applicant shall ensure the consistency of information relevant and related to the Project to be included in the EIA for this Project. The Applicant shall also liaise with the relevant parties regarding the

decommissioning of the former Kai Tak Airport to make sure the airport/runway area along the alignment of this Project has been decommissioned by third party before the commencement of the Project. Otherwise, the Applicant shall decommission the relevant part of the former Kai Tak airport/ runway to enable the Project to be constructed.

- 1.8 The western section of the Project in Yau Ma Tei will interface with the planned Widening of Gascoigne Road Flyover project. The Applicant shall make reference to the EIA study brief for the Widening of Gascoigne Road Flyover (No. ESB-155/2006) issued to Highways Department for any interface issue and potential cumulative impact to the sensitive receivers in the environs of Yau Ma Tei.

## 2. OBJECTIVES OF THE EIA STUDY

2.1 The objectives of the EIA study are as follows:

- (i) to describe the Project and associated works together with the requirements for carrying out the Project and the types of designated project(s) to be covered by the Project;
- (ii) 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;
- (iii) to provide information on the consideration of alternatives (including alignment options, built forms and construction / tunnelling methods) to avoid and minimize potential environmental impacts to sensitive uses; to compare the environmental benefits and dis-benefits of each of different options; to provide justifications and reasons for selecting the preferred option(s) and to describe the part environmental factors played in the selection;
- (iv) to identify and quantify emission sources and determine the significance of impacts on sensitive receivers and potential affected uses;
- (v) to identify, describe and quantify any potential landscape and visual impacts, evaluate the significance of such impacts on sensitive receivers and to propose measures to avoid or mitigate these impacts;
- (vi) to identify any negative impacts on sites of cultural heritage and to propose measures to avoid or mitigate these impacts;
- (vii) to identify negative impacts and proposes measures to avoid or provision of mitigation measures to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;
- (viii) to investigate the feasibility, practicability, effectiveness and implications of the proposed mitigation measures;
- (ix) to identify, predict and evaluate the residual environmental impacts (i.e. after practicable avoidance or mitigation measures) and the cumulative effects expected to arise during the construction and operation of the Project in relation to the sensitive receivers and potential affected uses;
- (x) to identify, assesses 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;
- (xi) 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;

- (xii) to identify within the scope of the EIA study as defined in Section 3.2 below, any individual works that constitute material change(s) to exempted project(s) or other designated project(s) under the EIAO; to ascertain whether the EIA Study has adequately addressed the environmental impact of these change(s) to exempted project(s); and where necessary, to identify the outstanding issues that need to be addressed;
- (xiii) to design and specify the environmental monitoring and audit requirements to ensure the effective implementation of the recommended environmental protection and pollution control measures; and
- (xiv) to recommend a mechanism for liaison with appropriate stakeholder(s) such that the adverse effect of the construction of the Project on the operation of, amongst others, schools, hospital(s) and court of law along the Project alignment could be minimised.

### **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 the Environmental Impact Assessment Process of the Environmental Impact Assessment Ordinance (hereinafter referred to as “the TM”), are met.

#### **3.2 The Scope**

The scope of this EIA study shall cover the Project proposed in the Project Profile (No. PP-300/2006) and the works mentioned in Section 1.3 above. 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, planned and known potential developments in the vicinity of the Project:

- (i) the potential noise impacts to sensitive receivers along or near the Project during the construction and operation of the Project, including construction noise impact, ground-borne noise impacts associated with the tunnelling works; noise impact from the operation of tunnel ventilation systems and from road traffic;
- (ii) the potential air quality impacts to sensitive receivers along or near the Project from construction works and potential air pollution impacts from vehicular emissions from open roads, tunnel portals and tunnel ventilation systems to sensitive receivers during operation of the Project;
- (iii) the potential impacts of various types of waste arising, in particular excavated materials arising from the construction works, any dredged marine sediment arising from the construction of the tunnel between Kowloon City Ferry Pier and Kai Tak runway, any other construction waste and chemical waste to be generated from the construction of the Project; and the proposed disposal arrangements;
- (iv) the potential land contamination impact arising from the construction of the Project at, but not limited to, any former shipyard sites within the West Kowloon Reclamation, areas near the former Ma Tau Kok Gas Works South Plant, and the former Kai Tak Airport and Runway. In particular, the potential need for handling contaminated spoil encountered and excavated during the tunnel construction

- works and the need for the decommissioning of the relevant part of the former Kai Tak Airport and Runway if it has not already been decommissioned by third party;
- (v) the potential water quality impact during construction and operation of the Project; including the potential water quality impact due to seabed disturbance from dredging and any other marine works that may be required for the construction of the tunnel between Kowloon City Ferry Pier and Kai Tak runway;
  - (vi) the potential hazard to life associated with the storage, use and transport of explosive at the Project site during the construction of the Project; and the potential hazard to life to the future tunnel users from the Ma Tau Kok Gas Works;
  - (vii) the potential impacts on the historic buildings and structures such as Yau Ma Tei Police Station, Tin Hau Temple at Temple Street, Yau Ma Tei Wholesale Fruit Market, Yau Ma Tei Theatre, Former Pumping Station of Water Supplies Department, Old South Kowloon District Court, Ex-Ma Tau Kok Animal Quarantine Depot; and some recorded items including the runway, seawall and former fire station C and its adjacent pole in the former Kai Tak Airport Site, Kowloon Rock together with the post, the boundary stone and the tunnel portal together with its associated network in Gascoigne Road (as shown in Figure 2 of this Study Brief);
  - (viii) the potential visual and landscape impact caused by the construction and operation of the Project including the elevated/at-grade roads and associated noise mitigation measures, portals, ventilation buildings, administration building and cut and cover tunnels; especially the impact on the existing trees at the Tin Hau Temple Complex; trees located in the vicinity of the proposed locations of the western ventilation building and the slip road connections between the tunnel and the road network on the West Kowloon Reclamation;
  - (ix) the cumulative environmental impacts of the Project, through interaction or in combination with other existing, committed and planned developments in the vicinity of the Project, and those impacts that may have a bearing on the environmental acceptability of the Project. Consideration shall be given to the impacts from likely concurrent/interfacing projects such as the Kai Tak Development (including the proposed Cruise Terminal at Kai Tak Runway), Widening of Gascoigne Road Flyover, Shatin to Central Link, Guangzhou-Shenzhen-Hong Kong Express Line Railway and Gas Pipelines Diversion for Kai Tak Development;
  - (x) the environmental impacts of the Project, including its alignment and ancillary infrastructure (such as ventilation building, slip roads) on the planned uses in the Kai Tak Development and on the existing temporary uses. The likely environmental benefits of the tunnel road for the planned development shall be stated in the EIA report; and
  - (xi) the potential environmental impacts arising from any works area proposed under the Project, including any off-site casting yard /dry dock casting yard and mooring site associated with the construction of the immersed tube tunnel (if adopted).

### **3.3 Description of Alignment Options and Construction Methods Considered**

#### **3.3.1 The Need of the Project**

The Applicant shall report on and provide information related to the need of the Project as mentioned in the Project Profile (No. PP-300/2006). The Applicant shall explain clearly the purpose and objectives of the Project and describe the scenarios with and without the Project.

### 3.3.2 Consideration of Alternative Alignment Option(s), the Selection of Proposed Alignment and Different Built-form(s)

The Applicant shall provide a detailed account on the alternative alignment option(s) considered, with clear reference to the reasons / justifications for selecting the proposed alignment and the part environmental factors played in the selection process. A comparison of the main environmental impacts of the various alignment options considered shall be provided with the likely environmental conditions in the absence of for the Project. An evaluation shall be presented to assess the environmental benefits and dis-benefits of all reasonable and practicable road and tunnel alignment options, including consideration of factors such as land resumption/clearance, disruption to the public, engineering, time, and cost. Potential cultural heritage impacts, landscape and visual impacts, air, noise, water and waste generation impacts shall be key issues in the evaluation. The considerations given in the design and location of ventilation buildings shall also be provided to justify the preferred options. In considering the alternative alignment option(s), the siting and design(s) of the ventilation buildings and portals, information shall be provided to show the emphasis given to the avoidance and/or minimization of adverse impacts on sensitive facilities including, amongst others, the Yau Ma Tei Police Station, schools, hospital(s), other cultural heritage facilities in the Yau Ma Tei and Ma Tau Kok environs, planned and existing receivers such as the Grand Waterfront, the Ho Man Tin South Development where The Lutheran Church Hong Kong Synod's Elderly Home is located.

In addition to the consideration of alternative alignment option(s), alternative built-form(s) and design of the road (such as depressed roads, sliproads and design of interchange) shall be reviewed and investigated. A comparison of the environmental benefits and dis-benefits of the alternative built-forms and design shall be made with a view to recommending the preferred option to avoid or minimize adverse environmental effects to the maximum practicable extent. In particular, consideration shall be given to avoidance or minimization of operational noise and air quality impacts.

### 3.3.3 Consideration of Alternative Construction Methods and Sequences of Works

Having regard to the combined effect of the severity and duration of the construction impacts on affected sensitive receivers, the EIA study shall explore alternative construction methods such as the use of Tunnel Boring Machine and sequences of works for the Project, with a view to avoiding adverse environmental impacts to the maximum practicable extent. A comparison of the environmental benefits and dis-benefits of applying different construction methods, including, amongst others, cut and cover method, drill and blast method, tunnel boring machine method, immersed tube tunnel method and sequence of works shall be made. The Applicant shall justify the selection of the proposed construction method for different tunnel sections.

## 3.4 **Technical Requirements**

3.4.1 The Applicant shall conduct the EIA study to address the environmental aspect of the activities as described in Sections 3.1, 3.2 and 3.3 above. The assessment shall be based on the best and latest information available during the course of the EIA Study.

3.4.2 The Applicant shall include in the EIA report details of the construction programme and methodologies for the Project in particular the tunnelling method used for the construction of the tunnel between Kowloon City Ferry Pier and Kai Tak Runway and the requirement for any dry dock casting yard / mooring site. The Applicant shall clearly state in the EIA report the time frame and work programmes of the Project and

other concurrent projects, including, amongst others, the Widening of Gascoigne Road Flyover and Kai Tak Development, and assess the cumulative environmental impacts from the Project with all interacting projects.

- 3.4.3 The Applicant shall review previously approved studies and EIA reports which are relevant to the Project and extract relevant information for the purpose of this EIA Study, including at least the following:
- (i) Comprehensive Feasibility Study for The Revised Scheme of South East Kowloon Development (EIAO Register No. AEIAR-044/2001);
  - (ii) Kai Tak Airport North Apron Decommissioning EIA Report (EIAO Register No. AEIAR -002/1998)
  - (iii) Feasibility Study for South East Kowloon Development (SEKDFS), Nov1998
- 3.4.4 The scope of the EIA study for Kai Tak Development (No. ESB-152/2006) also covers the Immersed Tube Tunnel for the Central Kowloon Route. For the purpose of this EIA Study, the Applicant shall also ensure the consistency of information relevant and related to the Project to be included in the EIA report.
- 3.4.5 The EIA study shall meet the following technical requirements on specific impacts:

### **3.4.6 Air Quality Impact**

- 3.4.6.1 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.
- 3.4.6.2 The Applicant shall assess the air pollutant concentrations in accordance with the Guidelines for Local-Scale Air Quality Assessment Using Models given in Appendices A-1 to A-3 of this Study Brief, or other methodology to be agreed by the Director (with reference to S4.4.2(c) of TM) prior to the commencement of the assessment.
- 3.4.6.3 The air quality impact assessment shall include the following:
- (i) Determination of Assessment Area  
The assessment area for air quality impact assessment shall generally be defined by a distance of 500 metres from the boundary of the Project as shown in Figure 1 of this Study Brief and any work sites proposed under the Project. Subject to the agreement of the Director, the assessment area shall be extended to include major emission sources that may have a bearing on the environmental acceptability of the Project.
  - (ii) Background and Analysis of Activities
    - (a) Provide background information relating to air quality issues relevant to the Project, such as description of the types of activities of the Project that may affect air quality during both construction and operation stages.
    - (b) Give an account, where appropriate, of the works/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 impact respectively.
    - (c) Present the background air quality levels in the assessment area for the purpose of evaluating the cumulative constructional and operational air quality impacts due to the Project.

(iii) Identification of Air Sensitive Receivers (ASRs) and Examination of Emission/Dispersion Characteristics

- (a) Identify and describe representative existing and planned/committed ASRs that would likely be affected by the Project, including those earmarked on the relevant Outline Zoning Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by Lands Department. In identifying planned ASRs, reference shall also be made to the Preliminary / Recommended Outline Development Plan for Kai Tak Development. The Applicant shall select the assessment points of the identified ASRs that represent the worst impact point of these ASRs. A map showing the location and description including the name of buildings, their use and height of the selected assessment points shall be given. Separation distances of these ASRs from the nearest emission sources shall also be given.
- (b) Identify and present a list of air pollutant 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 sub-section 3.4.6.3(ii) above. Activities that shall give rise to construction stage emission sources will at least include stock piling, blasting, concrete batching and vehicular movements on unpaved haul roads within the Project site. Potential operational stage emission sources shall take into account at least the following :
- emissions sources from the To Kwa Wan industrial area and any chimneys in the vicinity;
  - vehicular emissions from open roads, tunnel portals and ventilation buildings;
  - vehicular emissions from the proposed Widening of Gascoigne Road Flyover in the vicinity of the Project in the Yau Ma Tei end (No. ESB-155/2006)

Confirmation regarding the validity of the assumptions adopted and the magnitude of the activities (e.g. volume of construction material handled, traffic mix and volume on a road) shall be obtained from the relevant government departments / authorities and documented.

(iv) Construction 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 Applicant anticipates that the Project and, if applicable, the Project together with concurrent projects within the assessment area of the air quality assessment, will give rise to significant construction dust impacts likely to exceed the recommended limits in the TM at the ASRs despite the incorporation of the dust control measures proposed in accordance with sub-section 3.4.6.3(iv)(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 sub-section 3.4.6.3(vi) below when carrying out the quantitative assessment.

(v) Operational Phase Air Quality Impact

- (a) The Applicant shall calculate the expected air pollutant concentrations at the identified ASRs based on an assumed reasonable worst-case scenario under



normal operating conditions. The evaluation shall be based on the strength of the emission sources identified in sub-section 3.4.6.3(iii)(b) above. The Applicant shall follow sub-section 3.4.6.3(vi) below when carrying out the quantitative assessment.

- (b) The air pollution impacts of future road traffic shall be calculated based on the highest emission strength from the road within the next 15 years upon commencement of operation of the Project. The Applicant shall demonstrate that the selected year of assessment represents the highest emission scenario given the combination of vehicular emission factors and traffic flow for the selected year. The Fleet Average Emission Factors used in the assessment shall be agreed with the Director. If necessary, the Fleet Average Emission Factors shall be determined by a motor vehicle emission model such as EMFAC-HK model to be agreed with the Director. The traffic flow data and assumptions that used in the assessment shall be clearly and properly documented in the EIA report.
  - (c) For the vehicular tunnel and any full enclosures proposed in the Project, it is the responsibility of the Applicant to ensure that the air quality inside these proposed structures comply with EPD's *"Practice Note on Control of Air Pollution in Vehicle Tunnels"*. When assessing air quality impact due to emissions from the tunnel / full enclosures, the Applicant shall ensure prior agreement with the relevant ventilation design engineer over the amount and the types/kinds of pollutants emitted from the tunnel / full enclosures; and such assumptions shall be clearly and properly documented in the EIA report.
- (vi) Quantitative Assessment Methodology
- (a) 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 characteristics of the Project. This specific methodology must be documented in such level of details (preferably 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 at hand without referring to the model input files. Detailed calculation of the emission rates of air pollutants and a map showing the road links for input to the model shall be presented in the report. The Applicant must ensure consistency between the text description and the model files at every stage of submission. In case of doubt, prior agreement between the Applicant and the Director on the specific modelling details should be sought.
  - (b) The Applicant shall identify the key/representative air pollutant parameters (types of pollutants and the averaging time concentration) to be evaluated and provide explanation for choosing these parameters for the assessment of the impact of the Project.
  - (c) The Applicant shall calculate the cumulative air quality impact at the ASRs identified under sub-section 3.4.6.3(iii)(a) 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 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 contour to allow buffer distance requirements to be determined properly.
  - (d) If there are any direct noise mitigation measures recommended in the study, the air quality implication due to these measures shall be assessed. For instance if barriers are proposed to mitigate excessive traffic noise, they may affect the dispersion of air pollutants, then the implications of such measures on air quality impact shall be assessed. If tunnel / noise enclosure is proposed to mitigate excessive traffic noise,

then portal emissions of the tunnel/enclosed road section and air quality inside the tunnel/enclosed road section shall also be addressed. The Applicant shall highlight clearly the locations and types of agreed noise mitigation measures (where applicable), be they barriers, tunnel/road enclosure, and affected ASRs on the contour maps for easy reference.

(vii) 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 in the EIA report. The Applicant shall demonstrate quantitatively that the resultant impacts after incorporation of the proposed mitigating measures will comply with the criteria stipulated in section 1 of Annex 4 in the TM. The Applicant shall also justify the assumptions adopted in the assessment for effectiveness of the proposed mitigation measures.

(viii) Submission of Model Files

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

### **3.4.7 Noise Impact**

3.4.7.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing both the construction and operational noise impacts arising from the Project, as stated in Annexes 5 and 13 of the TM, respectively.

3.4.7.2 The noise impact assessment shall include the following :

(i) Determination of Assessment Area

The assessment area for the noise impact assessment shall generally include areas within a distance of 300 metres from the boundary of the Project as shown in Figure 1 of this Study Brief. Subject to the agreement of the Director, the assessment area could be reduced accordingly if the first layer of noise sensitive receivers (NSRs), closer than 300m from the outer Project boundary, provides acoustic shielding to those receivers at further distance behind. Similarly, subject to the agreement of the Director, the assessment area shall be expanded to include NSRs at distance greater than 300m from the boundary of the Project if they may be affected by the construction and operation of the Project. The assessment area for the construction noise impact assessment shall also cover areas within 300m of any work sites proposed under the Project.

(ii) Provision of Background Information and Existing Noise Levels

The Applicant shall provide 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

(a) The Applicant shall refer to Annex 13 of the TM when identifying the representative NSRs. The NSRs shall include existing NSRs and planned/committed noise sensitive developments and uses earmarked on the relevant Outline Zoning Plans, Outline Development Plans, Layout Plans and other relevant published land use plans. In

identifying planned NSRs, reference shall also be made to the Preliminary / Recommended Outline Development Plan for Kai Tak Development. Photographs of the representative existing NSRs shall be appended to the EIA report.

- (b) The Applicant shall select assessment points to represent the identified NSRs for carrying out quantitative noise assessment described below. The assessment points shall be agreed with the Director prior to the quantitative noise assessment. A map showing the location and description such as name of building, use, and floor of each and every selected assessment point shall be given. For planned noise sensitive land uses without committed site layouts, the Applicant should usually use the relevant planning parameters to work out representative site layouts for operational noise assessment purposes. However, such assumptions together with any constraints identified, such as setback of building, building orientation, extended podium, shall be agreed with the relevant responsible parties including Planning Department and Lands Department in accordance with section 6.3 of Annex 13 of the TM.

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

The Applicant shall provide an inventory of noise sources including representative construction equipment such as for tunneling and other construction works, for construction noise assessment and traffic flow / fixed plant equipment such as ventilation systems for tunnel, as appropriate, for operational noise assessment. Confirmation of the validity of the inventory shall be obtained from the relevant government departments/authorities and documented in the EIA report.

(v) Construction Noise Assessment

- (a) The assessment shall cover the cumulative noise impacts due to the construction works of the Project and other relevant concurrent projects in the vicinity identified during the course of the EIA study.
- (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) To minimise the construction noise impact, alternative construction methods to replace percussive piling shall be proposed as far as practicable. In case blasting works will be involved, it should be carried out, as far as practicable, outside the sensitive hours of 7 p.m. to 7 a.m. on Monday to Saturday and any time on a general holiday, including Sunday. 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 adequate mitigation measures should be recommended to reduce the noise impact as appropriate.
- (d) 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 tunnel boring machine is used and there is likely ground-borne noise affecting noise sensitive receiver, the criteria and assessment methodology for assessing ground-borne noise impact from these equipments/facilities shall be agreed with the Director (with reference to Section 4.4.2(c) of the TM) prior to commencement of the assessment. Cumulative impacts with other projects shall be covered if appropriate. Site measurements at appropriate locations may be required in order to obtain the empirical input parameters required in the ground-borne noise model.
- (e) If the unmitigated construction noise levels are found exceeding the relevant criteria,

the Applicant shall propose practicable direct mitigation measures (including movable barriers, enclosures, quieter alternative construction methods, re-scheduling and restricting hours of operation of noisy tasks) to minimize the impact. If the mitigated noise levels still exceed the relevant criteria, the duration of the noise exceedance at the affected NSRs shall be given.

- (f) The Applicant shall formulate a reasonable 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 in 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 the construction noise impact assessment for restricted hours, the Noise Control Authority will process the Construction Noise Permit (CNP) application, if necessary, based on the NCO, the relevant technical memoranda issued under the NCO, and the contemporary conditions/situations. This aspect should be explicitly stated in the noise chapter and the conclusions and recommendations chapter in the EIA report.

(vi) Operational Noise Assessment

(a) Road Traffic Noise

(a1) Calculation of Noise Levels

The Applicant shall analyse the scope of the proposed road alignment(s) to identify the road sections within the meaning of Item A.1 of Schedule 2 of EIAO and other road sections for the purpose of traffic noise impact assessment. In determining whether the traffic noise impact due to a road improvement project/ work is considered significant, detailed information with respect to factors including at least change of nature of road, change of alignment and change of traffic capacity or traffic composition shall be assessed. The traffic noise impact shall be considered significant if the traffic noise level with the road project is greater than that without the road project at the design year by 1.0 dB(A) or more. Figures showing extents of the road sections within the meaning of Item A.1 of Schedule 2 of EIAO and other road sections shall be provided in the EIA report.

The Applicant shall calculate expected road traffic noise using methods described in the U.K. Department of Transport's "*Calculation of Road Traffic Noise*" (1988). Calculations of future road traffic noise shall be based on peak hour traffic flow in respect of maximum traffic projection within a 15 years period upon commencement of operation of the Project. The Applicant shall calculate traffic noise levels in respect of each road section and the overall noise levels from combined road sections (road sections within the meaning of Item A.1 of Schedule 2 of EIAO and other road sections ) at NSRs.

The EIA report shall contain sample calculations and input parameters for at least 10 assessment points as requested by the Director. Furthermore, the Applicant shall provide the input data set of the traffic noise model in the format of electronic files in the EIA. The Applicant shall prepare and provide drawings (i.e., road-plots of the traffic noise model) of appropriate scale to show the road segments, topographic barriers, and assessment points of sensitive receivers input into the traffic noise model.

The Applicant shall provide input data sets of traffic noise prediction model adopted in the EIA study as requested by the Director for the following scenarios:

- (1) unmitigated scenario at assessment year;
- (2) mitigated scenario at assessment year; and
- (3) prevailing scenario for indirect technical remedies eligibility assessment;

The data shall be in electronic text file (ASCII format) containing road segments, barriers and noise sensitive receivers information. The data structure of the above file shall be agreed with the Director. CD-ROM(s) containing the above data shall be attached in the EIA report.

(a2) Presentation of Noise Levels

The Applicant shall present the prevailing and future noise levels in L10 (1 hour) at the NSRs at various representative floor levels (in m P.D.) on tables and plans of suitable scale.

A quantitative assessment at the NSRs for the road sections within the meaning of Item A.1 of Schedule 2 of EIAO shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM. The potential noise impact of road sections within the meaning of Item A.1 of Schedule 2 of EIAO shall be quantified by estimating the total number of dwellings, classrooms and other noise sensitive elements that will be exposed to noise levels exceeding the criteria set in Table 1A of Annex 5 in the TM.

(a3) Proposals for Noise Mitigation Measures

After rounding of the predicted noise levels according to the U.K. Department of Transport's "*Calculation of Road Traffic Noise*" (1988), the Applicant shall propose direct mitigation measures in all situations where the predicted traffic noise level due to the road sections within the meaning of Item A.1 of Schedule 2 of EIAO, exceeds the criteria in Table 1A of Annex 5 in the TM by 1 dB(A) or more. The direct mitigation measures listed under Section 6.1, Annex 13 of the TM, including the option of alternative land use arrangement, shall be thoroughly explored and evaluated with a view to reducing the noise level at the NSRs concerned to the level meeting the relevant noise criteria. Also, the feasibility, practicability, programming and effectiveness of the recommended mitigation measures should be assessed in accordance with section 4.4.2(k) of the TM. Specific reasons for not adopting certain direct mitigation measures in the design to reduce the traffic noise to a level meeting the criteria in the TM or to maximize the protection for NSRs as far as possible shall be clearly and specifically quantified and laid down in the EIA report.

Sections of barriers proposed to protect existing NSRs shall be differentiated clearly from those proposed for the protection of future or planned NSRs as the latter is only required to be constructed before the occupation of the planned NSRs. To facilitate the phased implementation of the barriers under this principle, a barrier inventory showing intended NSRs (i.e. existing NSRs as distinct from planned NSRs) to be protected by different barrier sections to achieve different extent of noise reduction (to be quantified in terms of how many dB(A)) should be provided.

The total number of dwellings, classrooms and other noise sensitive element that will benefit from, and be protected by the provision of direct mitigation measures shall be provided. In order to clearly present the extents/locations of recommended noise mitigation measures, plans prepared from 1:1000 or 1:2000 survey maps showing the mitigation measures (e.g., enclosures/barriers, low noise road surfacing) shall be included in the EIA report.

The total number of dwellings, classrooms and other noise sensitive elements that will still be exposed to noise levels above the criteria with the implementation of all recommended direct mitigation measures shall be quantified.

The Applicant shall provide, in the EIA report information of recommended noise mitigation measures (including at least barrier types, nominal dimensions at different cross-sections, extents/locations, lengths, mPD levels of barriers) in the format as agreed by the Director (including electronic format).

In case where a number of NSRs cannot be protected by the recommended direct mitigation measures, the Applicant shall identify and estimate the total number of existing dwellings, classrooms and other noise sensitive elements which may qualify for indirect technical remedies under the Executive Council Directive "*Equitable Redress for Persons Exposed to Increased Noise Resulting from the Use of New Roads*", the associated costs and any implications for such implementation. For the purpose of determining eligibility of the affected premises for indirect technical remedies, reference shall be made to the following set of three criteria :

- (1) the predicted overall noise level at the NSR from the road sections within the meaning of Item A.1 of Schedule 2 of EIAO together with other traffic noise in the vicinity must be above a specified noise level ( e.g. 70 dB(A) for domestic premises and 65 dB(A) for education institutions, all in L10(1hr) );
- (2) the predicted overall noise level at the NSR is at least 1.0 dB(A) more than the prevailing traffic noise level, i.e. the total traffic noise level existing before the works to construct the road were commenced; and
- (3) the contribution from the road sections within the meaning of Item A.1 of Schedule 2 of EIAO to the increase in predicted overall noise level at the NSR must be at least 1.0dB(A).

(b) Fixed Noise Sources

(b1) Assessment of Fixed Source Noise Levels

The Applicant shall assess the noise impacts from the operation of tunnel ventilation systems and other fixed noise sources identified in sub-section 3.4.7.2 (iv) above and calculate the expected noise level at the NSRs using standard acoustics principles. Calculations for the expected noise level shall be based on assumed plant inventories and utilization schedule for the reasonable worst-case scenario. 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* issued under the NCO.

(b2) Presentation of Noise Levels

The Applicant shall present the noise levels in Leq(30min) at the NSRs at various representative floor levels (in m P.D.) on tables and plans of suitable scale.

A quantitative assessment at the NSRs for the fixed noise source(s) shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM.

(b3) Proposals for Noise Mitigation Measures

The Applicant shall propose direct mitigation measures within the boundary of the Project in all situations where the predicted noise level exceeds the criteria set out in Table 1A of Annex 5 of the TM to protect the affected NSRs.

(vii) Assessment of Side Effects and Constraints

The Applicant shall identify, assess and propose means to minimize any side effects and to resolve any potential constraints due to the inclusion of any recommended direct mitigation measures.

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

For planned noise sensitive uses which will still be affected even with all practicable direct mitigation measures in place, the Applicant shall propose, evaluate and confirm the practicality of additional measures within the planned noise sensitive uses and shall make recommendations on how these noise sensitive uses will be designed for the information of relevant parties.

The Applicant shall take into account agreed environmental requirements / constraints identified by the study to assess the development potential of concerned sites which shall be made known to the relevant parties.

### **3.4.8 Water Quality Impact**

- 3.4.8.1 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.
- 3.4.8.2 The EIA report shall cover the following:
- (a) The water quality impacts of the site run-off generated during the construction stage, including but not limited to the effluents generated from dewatering associated with piling activities, grouting, concrete washing and dewatering of spoil from any type tunnel construction operations;
  - (b) The water quality impacts of the road runoff containing oil/grease and suspended solids during the operational stage;
  - (c) The water quality impacts on stream courses (if any) and drainages around the work sites, Victoria Harbour, and seawater intakes for cooling systems;
  - (d) The water quality impacts and the proposed monitoring schemes on the water quality at the seawater intakes of the seawater pumping stations (if any) of the Water Supplies Department or Electricity and Mechanical Engineering Services Department;
  - (e) The water quality impacts associated with the construction and operation of the Project, in particular the immersed tube tunnel, dry dock casting yard, mooring site and transportation of the immersed tube tunnel sections within the Hong Kong Special Administrative Region (if any). If the dry dock casting yard will require dredging and backfilling activities, the Applicant shall propose water quality assessment methodology for EPD agreement;
  - (f) The water quality impacts on the identified water systems and water sensitive receivers due to sewage derived from both the construction and operational stages of the Project.
- 3.4.8.3 The assessment area for the water quality impact assessment shall be within 300m from either side and along the full length of the project boundary. For the assessment of the impacts due to the tunnel, dry dock casting yard and mooring site (if any), the study areas shall include the Victoria Harbour Water Control Zone and other relevant Water Control Zones stipulated under the Water Pollution Control Ordinance. This study area may be extended to include other areas being impacted such as stream courses and the associated water systems in the vicinity.
- 3.4.8.4 The Applicant shall identify and analyse the physical, chemical and biological disruptions of marine or fresh water, stormwater drainage system and coastal water arising from the construction and operation of the Project.

- 3.4.8.5 The Applicant shall predict, quantify and assess any water quality impacts arising from the Project on the water system(s) and the sensitive receivers by appropriate mathematical modelling and/or other techniques proposed by the Applicant and approved by the EPD. The mathematical modelling requirements are set out in Appendix B to this Study Brief. Possible impacts shall include but not limited to changes in hydrology, flow regime, sediment erosion and deposition pattern, water and sediment quality due to any dredging of marine sediment, backfilling activities and the proposed construction method for laying the immersed tube tunnel or other tunnel construction methods, and the consequential effects on aquatic organisms due to such changes in affected water bodies including Victoria Harbour, and the waterbodies associated with the dry dock casting yard, if any.
- 3.4.8.6 The Applicant shall take into account and include likely different construction stages or sequences, and different operational stages of the Project in the assessment. The assessment shall have regard to the frequency, duration, volume and flow rate of discharges and their pollutant and sediment loading. The assessment shall address the following:
- (a) Collection and review of background information on the existing and planned water system(s) and sensitive receivers which may be affected by the Project during construction and operation;
  - (b) Characterization of water and sediment quality of the water system(s) and sensitive receivers which may be affected by the Project during construction and operation based on existing information or appropriate site surveys and tests;
  - (c) Identification and analysis of the existing and planned future activities and beneficial uses related to the water system(s) and identification of the water sensitive receivers. The Applicant shall refer to, *inter alia*, those developments and uses earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans and Layout Plans;
  - (d) Identification of pertinent water and sediment quality objectives and establishment of other appropriate water and sediment quality criteria or standards for the water system(s) and the sensitive receivers in (a) and (c) above;
  - (e) Review of the construction sequences and methods, and operation of the Project to identify any alteration of existing shoreline, bathymetry and flow regimes;
  - (f) Identification and quantification of existing and likely future water and sediment pollution sources and loading (which shall include maintenance dredging of marine sediment for the immersed tube tunnel, if necessary, during the operational phase of the Project). An emission inventory on the quantities and characteristics of these existing and likely future pollution sources in the study area shall also be provided. Field investigation and laboratory tests, as appropriate, shall be conducted to fill relevant information gaps;
  - (g) Identification and quantification of dredging, sediment/mud transportation, filling, disposal activities and requirements. Potential fill source and dumping ground to be involved shall also be identified. Field investigation, sampling and chemical laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. The potential for the release of contaminants during dredging shall be addressed using the chemical testing results derived from sediment and marine water samples collected on site and relevant historic data. Appropriate laboratory tests including elutriate tests and sediment pore water (interstitial water) analyses shall be performed on the sediment samples to simulate and quantify the degree



of mobilization of various contaminants such as metals, ammonia, trace organic contaminants (including PCBs, PAHs, TBT and chlorinated pesticides) into the water column during dredging. The ranges of parameters to be analysed; the number, location, depth of sediment, type and methods of sampling; sample preservation; and chemical laboratory test methods to be used shall be subject to the approval of EPD. The Applicant shall also assess the pattern of the sediment deposition and the potential increase in turbidity and suspended solid levels in the water column and at the sensitive receivers due to the disturbance of sediments during dredging;

- (h) Review of the designs and constructions methods and operation of the dry dock casting yard and concrete batching plant. Details including but are not limited to location of dredging and backfilling and their working rates, volumes and characteristics of marine sediment and fill materials to be dredged and backfilled respectively, equipment to be used should also be provided. The Applicant shall devise assessment methodology for EPD agreement. Water quality modelling assessment shall be required if major marine work is involved;
- (i) Prediction and quantification of impacts on the water system(s) and the sensitive receivers likely to be affected by the alterations and changes identified in (e) above and the pollution sources identified in (f) above. The Applicant shall assess both the local and global effects on erosion, resuspension, sediment dispersion and water quality due to any dredging of marine sediment, backfilling activities and the proposed construction method for laying the immersed tube tunnel or other tunnel construction methods. The location, nature, extent and rate of such works for the tunnel shall be clearly identified and evaluated. The assessment shall also take into account the additional pollution loading and oxygen demand exerted by sediment disturbed during construction stage of the immersed tube tunnel;
- (j) Assessment of the cumulative impacts due to other related concurrent and planned projects, activities or pollution sources along the identified water system(s) and water sensitive receivers, that may have a bearing on the environmental acceptability of the Project, through mathematical modelling. This shall include the potential cumulative construction and operational water quality impact arising from, *inter alia*, the dredging works associated with the Proposed Cruise Terminal at Kai Tak Runway, Gas Pipelines Diversion for Kai Tak Development and other marine works proposed under Kai Tak Development; and
- (k) The Applicant shall devise mitigation measures to avoid or minimize the impacts identified above, in particular suitable mud dredging and disposal methods shall be recommended to mitigate any adverse impacts. The residual impacts on the water system(s) and the sensitive receivers with regard to the relevant water and sediment quality objectives, criteria, standards or guidelines shall be assessed and quantified using appropriate mathematical models as set out in Appendix B of this Study Brief.

### **3.4.9 Waste Management Implications**

3.4.9.1 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.

3.4.9.2 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 arising as a

result of the construction and operation activities of the Project, based on the sequence and duration of these activities.

(ii) Proposal for Waste Management

- (a) Prior to considering the disposal options for various types of wastes, opportunities for reducing waste generation, on-site or off-site re-use and recycling shall be evaluated. Measures which can be taken in the planning and design stages (e.g. 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 types and quantities of the wastes required to be disposed of as a consequence shall be estimated and the disposal options for each type of waste shall be described in detail. Pretreatment processes for slurry before disposal shall be addressed in details. The disposal method recommended for each type of waste shall take into account of the result of the assessment in (c) below.
- (c) The impact caused by handling (including labelling, packaging & storage), collection, and reuse/disposal of wastes shall be addressed in detail and appropriate mitigation measures shall be proposed. This assessment shall cover the following areas :
  - potential hazard;
  - air and odour emissions;
  - noise;
  - wastewater discharge; and
  - public transport.

(iii) Dredged Sediment Disposal

Identification and quantification of the dredging, fill extraction, filling, reclamation, mud/sediment 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. 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 shall be agreed with the Director (with reference to Section 4.4.2(c) of the TM) prior to the commencement of the tests. The categories of sediments 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 contaminated sediment which requires special treatment/disposal is confirmed, the Applicant shall identify the most appropriate treatment and/or disposal arrangement and demonstrate its feasibility.

### **3.4.10 Land Contamination Impact**

3.4.10.1 The Applicant shall follow the guidelines for evaluating and assessing potential land contamination issues as stated in Sections 3.1 and 3.2 in Annex 19 of the TM.

3.4.10.2 The "Assessment Area" for land contamination impact shall include areas within the boundary of the Project as shown in Figure 1 of this Study Brief. 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 map) and the relevant land use history in relation to locations with potential land and groundwater contamination (including accident records, change of land use(s) and the like). Particular attention shall be given to the works area at the former shipyard sites within the West Kowloon

Reclamation, areas near the former Ma Tau Kok Gas Works South Plant, and the former Kai Tak Airport and Runway and any other potential contaminated site(s) identified in this EIA. If the relevant part of the former Kai Tak Airport / Runway has not been decommissioned by third party before the commencement of this Project, the Applicant shall also decommission the relevant part of the former Kai Tak Airport and Runway and include this component in the remedial action plan prepared under this Project.

- 3.4.10.3 If the land contamination impact of a certain part of the development area has been adequately assessed in any approved environmental impact assessment reports in the EIA Ordinance Register or any contamination assessment reports/remediation action plans approved by the Director in accordance with the relevant Practice Note for Professional Persons or guidelines issued by the EPD, the Applicant shall make reference to such reports and confirm with the Director whether the information and findings of such reports are still relevant and valid for the EIA study.
- 3.4.10.4 During the course of the EIA study, the Applicant shall submit a contamination assessment plan (CAP) to the Director for agreement prior to conducting the contamination impact assessment of the relevant land or site(s) suspected to contain land contaminant(s) that shall require remediation. The CAP shall include proposals with details on representative sampling and analysis required to determine the nature and the extent of the contamination of the relevant land or site(s). Alternatively, the Applicant may refer to other previously agreed and still relevant and valid CAP(s) for the concerned site(s).
- 3.4.10.5 Based on the CAP agreed with the Director, the Applicant shall conduct a land contamination impact assessment. If land contamination is confirmed, a remedial action plan (RAP) shall be prepared to formulate necessary remedial measures.
- 3.4.10.6 If there is/are potential contaminated site(s) inaccessible for preparing sampling and analysis during the course of the EIA study as required under sub-section 3.4.10.4 above, e.g. due to site access problem, the Applicant's CAP shall include:
- (i) a review of the available information;
  - (ii) an initial contamination evaluation of this/these site(s) and possible remediation methods;
  - (iii) a confirmation of whether the contamination problem at this/these site(s) would be surmountable;
  - (iv) a sampling and analysis proposal which shall aim at determining the nature and the extent of the contamination of this/these site(s); and
  - (v) a schedule of submission of revised CAP(if necessary), CAR and RAP upon this/these site(s) is/are accessible.

#### **3.4.11 Hazard Assessment**

- 3.4.11.1 The Applicant shall follow the criteria for evaluating hazard to life as stated in Annex 4 of the TM.

##### *Ma Tau Kok Gas Works (MTKGW)*

- 3.4.11.2 The Applicant shall investigate methods to avoid and/or minimize risks from drawing towngas into the tunnel through the supply-air-only ventilation building at the junction of To Kwa Wan Road and San Ma Tau Street, in the event of potential gas leak from MTKGW. The Applicant shall carry out hazard assessment to evaluate potential hazardous scenarios from MTKGW to the operation of the Project. The hazard assessment shall include the following:

- (i) Identification of hazardous scenarios requiring Quantitative Risk Assessment (QRA) associated with the draw in of town gas leak from the MTKGW;
- (ii) Execution of a QRA expressing population risks in both individual and societal terms;
- (iii) Comparison of individual and societal risks with the criteria for evaluating hazard to life stipulated in Annex 4 of the TM; and
- (iv) Identification and assessment of practicable and cost-effective risk mitigation measures, including the consideration for alternative siting for the supply-air-only ventilation building at the junction of To Kwa Wan Road and San Ma Tau Street.

#### *Explosives*

3.4.11.3 The Applicant shall investigate alternative construction method to avoid the use of explosives. If there is use of explosives for the construction activities and the storage or blasting location is in close vicinity of populated areas, LPG fuelling station and /or Potentially Hazardous Installation site (e.g. Ma Tau Kok Gas Works), the Applicant shall carry out hazard assessment as follow:

- (i) Identify hazardous scenarios associated with the transport, storage and use 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 of hazard assessment shall be agreed and approved by the Director.

#### **3.4.12 Landscape and Visual Impact**

3.4.12.1 The Applicant shall follow the criteria and guidelines as stated in Annexes 10 and 18 of the TM and EIAO Guidance Note No. 8/2002 on "*Preparation of Landscape and Visual Impact Assessment under the Environmental Impact Assessment Ordinance*" for evaluating and assessing landscape and visual impacts of any above ground structures, such as the ventilation buildings, administration building, tunnel portals, elevated / at grade roads and any noise barriers proposed in the EIA study, and work areas associated with the Project during both construction and operation stages.

3.4.12.2 The assessment area for the landscape impact assessment shall include areas within 100 metres from the boundary of the Project. The assessment area for the visual impact assessment shall be defined by the visual envelope of the Project. The defined visual envelope must be shown on a plan in the EIA report.

3.4.12.3 The Applicant shall review relevant Outline Development Plans, Outline Zoning Plans, Layout Plans, Preliminary / Recommended Outline Development Plan for Kai Tak Development, planning briefs and studies which may identify areas of high landscape value. Any guidelines on landscape strategies, landscape framework, urban design concept, building height profiles, designated view corridors, special design areas, landmarks, open space network and landscape links that may affect the appreciation of the Project should 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 surrounding setting. Any conflict with published land use plan(s) should be highlighted and appropriate follow-up action should be recommended.

- 3.4.12.4 The Applicant shall describe, appraise, analyze and evaluate the existing and planned landscape resource and character of the assessment area including, amongst others, the existing trees at the Tin Hau Temple Complex; trees located in the vicinity of the proposed locations of the western ventilation building and the slip road connections between the tunnel and the road network on the West Kowloon Reclamation. Annotated oblique aerial photographs and plans of suitable scale showing the baseline landscape character areas and landscape resources and mapping of impact assessment shall be extensively used to present the findings of impact assessment. Tree survey information should be included. The assessment shall be particularly focused on the sensitivity of the landscape framework and its ability to accommodate change. The Applicant shall identify the degree of compatibility of the Project with the existing and planned landscape settings. The landscape impact assessment shall quantify the potential landscape impacts 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.
- 3.4.12.5 The Applicant shall assess the visual impacts of the Project. Clear illustrations including mapping of visual impact is required. The assessment shall include the following:
- (i) Identification and plotting of visual envelop of the Project within the assessment area;
  - (ii) Identification of the key groups of sensitive receivers within the visual envelope and their views at both ground level and elevated vantage points;
  - (iii) Description of the visual compatibility of the Project with the surrounding, and the planned setting and its obstruction and interference with the key views of the adjacent areas; and
  - (iv) Description of the severity of visual impacts in terms of nature, distance and number of sensitive receivers. The visual impacts of the Project with and without mitigation measures shall also be included.
- 3.4.12.6 The Applicant shall evaluate the merits of preservation in totality, in parts or total destruction of existing landscape and the establishment of a new landscape character area. In addition, alternative alignment, design and construction methods that would avoid or reduce the identified landscape and visual impacts shall 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 should also include consideration of potential enhancement of existing landscape. The Applicant shall recommend mitigation measures to minimize the adverse effects identified above, including provision of a landscape design.
- 3.4.12.7 The mitigation measures shall include consideration of at least the following: preservation of vegetation, transplanting, provision of screen planting, re-vegetation of disturbed land, compensatory planting, provisioning/reprovisioning of amenity areas and open spaces, avoidance and minimization of noise barriers, design of structures, provision of finishes to structures, colour scheme and texture of material used and any measures to mitigate the impact on existing land use. The relevant responsible parties shall be identified for the on going management and maintenance of the proposed mitigation works 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 be provided.

3.4.12.8 Annotated illustration materials such as coloured perspective drawings, plans and section/elevation diagrams, oblique aerial photographs, photographs taken at vantage points, and computer-generated photomontage shall be adopted to fully illustrate the landscape and visual impacts of the Project to the satisfaction of the Director. In particular, the landscape and visual impacts of the Project with and without mitigation measures shall also be properly illustrated in existing and planned setting by computer-generated photomontage so as to demonstrate the effectiveness of the proposed mitigation measures. All computer graphics shall be compatible with Microstation DGN file format. The Applicant shall record the technical details such as system set-up, software, data files and function in preparing the illustration that may need to be submitted for verification of the accuracy of the illustrations.

### **3.413 Impact on Cultural Heritage**

3.4.13.1 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, *Criteria for Cultural Heritage Impact Assessment* in Appendix C1, *Guidelines for Handling of Archaeological Finds and Archives* in Appendix C2, *Guidelines for Marine Archaeological Investigation (MAI)* at Appendix C3 and *Guidelines for Archaeological Reports* at Appendix C4.

3.4.13.2 The cultural heritage impact assessment shall include archaeological impact assessment and built heritage impact assessment.

(i) Archaeological Impact Assessment (AIA)

The Applicant shall engage qualified archaeologist(s) to review the archaeological potential (both terrestrial and marine) of the Project 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 marine) to assemble data. The qualification of the archaeologist(s) to be appointed for carrying out the AIA shall be agreed with the Antiquities Authority.

The details of the archaeological impact assessment shall be agreed with the Antiquities Authority or the Director prior to the commencement of the assessment (with reference to Section 4.4.2(c) of the TM).

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.

The Applicant shall draw necessary reference to relevant sections of the *Criteria for Cultural Heritage Assessment* at Appendix C1, *Guidelines for Handling of Archaeological Finds and Archives* at Appendix C2, *Guidelines for Marine Archaeological Investigation (MAI)* at Appendix C3, and *Guidelines for Archaeological Reports* at Appendix C4.

(ii) Built Heritage Impact Assessment

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 known and unknown heritage items within the assessment area (as described in section

1.3 and 3.2) that may be affected by the Project and its associated works to assess the direct and indirect impacts on heritage items. Appropriate mitigation measures should be recommended in the BHIA.

Particular attention shall be paid to the following graded historical buildings:

- (a) Yau Ma Tei Police Station (Grade III)
- (b) Tin Hau Temple (Grade II)
- (c) Yau Ma Tei Wholesale Fruit Market (Grade III)
- (d) Yau Ma Tei Theatre (Grade II)
- (e) Former Pumping Station of Water Supplies Department (Grade I)
- (f) Old South Kowloon District Court (Grade II)
- (g) Ex- Ma Tau Kok Animal Quarantine Depot (Grade III)

A structural and geotechnical survey of the Yau Ma Tei Police Station and its immediate surrounding area should be conducted to facilitate the evaluation of possible impact, formulation of the optimal alignment and practicability of the recommended mitigation measures. The Applicant shall demonstrate that all reasonable efforts have been made to avoid damage or demolition of any part of the Yau Ma Tei Police Station through modification of layout and design of the Project or use of the latest tunnelling / engineering techniques.

The Applicant shall draw necessary reference to relevant sections of the *Criteria for Cultural Heritage Assessment* at Appendix C1.

#### **3.4.14 Documentation of Key Assessment Assumptions, Limitation of Assessment Methodologies and related Prior Agreement(s) with the Director**

- 3.4.14.1 To facilitate efficient retrieval, a summary to include the assessment methodologies and key assessment assumptions adopted in this EIA study, the limitations of these assessment(s) methodologies/assumptions, if any, plus all relevant prior agreement(s) with the Director or other Authorities on individual environmental media assessment components shall be provided in the EIA report. 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) before seeking the Director's agreement. This summary and the related supporting documents shall be provided in the form of an Appendix to the EIA study report.

#### **3.4.15 Impacts Summary**

- 3.4.15.1 To facilitate effective retrieval of pertinent key information, a summary of environmental impacts in the form of a table (or in any other form approved by the Director) showing the assessment points (such as ASRs, NSRs), results of impact predictions, relevant standards or criteria, extents of exceedances predicted, impact avoidance measures considered, mitigation measures proposed and residual impacts (after mitigation) shall be provided to cover each individual impact in the EIA report. This impact summary shall form an essential part of the Executive Summary.

#### **3.4.16 Summary of Environmental Outcomes**

- 3.4.16.1 The EIA report shall contain 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.

### **3.4.17 Environmental Monitoring and Audit (EM&A) Requirements**

- 3.4.17.1 The Applicant shall identify and justify in the EIA study whether there is any need for EM&A activities during the construction and operation phases of the Project and, if affirmative, to define the scope of the EM&A requirements for the Project in the EIA study and include an EM&A Manual.
- 3.4.17.2 Subject to the confirmation of the EIA study findings, the Applicant shall comply with the requirements as stipulated in Annex 21 of the TM.
- 3.7.17.3 The Applicant shall prepare a project implementation schedule in the form of a checklist containing all the EIA study recommendations and mitigation measures with reference to the Project implementation programme. The Implementation Schedule shall include and discriminate between all phases and stages of Project implementation, and shall include all on and off-site works areas and sites, and temporary and permanent works.

## **4. DURATION OF VALIDITY**

- 4.1 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.

## **5. REPORT REQUIREMENTS**

- 5.1 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.
- 5.2 The Applicant shall supply the Director with the following number of copies of the EIA report and the executive summary:
- (i) 50 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 5.2 (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.
- 5.3 The Applicant shall, upon request, make additional copies of the above documents available to the public, subject to payment by the interested parties of full costs of printing.
- 5.4 In addition, to facilitate the 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 Report prepared in HyperText Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 4.0 or later), unless otherwise agreed by the Director. 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 Report 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 unless otherwise agreed by the Director.

- 5.5 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.
- 5.6 When the EIA Report and the Executive Summary are made available for public inspection under section 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.
- 5.7 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 and their format shall be agreed by the Director.
- 5.8 To facilitate public involvement in the EIA process, the Applicant shall provide 3-dimensional electronic visualizations of the road traffic noise predictions of the EIA report, including impacts with and without the Project, and the mitigated and unmitigated impacts so that the public can understand the project, the associated road traffic noise impacts and the noise reduction effectiveness of the different elements in the recommended mitigation proposals. The visualizations shall be based on the EIA report and released to the public. The visualizations shall be submitted in CD-ROM, DVD-ROM or other suitable means agreed with the Director in commonly readable formats which could be readily disseminated for public access through the internet. Unless otherwise advised or agreed by the Director, the number of copies of CD-ROM/DVD-ROM required shall be the same as that for EIA reports under Section 5.2.

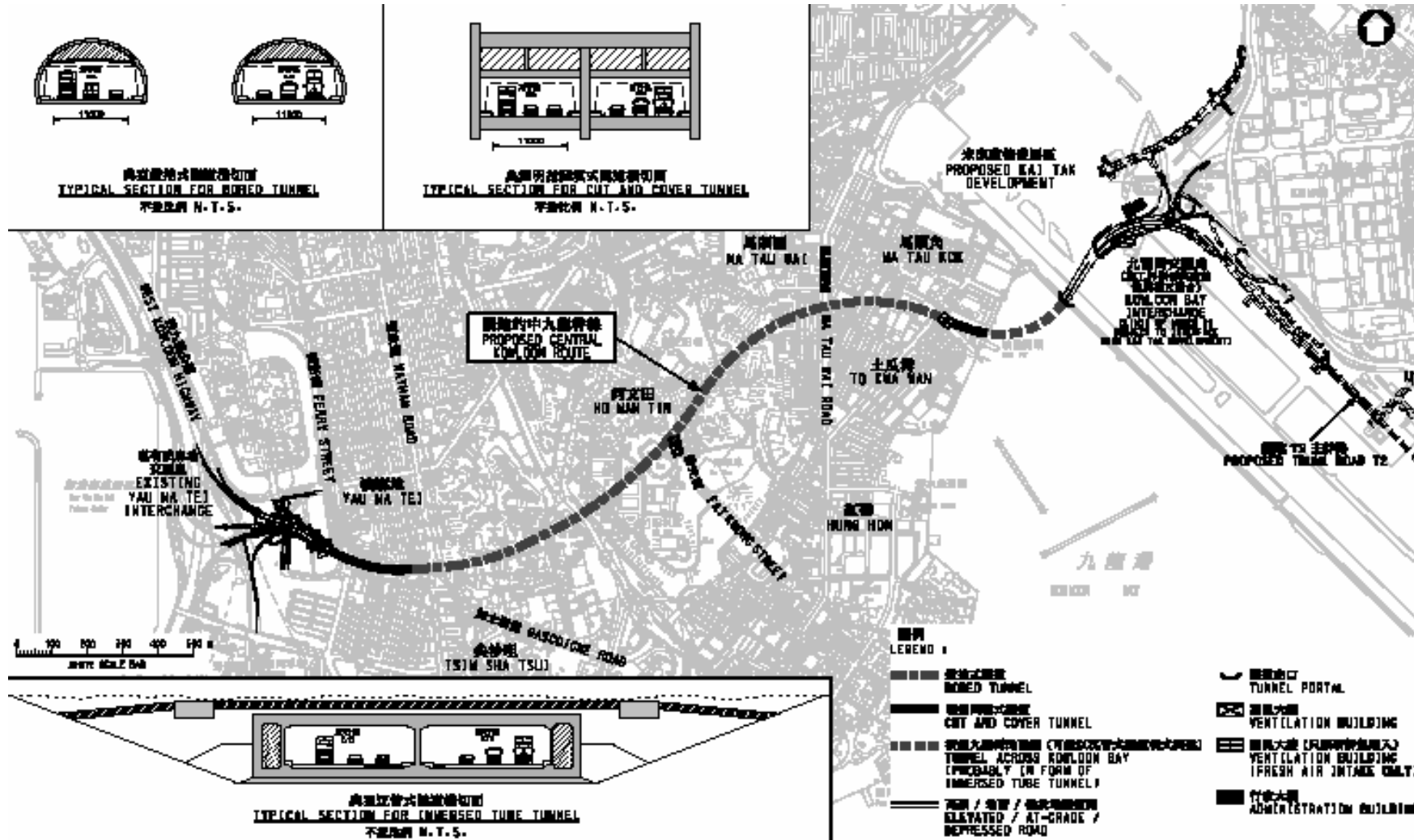
## **6. OTHER PROCEDURAL REQUIREMENTS**

- 6.1 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.
- 6.2 If there is any key change in the scope of the Project mentioned in Section 1.3 of this EIA study brief and in Project Profile (No. PP-300/2006), 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.

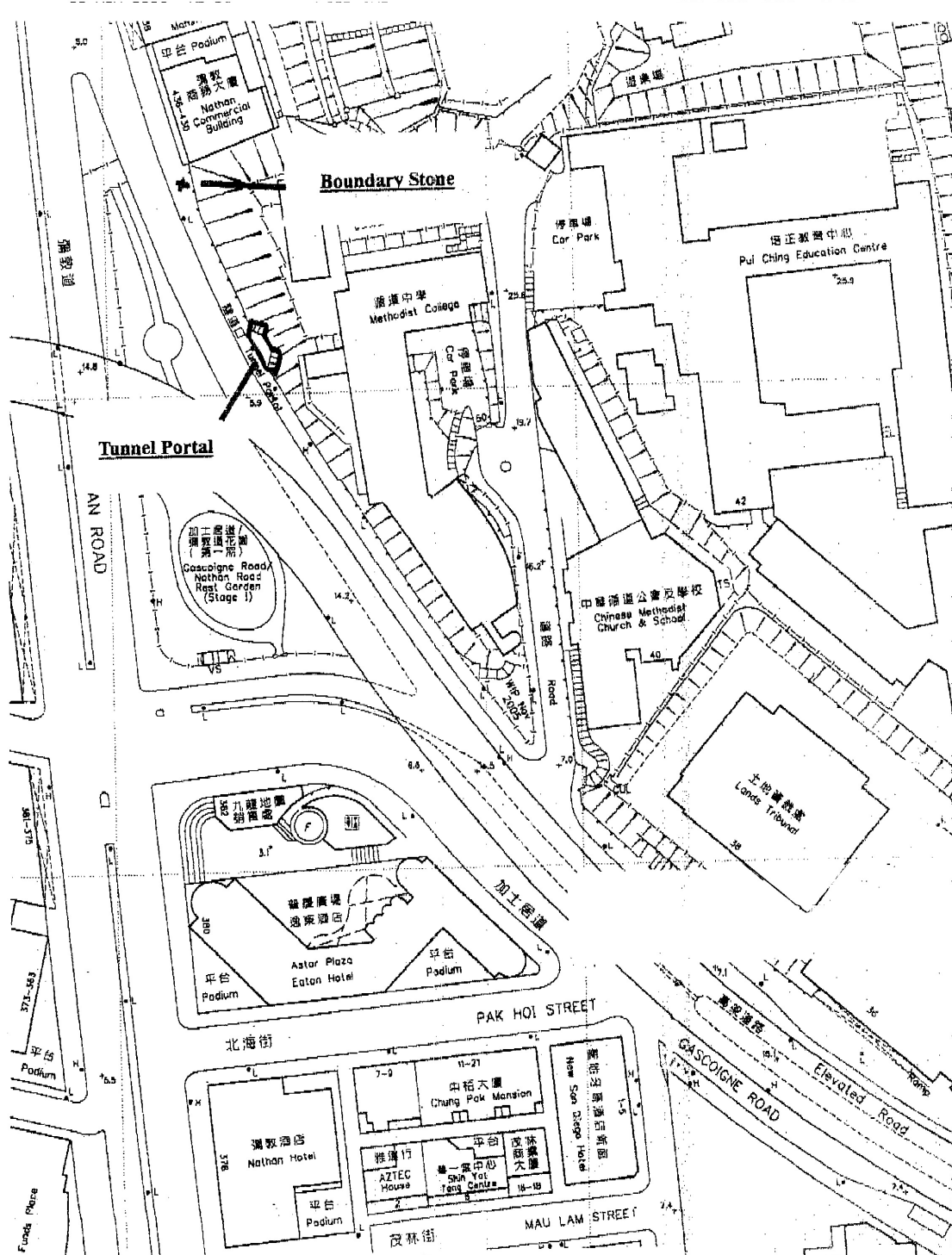
--- END OF EIA STUDY BRIEF ---

November 2006  
Environmental Assessment and Noise Division,  
Environmental Protection Department

Figure 1 – Project Location



**Figure 2 - Locations of Some Recorded Items (referred in para. 3.2 (vii) of this EIA Study Brief)**



**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 exercises 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'.
- 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 the 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,  $\sigma_{\Theta}$ , needs to be provided as input to the CALINE4 model. Typical values of  $\sigma_{\Theta}$  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/m<sup>2</sup>) 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, 5<sup>th</sup> 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 classed 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 classed 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 the 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  $\mu$ m) and RSP (< 10  $\mu$ m) compositions should be used.

### 3.7 NO<sub>2</sub> to NO<sub>x</sub> Ratio

The conversion of NO<sub>x</sub> to NO<sub>2</sub> 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<sub>2</sub>:

- (a) Ambient Ratio Method (ARM) - assuming 20% of NO<sub>x</sub> to be NO<sub>2</sub>; or
- (b) Discrete Parcel Method (DPM, available in the CALINE4 model); or
- (c) Ozone Limiting Method (OLM) - assuming the tailpipe NO<sub>2</sub> emission to be 7.5% of NO<sub>x</sub> and the background ozone concentration to be in the range of 57 to 68 µg/m<sup>3</sup> depending on the land use type (see also EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts').

### 3.8 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.

### 3.9 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.

*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.*

### 3.10 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. Refer to EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts' for further information.

### 3.11 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:	pollution not accounted for by the previous two (Background contributions)

**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:

<b>POLLUTANT</b>	<b>URBAN</b>	<b>INDUSTRIAL</b>	<b>RURAL/NEW DEVELOPMENT</b>
NO <sub>2</sub>	59	57	39
SO <sub>2</sub>	21	26	13

O <sub>3</sub>	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 realised) 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).
- 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\*

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

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.

\* 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.

Model details – Calibration & Validation

1. The models shall be properly calibrated and validated before its use in this study in the Hong Kong waters, the Pearl Estuary and the Dangan (Lema) Channel, with the field data collected by:
  - South East Kowloon Development Comprehensive Planning and Engineering Review – Stage I: Planning Review, CEDD (2005/2006)
  - Hydraulic and Water Quality Studies in Victoria Harbour (1987)
  - Port and Airport Development Strategy - Enhancement of WAHMO Mathematical Models (1990)
  - Strategic Sewage Disposal Scheme Stage II - Oceanic Outfall, Oceanographic Surveys and Modelling (1992)
  - Update on Cumulative Water Quality and Hydrological Effect of Coastal Developments and Upgrading of Assessment Tool (1998)
  - Environmental Protection Department (EPD)'s routine monitoring data
  - Tidal data from Hong Kong Observatory, Macau and relevant Mainland Authorities
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 (rms)	< 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

### 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 waterway and the proposed disposal ground. 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. When it's necessary to simulate the scenario of opening the Kai Tak Runway (proposed under the Kai Tak Development), the Kai Tak Approach Channel shall have at least 4 grids across it to better resolve transverse variations of the Channel. The grid schematization shall be agreed with EPD.

### Modelling assessment

1. The assessment shall include the construction and operation phases of the project. 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. Any changes in hydrodynamic regime shall be assessed. Daily erosion / sedimentation rate shall be computed and its ecological impact shall be assessed.
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.
6. All modelling input data and results shall be submitted in digital media to EPD.



**Appendix C-1****Criteria for Cultural Heritage Impact Assessment****(1) Baseline Study**

1.1 A baseline study shall be conducted:

- a. to compile a comprehensive inventory of archaeological sites (including marine archaeological sites), historic buildings and structures within the proposed project area, which include:
  - (i) all sites of archaeological interest (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) landscape features include sites of historical events or providing a significant historical record or a setting for buildings or monuments of architectural or archaeological importance, historic field patterns, tracks and fish ponds and cultural element such as *fung shui* woodlands and clan grave.
- b. to identify the direct and indirect impacts on the site of cultural heritage 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 in its settings causing impinge 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, recreation pressure and ecological damage by the 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 study and a field evaluation.

**1.3. Desk-top Study**

- 1.3.1 Desk-top searches should be conducted to analyse, collect and collate extant information. They include:
  - a. Search of the list of declared monuments protected by the Antiquities and Monuments Ordinance (Chapter 53).
  - b. Search of the list of deemed monuments through the Antiquities and Monuments Office (AMO) of the Leisure and Cultural Services Department.
  - c. Search of the list of sites of cultural heritage identified by the AMO.
  - d. Search of 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.
  - e. Search of 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.

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- f. Search of any other unpublished archaeological investigation and excavation reports kept by the AMO.
  - g. Search of 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.
  - h. Search of cartographic and pictorial documents. Maps of the recent past searched in the Maps and Aerial Photo Library of the Lands Department.
  - i. Study of existing Geotechnical information (for archaeological desk-top research).
  - j. Discussion with local informants.

#### 1.4 Field Evaluation

1.4.1 The potential value of the project area with regard to 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 combined with discussions with appropriate individuals or organisations should be conducted by those with expertise in the area of cultural heritage to clarify the position.

#### 1.4.2 Historic buildings and structures survey

- 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 of each historic building or structure.
- c. Interview with local elders and other informants on the local historical, architectural, anthropological and other cultural information related to the historic buildings and structures.
- d. Architectural appraisal of the historic buildings and structures.

#### 1.4.3 Archaeological Survey

A licence shall be obtained from the Antiquities Authority for conducting an archaeological survey. It takes at least two months to process the application.

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.

The following methods of archaeological survey (but not limited to) should be applied to assess the archaeological potential of the project area:

- a. Definition of areas of natural land undisturbed in the recent past.
  - b. Field scan of the natural land undisturbed in the recent past in detail with
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special attention paid to areas of exposed soil which were searched for artifacts.

- c. 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.
- d. 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.
- e. The exact quantity and location of auger holes and test pits should be agreed with the Antiquities and Monuments Office prior to applying for a licence.
- f. A qualified 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.

1.4.4 If the field evaluation identifies any additional sites of cultural heritage within the study area which are of potential historic or archaeological importance and not recorded by AMO, the office should be reported as soon as possible. The historic and archaeological value of the items will be further assessed by the AMO.

## 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 sites of cultural heritage supported by full description of their cultural significance. The description should contain detailed geographical, historical, archaeological, architectural, anthropological, ethnographic and other cultural data supplemented with illustrations below and photographic and cartographic records.

### 1.5.2 Historic Buildings and Structures

- a. A map in 1:1000 scale showing the boundary of each historic building or structure.
- b. Photographic records of each historic building or structure.
- c. Detailed record of each historic building or structure including its construction year, previous and present uses, architectural characteristics, as well as legends, historic persons and events, and cultural activities associated with the structure.

### 1.5.3 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 surveyor.

1.5.4 A full bibliography and the source of information consulted should be provided to assist the evaluation of the quality of the evidence. It is expected that the study and result are up to an internationally accepted academic and professional

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standard.

## 1.6 Finds and Archives

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

## (2) Impact Assessment

- 2.1 Culture heritage impact assessment must be undertaken to identify the impacts of the sites of cultural heritage 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 an expert in cultural heritage. During the assessment, both the direct impacts such as loss or damage of important features as well as indirect impacts such as change of ground water level which may affect the preservation of the archaeological and built heritage in situ should be stated. A detailed description and plans should be provided to elaborate to what extent the site of cultural heritage will be affected.
- 2.2 Preservation in totality must be taken as the first priority. Please refer to 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 for the detailed requirements of the impact assessment.

## (3) Mitigation Measures

- 3.1 It is always a good practice to recognise the site or monument 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. Built heritage, sites and landscapes are to be in favour of preservation unless it can be shown that there is a need for a particular development which is of paramount importance and outweighs the significance of the heritage feature.
- 3.2 If avoidance of the cultural heritage is not possible, amelioration can be achieved by reduction of the potential impacts and the preservation of heritage features, 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 cultural heritage and affecting its character.
- 3.3 All the assessments should be conducted by an expert in cultural heritage and further evaluated and endorsed by the Antiquities and Monuments Office and the Antiquities Advisory Board.
- 3.4 Besides refer to paragraph 4.3.1(d), items 2.10 to 2.14 of Annex 19 and other relevant parts of the Technical Memorandum. Proposals for mitigation measures should be accompanied with a master layout plan together with all detailed treatment, elevations, and landscape plan. 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.
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- 3.5 The programme for implementation of agreed mitigation measures should be able to be implemented. It is to be clearly stated in the EIA report, as required in Annex 20 of the Technical Memorandum. 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 Site of Cultural Heritage, if any, during the planning and design stage of the proposed project must be detailed.

**Appendix C-2****Guidelines for Handling of Archaeological Finds and Archives****I. 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.

**II. 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” technique should be adopted for marking permanent identification number on an object. *(Please see annex for detail)*
  - 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, 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.

### **III. Field Archives and Laboratory Records**

7. Field archives include field dairy, 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.

### **IV. 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.

**Annex to Appendix C-2**

*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.



**Appendix C-3****Guidelines for Marine Archaeological Investigation (MAI)**

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. 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 on the seabed which may be archaeological material.

**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.

**(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 C-4****Guidelines for Archaeological Reports****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, but not exceeding A3 size unless otherwise approved by the Antiquities and Monuments Office (AMO).
3. Draft reports should be submitted to 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
  - Author
  - Date of report
2. Contents list  
Page number of each section should be given.
3. Non-technical summary (both in English and in Chinese)  
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.

Guidelines for archaeological 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.
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 and with proper legends 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.