

Environmental Impact Assessment Ordinance (Cap. 499), Section 5(7)
Environmental Impact Assessment Study Brief No. ESB-193/2008

Project Title: Shatin to Central Link – Cross Harbour Section
(Phase II - Hung Hom to Admiralty)
(hereinafter known as the "Project")

Name of Applicant : MTR Corporation Limited (MTRCL)
(hereinafter known as the "Applicant")

1. BACKGROUND

1.1 An application (No. ESB-193/2008) for an Environmental Impact Assessment (EIA) study brief under section 5(1) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by the Applicant on 18 June 2008 with a Project Profile (No. PP-358/2008) (the Project Profile).

1.2 There are two sections in the Shatin to Central Link (SCL), i.e. the Cross Harbour Section and the Tai Wai to Hung Hom Section. The Cross Harbour Section consists of two phases. The Phase I of the Cross Harbour Section is from Mong Kok East to the Hung Hom Station. The Phase II of the Cross Harbour Section is from Hung Hom to Admiralty.

1.3 This study brief covers only the Shatin to Central Link – Cross Harbour Section (Phase II - Hung Hom to Admiralty) (hereinafter known as the "Project"). The Phase I of the Cross Harbour Section from Mong Kok East to the Hung Hom Station is covered by a separate study brief issued under the EIAO. The indicative alignment of the Project is shown in the Project Profile and is reproduced in Figure 1 in this study brief. The development and operation of the Project will comprise the following:

- (i) An approximately 6km extension of the East Rail Line including a rail harbour crossing from Hung Hom, Kowloon across the harbour to Admiralty on Hong Kong Island;
- (ii) A new station near the Hong Kong Convention and Exhibition Centre (HKCEC) i.e. Exhibition Station (EXH);
- (iii) Demolition of the existing MTRC Freight Operations Building at south of Hung Hom Station to facilitate the construction of the Project; and
- (iv) Ventilation buildings, vent shaft, smoke extraction facilities and other associated works of the Project.

The Project consists of designated project elements including Items A.2 and A.7, Part I under Schedule 2 of the EIAO.

(Remarks: Based on the information in the Project Profile, the works at the new Hung Hom Station (HUH) would be within the scope of Phase I of the Cross

Harbour Section, i.e. not within the scope of the Project. The Admiralty Station (ADM) would be extended and become an integrated station for the existing urban lines, the future SCL and South Island Line (SIL). The design and construction of the Admiralty Station including the parts for the SCL will be carried out by the SIL project.)

- 1.4 Pursuant to section 5(7)(a) of the Environmental Impact Assessment Ordinance, the Director of Environmental Protection (the Director) issues this Environmental Impact Assessment (EIA) study brief to the Applicant to carry out an EIA study.
- 1.5 The purpose of this EIA study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and related activities that take place concurrently. This information will contribute to decisions by the Director on:
- (i) the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project;
 - (ii) the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and
 - (iii) the acceptability of residual impacts after the proposed mitigation measures are implemented.

2. OBJECTIVES OF THE EIA STUDY

- 2.1 The objectives of the EIA study are as follows:
- (i) to describe the Project, associated works, and option(s) of alignment together with the requirements and environmental benefits for carrying out the Project;
 - (ii) to identify any individual designated project element(s) under Schedule 2 of the EIAO to be covered in the Project; to ascertain whether the findings of the EIA study have adequately addressed the environmental impacts of these project;
 - (iii) to identify and describe the elements of the community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the Project, including both the natural and man-made environment and the associated environmental constraints;
 - (iv) to present the considerations of alternative(s) with regard to avoiding and minimizing the potential environmental impacts on the sensitive receivers; to compare the environmental benefits and dis-benefits of the option(s) (including Project alignment, train system, location(s) and size(s) of station/platforms, ventilation building(s), vent shaft(s), entrances and exits, works

- areas/works sites, overnight explosive storage facility (if any) and construction method(s)); to provide reasons for selecting the preferred option(s) and to describe the part that environmental factors played in the selection;
- (v) to identify and assess water quality impacts, waste management implications, potential land contamination issue, landscape and visual impacts, noise impacts, air quality impacts, ecological impacts, potential hazard to life, potential cultural heritage impacts, and determine the significance of impacts on sensitive receivers and potential affected uses;
 - (vi) to propose provision of mitigation measures so as to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;
 - (vii) to investigate the feasibility, practicability, effectiveness and implications of the proposed avoidance or mitigation measures;
 - (viii) to identify, predict and evaluate the residual environmental impacts (i.e. after practicable mitigation) and the cumulative effects expected to arise during the construction and operational phases in relation to the sensitive receivers and potential affected uses;
 - (ix) to identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operational stages of the Project which are necessary to avoid or mitigate these environmental impacts and cumulative effects and reduce them to acceptable levels;
 - (x) to investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures and to identify constraints associated with the mitigation measures recommended in the EIA study, as well as the provision of any necessary modification; and
 - (xi) to design and specify the environmental monitoring and audit requirements to ensure the effective implementation of the recommended environmental protection and pollution control measures.

3. DETAILED REQUIREMENTS OF THE EIA STUDY

3.1 The Purpose

- 3.1.1 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 fully complied with.

3.2 The Scope

- 3.2.1 The scope of this EIA study shall cover the Project proposed in the Project Profile and shall include the major elements mentioned in Section 1.3 above. The Applicant shall clearly present the scope of the Project, including at least the scope of the new railways and rail tunnel(s) from Hung Hom to Admiralty, the associated station-related works, ventilation buildings, vent shaft, any dredging works, any reclamation works¹ including temporary reclamation under the Project.
- 3.2.2 In addition to the designated project elements stated in Section 1.3 above, the Applicant shall identify any individual designated project element(s) under Schedule 2 of the EIAO to be covered in the Project based on the best available information during the course of the EIA study, e.g. any dredging, reclamation, typhoon shelter, etc. The Applicant shall confirm whether the findings of the EIA study have adequately addressed the environmental impacts of all identified designated project elements or whether any further EIA study is required.
- 3.2.3 The EIA study shall address the key issues and provide information as 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 developments in the vicinity of the Project, including at least the existing Hung Hom Station and the existing East Rail and the East Rail Extension – Hung Hom to Tsim Sha Tsui, and committed, planned or known potential developments in the vicinity of the Project, including at least the Shatin to Central Link (Tai Wai to Hung Hom Section), the Shatin to Central Link (Cross Harbour Section Phase I – Mong Kok East to Hung Hom) that might interface with the Project at the Hung Hom Station, the South Island Line that might interface with the Project at the Admiralty Station, North Island Line that might interface with the SCL on Hong Kong Island, Hong Kong Polytechnic University (Phase 8 Development), Re-provisioning of the existing International Mail Centre (IMC), the Wan Chai Development Phase II (WDII), and the Central-Wan Chai Bypass (CWB):
- (i) the potential water quality impacts during the construction and operation stages of the Project, in particular if marine works is required, including any dredging, backfilling, temporary/ permanent reclamation, immersed tube tunnel and the associated dry dock casting yard site, temporary typhoon shelter/mooring site, any other marine works, extraction of groundwater, sewage/wastewater discharge, spent cooling water discharge from air conditioning systems, construction site runoff, track runoff, etc. on existing and planned water sensitive receivers, such as the saltwater pumping stations of the Water Supplies Department (WSD) and seawater intakes for cooling systems, etc.;

¹ Any proposed reclamation should be considered in the context of the Protection of the Harbour Ordinance (Cap. 531), giving due consideration to the judgment of the Court of Final Appeal of 9 January 2004 and the judgment of the Court of First Instance of 20 March 2008.

- (ii) the potential noise impacts including construction noise, operational rail noise, fixed noise sources, ground-borne noise, if applicable, on the existing and planned sensitive receivers, such as nearby residential developments, educational institutions, etc.;
- (iii) the potential landscape and visual impacts arising from the construction and operation of the Project, including any open-cut area during construction stage and temporary and permanent above ground works/structures, such ventilation buildings, vent shafts, smoke extraction facilities, station(s), entrances and exits;
- (iv) the potential impacts of various types of waste arising, including at least excavated materials from constructing the underground section of the Project, any dredged marine sediment, and any other wastes to be generated from the construction and operation of the Project;
- (v) the potential land contamination issue, taking into account relevant land use history and/or present land use/operation of the existing railway including the existing Hung Hom Freight Yard;
- (vi) the potential impacts on sites with cultural heritage values likely to be affected by the construction works of the Project;
- (vii) the potential ecological impacts arising from the Project in particular if marine works is required;
- (viii) the potential fisheries impacts arising from the Project in particular if marine works is required;
- (ix) the potential hazard to life arising from any proposed over-night storage of explosives; and
- (x) the potential construction dust impacts arising from the Project,

In particular, with the uncertainty of the project programme of the WDII & CWB proposal, the EIA shall address both long-term and interim scenarios of with and without the WDII & CWB development based on the best available information at the time of the EIA study.

3.3 Consideration of Alternative Project Design, Alignment Option(s) and Construction Method(s)

3.3.1 The Background Information of the Project

The Applicant shall provide information on the background for the construction and operation of this Project and provide plan(s) of a scale of at least 1:5000 to clearly present the scope of the Project, the Project boundary and associated work(s) areas/works site(s) location(s). The Applicant shall explain clearly the purpose and

objectives of the Project, and shall include a description of the potential environmental benefits of the Project.

3.3.2 Consideration of Alternative Options for Alignment(s), Station(s)/Platforms, Train System, Ventilation Building(s)/Vent Shaft(s) and Entrances/Exits

In addition to the proposed alignment and station(s) option mentioned in the Project Profile and Section 1.3 above, the Applicant shall describe the considerations given, when exploring various feasible alternative option(s) for alignment, station(s)/platform(s), train system (including number of cars in a train), ventilation building(s)/vent shaft(s) and entrances/exits, to avoid and minimize adverse environmental impacts, taking into account previous studies, any lessons learned from other similar projects and the existing twin submarine town gas pipelines between Hung Hom and Kellett Island across the Victoria Harbour. A comparison of the environmental benefits and dis-benefits of feasible alternative option(s) shall be presented to support the selection of the preferred option.

Operational consideration(s) or other constraint(s) affecting the selection of the preferred option shall also be stated. The consideration(s) given in the design and location of the entrances and exits and smoke extraction facilities and/or other station-related structure(s) of the Project shall also be provided to justify the selection of the preferred option.

3.3.3 Consideration of Alternative Construction Method(s), Sequences of Work(s), Works Areas/Works Sites Requirements and Locations

Taking into consideration the potential cumulative effects during the construction period and the degree of the construction impacts on affected sensitive receivers, the EIA study shall describe the considerations given, when exploring various feasible alternative construction methods (including at least tunnel boring machine, cut-and-cover, drill-and-blast, New Austrian Tunneling Method/Shield Tunneling, immersed tube, mined tunneling, mini- and micro-tunneling) and sequence of works, works areas/works sites size requirements and works areas/works sites locations for the Project, (including tunnel boring machine launching and retrieval sites, works sites away from the railway route, and overnight explosive storage facility, if any), to avoid extensive periods of exposing sensitive receivers to adverse environmental impacts. The EIA study shall also explore with a view to select feasible method(s) for constructing the railway tunnels that would not adversely affect the underground water levels; and the existing twin submarine town gas pipelines between Hung Hom and Kellett Island across the Victoria Harbour.

A comparison of the environmental benefits and dis-benefits of applying different construction method(s), sequences of work(s), works areas/works sites locations and size shall be made.

3.3.4 Selection of Preferred Option

Taking into consideration of the findings resulting from Sections 3.3.2 and 3.3.3

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above, the Applicant shall provide the recommendation(s) and justification(s) for the preferred option that will avoid or minimize adverse environmental effect(s) arising from the construction and operation of the Project, and shall adequately describe the part that environmental factor(s) played in arriving at the final selection.

3.3.5 Description of the Project

The Applicant shall describe the Project in details, including at least the Project alignment, location and design of ventilation building(s)/vent shaft(s), station(s)/platforms and entrances and exits, and train system to be adopted (including number of cars in a train), the construction programme, the works areas/works sites size requirements and their locations, the form of construction and construction method(s) for various structure(s) of the Project, including overnight explosive storage facility, if any, and the operation of the Project in conjunction with the existing East Rail, the existing East Rail – Hung Hom to Tsim Sha Tsui Extension, and the potential railway development of Shatin to Central Link (Tai Wai to Hung Hom Section), the Shatin to Central Link (Cross Harbour Section Phase I – Mong Kok East to Hung Hom) that interface with the Project at Hung Hom Station. The information should aim at providing sufficient details to facilitate assessment of various environmental impacts.

3.4 **Technical Requirements**

The Applicant shall conduct the EIA study to address the environmental aspects as described in Section 3.2 above. The assessment shall be based on the best and latest information available during the course of the EIA study.

3.4.1 **Water Quality Impact**

3.4.1.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing water pollution as set out in Annexes 6 and 14 of the TM, respectively.

3.4.1.2 The water quality impact assessment shall include the following:

- (a) the water quality impacts associated with marine works (if any), e.g. any dredging, backfilling, temporary reclamation, re-provision of temporary typhoon shelter, any dry dock casting yard, any mooring site and transportation of the immersed tube tunnel sections within the Hong Kong Special Administrative Region (HKSAR) for construction of the cross harbour railway tunnel;
- (b) the water quality impacts of the other construction works, including but not limited to site runoff, the effluents generated from dewatering associated with piling activities, grouting, concrete washing and dewatering of spoil from the tunnel boring operations;
- (c) the water quality impacts during operation stage, including the track runoff containing oil/grease and suspended solids, sewage and wastewater arising

from the railway operation, spent cooling water discharge (if applicable) from air-conditioning systems; and

- (d) the water quality impacts and any proposed monitoring and audit programme on the water quality, e.g. at the seawater intakes of the WSD's salt water pumping stations and seawater intakes for cooling systems, if applicable.

- 3.4.1.3 The assessment area shall include the Victoria Harbour Water Control Zone (WCZ), the Eastern Buffer WCZ and the Western Buffer WCZ as declared under the Water Pollution Control Ordinance, any areas within a distance of 300m from the Project boundary and from any works sites, including works sites away from the railway route, and other areas such as existing and new drainage system and any associated water system(s) affected by the construction and operation of the Project and associated works, including any phased implementation. The assessment area may be extended to include other areas being impacted such as stream courses and the associated water systems in the vicinity.
- 3.4.1.4 The Applicant shall identify and analyse 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.
- 3.4.1.5 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 agreed with the Director. If mathematical modelling is necessary, such as to assess impact due to marine works, the mathematical modelling requirements are set out in **Appendix A** 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, spent cooling water discharge and the proposed construction method(s), and the consequential effects on aquatic organisms due to such changes in affected water bodies including the Victoria Harbour WCZ, the Eastern Buffer WCZ and the Western Buffer WCZ.
- 3.4.1.6 The Applicant shall take into account and include likely different construction method(s), 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 existing and planned future activities and beneficial uses related to the water system(s) and identification of 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, such as the existing and planned WSD's salt water pumping stations and seawater intakes for cooling system;
- (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 all 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, reclamation, 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 agreement of the Director. 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 construction methods and operation of the dry

dock casting yard and concrete batching plant if any. 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 agreement with the Director. Water quality modelling assessment shall be required if major marine work is involved;

Impact Prediction

- (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, spent cooling water discharge and the proposed construction methods e.g. by the immersed tube tunnel and cut-and-cover method. The location, nature, extent and rate of such works for the proposed construction method 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;
- (j) If contaminated groundwater is identified in the land contamination assessment covered in this study brief, the potential impacts during construction stage shall be evaluated and properly addressed.
- (k) If seawater will be used in cooling systems and spent cooling effluent will be discharged into marine water, prediction and quantification by mathematical modelling shall be required to assess the impacts on the water system and sensitive receivers, in respect of thermal and chemical discharge. The water quality modelling specifications in **Appendix A** to this study brief could be used as a guideline subject to amendment in respect of the model calibration area and the fine grid model area. If the spent cooling water discharge will not be significant in terms of discharge rate and impact on sensitive waters or sensitive receivers, the Applicant may propose alternative assessment methodology for the agreement of the Director.
- (l) 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 but not limited to, the potential cumulative construction and operational water quality impact arising from, *inter alia*, the project components highlighted in Section 3.2.3(i) above; and

Mitigation

- (m) 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 A** of this study brief.

3.4.2 Noise Impact

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

3.4.2.2 The Applicant shall address the potential noise impacts including at least:

- (a) the potential air-borne and ground-borne construction noise impacts;
- (b) the potential operational rail noise impacts including ground-borne railway noise impacts; and
- (c) the potential fixed noise impacts during the operation stage, such as noise from ventilation, air-conditioning and smoke extraction facilities,

at noise sensitive receivers, such as nearby residential developments, Hong Kong Academy for Performing Arts and Arts Centre.

3.4.2.3 The noise impact assessment shall include the following:

(i) Determination of Assessment Area

The assessment area shall include all areas within a distance of 300m from the Project alignment and from any works sites, including works sites away from the Project alignment, proposed under the Project. The assessment area may be reduced accordingly if the first layer of noise sensitive receivers (NSRs), closer than 300m from the outer Project limit, provides acoustic shielding to those receivers located further away. In this case, the assessment area shall be agreed with the Director. Subject to the agreement of the Director, the assessment area shall be expanded to include NSRs at greater distance which would be affected by the construction and operation of the Project.

(ii) Provision of Background Information and Existing Noise Levels

The Applicant shall provide background information relevant to the Project, e.g. 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 particularly required.

(iii) Identification of Noise Sensitive Receivers

- (a) The Applicant shall refer to Annex 13 of the TM when identifying the 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 and Layout Plans, and other relevant published land use plans.
- (b) The Applicant shall select assessment points to represent all identified NSRs for carrying out quantitative noise assessment as described below. The assessment points shall be agreed with the Director prior to the quantitative noise assessment and may be varied subject to the best and latest information available during the course of the EIA study. A map shall be given showing the location and description such as name of building, use, and floors of each and every selected assessment points. For planned noise sensitive land uses without committed site layouts, the Applicant should use the relevant planning parameters to work out representative site layouts for operational noise assessment purpose.

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

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

(v) Construction Noise Assessment

- (a) The assessment shall cover the cumulative noise impacts due to the construction works of the Project and other likely concurrent projects 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) If tunneling by a mechanized tunnel boring machine is used, the criteria and assessment methodology for construction ground-borne noise impacts shall be agreed with the Director (with reference to Section 4.4.2(c) of the TM). Site measurements at appropriate locations may be required in order

to obtain the empirical input parameters required in the ground-borne noise model.

- (d) To minimize the construction noise impact, alternative construction methods to replace percussive piling and blasting shall be considered as far as practicable. In case blasting cannot be avoided, it should be carried out, as far as practicable, outside the sensitive hours (7pm to 7am on Monday to Saturday and any time on a general holiday, including Sunday). For blasting that must be carried out during the above-mentioned sensitive hours, the noise impact associated with the removal of debris and rocks should be fully assessed and mitigation measures should be recommended to reduce the construction noise impact. Also, a mechanism should be recommended in the EIA Report such that the blasting schedule should be submitted to the concerned authority for approval prior to its implementation.
- (e) For tunnelling, noise impact associated with the operation of powered mechanical equipment or equivalent shall be assessed. If the equipment, such as a tunnel boring machine and associated facilities, is used, the methodology/model for assessing ground-borne noise impact from these equipments/facilities shall be agreed with the Director prior to obtaining the empirical parameters required in the ground-borne noise model. Cumulative impacts with other projects shall be covered if appropriate.
- (f) If the unmitigated construction noise levels are found to exceed the relevant criteria, the Applicant shall propose practicable direct mitigation measures (including at least movable barriers, enclosures, quieter alternative methods, re-scheduling and restricting hours of operation of noisy tasks), particularly at open-cut area(s) to minimize the impact. If the mitigated noise levels still exceed the relevant criteria, the duration of the noise exceedance and population being affected shall be given.
- (g) The Applicant shall formulate a construction programme as far as practicable such that no work will be required in the restricted hours as defined under the Noise Control Ordinance (NCO). In case the Applicant needs to evaluate whether construction works during restricted hours as defined under the NCO are feasible or not in the context of programming construction works, reference should be made to the relevant technical memoranda issued under the NCO. Regardless of the results of construction noise impact assessment for restricted hours, the Noise Control Authority will process Construction Noise Permit (CNP) application, if necessary, based on the NCO, the relevant technical memoranda issued under the NCO, and the contemporary condition/situations of adjoining land uses and any previous complaints against construction activities at the site before making his decision in granting a CNP. This should be explicitly stated in the noise chapter and the conclusions and recommendations chapter in the EIA report.

(vi) Operational Rail Noise Assessment

- (a) The Applicant shall assess the noise impacts during the operational phase of the Project, including worst case scenario, normal, abnormal, transient and emergency operations, if applicable, with respect to the acceptable levels contained in Table 1A in Annex 5 in the TM. The assessment methodology including the railway/train design noise level shall be agreed with the Director prior to the commencement of the assessment.
- (b) For operation ground-borne noise impact, the criteria and assessment methodology shall be agreed with the Director with special reference to Section 4.4.2(c) of the TM. The assessment shall also cover the cumulative ground-borne noise impact due to the Project and the railways in the vicinity, including the existing East Rail, East Rail Extension – Hung Hom to Tsim Sha Tsui, Island Line and Tsuen Wan Line near Admiralty Station, and the committed, planned or known potential developments in the vicinity of the Project, such as the SCL (Tai Wai to Hung Hom Section), the SCL (Cross Harbour Section Phase I – Mong Kok East to Hung Hom), the South Island Line and the North Island Line. Site measurements at appropriate locations on a “like-to-like” basis (e.g. under similar situations) may be required in order to obtain the empirical input parameters required in the ground-borne noise model.
- (c) In assessing the noise level, the Applicant shall allow for a deterioration in rail and rolling stock condition from brand new to an operating level, and if applicable, with consideration to maintenance trains and cumulative impacts due to freight trains/through trains in Hung Hom area; and shall address the reasonable and worst case scenarios, taking into account any other planned noise sources. The Applicant shall present the noise levels in $Leq(30min)$, $Leq(24 hr)$ and L_{max} during the day and at night at the NSRs at various representative floor levels (in mPD) on tables and plans of suitable scale. Quantitative assessment at the identified NSRs for different alignment of the rail shall be compared against the relevant criteria or limits. The potential noise impact of each proposed alignment on the existing and planned NSRs shall be quantified by estimating the total number of dwellings and/or classrooms and other sensitive elements that will be exposed to levels above the relevant planning criteria and statutory limits.
- (d) The Applicant shall make recommendations for noise amelioration/direct technical remedies for any existing or planned NSR which would be subject to predicted cumulative noise level in excess of the relevant planning criteria or statutory limits in the appropriate design year. A manual detailing the schedule of maintaining/capping the wheel/rail noise to suit the design specification shall be provided, if relevant.
- (e) In case where a number of the NSRs cannot be protected by the recommended noise amelioration/direct technical remedies, the Applicant

shall consider alternatives to reduce the impact.

(vii) Fixed Noise Source Assessment

For fixed noise sources, such as ventilation, air-conditioning and smoke extraction facilities, the following assessment requirements shall be followed:

- (a) Assessment of Fixed Source Noise Levels – The Applicant shall calculate the expected noise using standard acoustic principles. Calculations for the expected noise shall be based on the assumed plant inventories and utilization schedule for the reasonable and worst case scenarios. The Applicant shall calculate the noise levels taking into account the correction of tonality, impulsiveness and intermittency in accordance with the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites. The cumulative impacts due to the fixed noise sources proposed for the Project (such as tunnel ventilation exhausts and smoke extraction facilities) and other existing and planned noise sources shall also be assessed.
- (b) Presentation of Noise Levels – The Applicant shall present the existing and future noise levels in Leq(30min) at the NSRs at various representative floor levels (mPD) on tables and plans of suitable scale. A quantitative assessment at the NSRs for the proposed fixed noise sources shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM.
- (c) Proposal for Noise Mitigation Measures – To protect the affected NSRs, the Applicant shall propose direct technical remedies within the Project limits in all situations where the predicted noise levels exceed the criteria set out in Table 1A of Annex 5 of the TM.

(viii) Assessment of Side Effects and Constraints

The Applicant shall identify, assess and propose means to avoid or minimize any consequential adverse impacts from the construction of noise impact mitigation measures and to resolve any potential constraints due to the inclusion of the recommended direct technical remedies.

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

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

- (b) The Applicant shall take into account the agreed environmental requirements/constraints identified by the study to assess the development potential of the concerned sites, and shall make such information known to the relevant parties.

3.4.3 Landscape and Visual Impacts

- 3.4.3.1 The Applicant shall follow the criteria and guidelines as stated in Annexes 10 and 18 of the TM and the EIAO Guidance Note No.8/2002 on “Preparation of Landscape and Visual Impact Assessment under the Environmental Impact Assessment Ordinance”.
- 3.4.3.2 The Applicant shall address the potential landscape and visual impacts due to any open-cut works area and above-ground structures, including but not limited to possible temporary reclamation in the Causeway Bay Typhoon Shelter, ventilation buildings, vent shafts, railway station facilities, smoke extraction facilities, entrances and exits, and associated access roads during the construction and operation stages.
- 3.4.3.3 The assessment area for landscape impact assessment shall include all areas within a 100m distance from the Project alignment and of all work sites, including work areas away from the Project alignment. The assessment area for the visual impact assessment shall be defined by the visual envelope of the Project.
- 3.4.3.4 The Applicant shall review relevant outline development plan(s), outline zoning plan(s), layout plan(s) or planning briefs and studies which may identify areas of high landscape value and visually sensitive areas. The aim is to gain an insight to the future outlook of the area affected so as to assess whether the Project can fit into the surrounding setting. Any conflict with statutory town plan(s) shall be highlighted and appropriate follow-up action shall be recommended.
- 3.4.3.5 The Applicant shall describe, appraise, analyze and evaluate the existing landscape resources and character of the assessment area within the assessment area. A system shall be derived for judging landscape and visual impact significance as required under the TM. The sensitivity of the landscape framework and its ability to accommodate change shall be particularly focused on. The Applicant shall identify the degree of compatibility of the Project with the existing and planned landscape setting. The landscape impact assessment shall evaluate the potential landscape impact so as to illustrate the significance of such impacts arising from the proposed Project. Clear mapping of the baseline landscape resources, landscape character areas and the landscape impact is required if area(s) of high landscape value is (are) identified in Section 3.4.3.4 above.
- 3.4.3.6 The Applicant shall assess the visual impacts of the Project. For above ground ancillary structures of the Project, clear illustration including mapping of visual

impact is required. The assessment shall adopt a systematic methodology and include the following:

- (i) Identification and plotting of visual envelope of the proposed Project within the study area;
- (ii) Identification of the key groups of sensitive receivers within the visibility 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. Among other receivers, sensitive receivers shall include nearby residents, visitors at the harbour-front, people in the nearby workplaces and hotels, people passing by, etc.;
- (iv) Description of the severity of visual impacts in terms of distance, nature and number of sensitive receivers. The visual impacts of the Project with and without mitigation measures shall also be included so as to demonstrate the effectiveness of the proposed mitigation measures; and
- (v) Clear evaluations and explanation with supportive arguments of all relevant factors considered in arriving the significance thresholds of visual impact.

3.4.3.7 The Applicant shall evaluate the merit of preservation in totality, in parts or total destruction of existing landscape and the establishment of a new landscape character area. Alternative construction methods and/or Project-related works/structure(s) that would avoid or reduce the identified landscape and visual impacts shall first be considered and be evaluated for comparison before adopting other mitigation or compensatory measures to alleviate the impacts. The mitigation measures proposed shall not only be concerned with damage reduction but shall also include consideration of potential enhancement of the existing landscape and visual quality. The Applicant shall recommend mitigation measures to minimize the adverse effects identified above, including provision of a landscape design.

3.4.3.8 The mitigation measures shall also include the preservation of vegetation, transplanting of trees of good amenity value, provision of screen planting, re-vegetation of disturbed lands, compensatory planting, re-provisioning of amenity areas and open spaces, design of structure, provision of finishes to structure, colour scheme and texture of material used, design integration of new station works with existing station where applicable, minimization of additional land intake, sensitive design of station and related structures appropriate for the harbourfront setting, and any measures to mitigate the disturbance of the existing land use. 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.

3.4.3.9 Annotated illustration 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 illustrate the significance of the landscape and visual impacts of the above ground ancillary structures of the Project.

3.4.4 Waste Management Implications

3.4.4.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing the waste management implications of the Project as set out in Annexes 7 and 15 of the TM, respectively.

3.4.4.2 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 wastes arising as a result of the construction and operation activities of the Project, based on the sequence and duration of these activities. The Applicant shall adopt design, general layout, construction methods and programme to minimize the generation of public fill/inert C&D materials and maximize the use of public fill/inert C&D materials for other construction works.

(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 fully evaluated. Measures that 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 wastes shall be described in detail. The disposal methods/options recommended for each type of wastes shall take into account the result of the assessment in (c) below; and
- (c) The impact caused by handling (including stock-piling, labelling, packaging and storage), collection, transportation and re-use/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) Dredging/Excavation, Filling and Dumping

- (a) Identification and quantification as far as practicable of all dredging/excavation, fill extraction, filling, reclamation, sediment/mud transportation and disposal activities and requirements shall be conducted. 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 sediment/mud which are to be disposed of in accordance with a permit granted under the Dumping at Sea Ordinance (DASO) shall be identified by both chemical and biological tests and their quantities shall be estimated. If the presence of any serious contamination of sediment/mud which requires special treatment/disposal is confirmed, the Applicant shall identify the most appropriate treatment and/or disposal arrangement and demonstrate its feasibility.
- (b) Identification and evaluation of the practical dredging/excavation methods to minimize dredging/excavation and dumping requirements and demand for fill sources based on the criterion that existing sediment/mud shall be left in place and not to be disturbed as far as practicable.

3.4.5 **Land Contamination Assessment**

- 3.4.5.1 The Applicant shall follow the guidelines for evaluating and assessing potential land contamination issues as stated in Sections 3.1 and 3.2 of Annex 19 of the TM.
- 3.4.5.2 The "Assessment Area" for the land contamination shall include any potential land contamination site(s) within the Project area including any on-site and off-site works areas and any other potential contaminated site(s) identified in this EIA study, e.g. MTR Hung Hom Freight Yard, any train maintenance workshops and fuel oil (e.g. diesel and petrol) storage facilities.
- 3.4.5.3 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 possible land contamination (including accident records and change of land use(s) and the like).

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- 3.4.5.4 During the course of the EIA study, the Applicant shall submit a Contamination Assessment Plan (CAP) to the Director for endorsement prior to conducting the contamination impact assessment of the relevant land or site(s). The CAP shall include proposal 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).
- 3.4.5.5 Based on the endorsed CAP, the Applicant shall conduct a land contamination impact assessment and submit a Contamination Assessment Report (CAR) to the Director for endorsement. If land contamination is confirmed, a Remedial Action Plan (RAP) shall also be submitted to the Director for endorsement to formulate necessary remedial measures.
- 3.4.5.6 If there is/are potential contaminated site(s) that is/are inaccessible for preparing sampling and analysis during the course of the EIA study, 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.
- 3.4.5.7 The Applicant shall complete land contamination assessment and remediation (if necessary) at the potential contaminated site(s) prior to the commencement of the construction works at the respective site(s).

3.4.6 Impact on Cultural Heritage

- 3.4.6.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing impacts on sites of cultural heritage as set out in Annexes 10 and 19 of the Technical Memorandum, respectively. The assessment area shall be within 300m from either side along the full length of the Project alignment and from any works sites, including works sites away from the Project alignment, proposed under the Project.
- 3.4.6.2 The Applicant shall conduct a Cultural Heritage Impact Assessment (CHIA), including marine archaeological review, built heritage impact assessment (BHIA) and archaeological impact assessment.

(a) Marine archaeological review

The Applicant shall engage a qualified marine archaeologist to review available information to identify whether there is any possible existence of sites or objects of cultural heritage, for example shipwreck, within the seabed that will be affected by the marine works of the Project. The result of the review shall be presented as a written report and charts. If possible existence of sites or objects of cultural heritage are found, a Marine Archaeological Investigation (MAI) undertaken by a qualified marine archaeologist shall be required. The guidelines for the MAI are set out in **Appendix B** of this Study Brief.

(b) Built heritage impact assessment

The Applicant shall conduct a Built Heritage Impact Assessment (BHIA), taking the results of previous BHIA studies and other background of the site into account, to identify known and unknown heritage items within the assessment area, including but not limited to the Royal Hong Kong Yacht Club at Kellett Island, the Noon Day Gun, floating Tin Hau Temple at Causeway Bay Typhoon Shelter, Wan Chai Police Station, Old Victoria Barracks (former explosives magazine), that may be affected by the Project and its associated works.

(c) Archaeological impact assessment

The Applicant shall engage a qualified archaeologist to conduct an archaeological impact assessment (AIA). Special attention shall be paid to the Kellett Island Archaeological Site.

Based on the CHIA, appropriate mitigation measures shall be recommended in the CHIA. A checklist including all the affected sites of cultural heritage, impact identified, recommended mitigation measures as well as the implementation agent and period shall also be included in the EIA report.

- 3.4.6.3 The Applicant shall demonstrate that all reasonable efforts have been made to avoid or keep the adverse impacts on cultural heritage sites to the minimum through modification of design of the Project, or use of latest construction/engineering techniques.
- 3.4.6.4 The CHIA shall be conducted by qualified person with proven archaeological and historical building research works in Hong Kong. The marine archaeological review and AIA shall be carried out by a qualified marine archaeologist and a qualified archaeologist respectively. If field evaluation is required, the archaeologist shall obtain a licence from the Antiquities Authorities before undertaking the field evaluation under the Antiquities and Monuments Ordinance.
- 3.4.6.5 The Applicant shall refer to the “Guidelines for Marine Archaeological Investigation” and “Guidelines for Cultural Heritage Impact Assessment” at **Appendix B** and **Appendix C** of this study brief respectively for detailed

requirements.

3.4.7 Ecological Impact

- 3.4.7.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing ecological impact as stated in Annexes 8 and 16 of the TM.
- 3.4.7.2 Marine ecological impact assessment is required only if there are proposed marine works that would disturb the seabed, e.g. dredging for constructing the cross harbour tunnel railway and any future maintenance dredging. The assessment area for marine ecological impact assessment shall be the same as that for the water quality impact assessment as stated in Section 3.4.1.3 above and include any areas likely to be impacted by the Project.
- 3.4.7.3 Terrestrial/freshwater ecological impact assessment is required only if off-site works area, e.g. dry dock casting yard, would encroach or affect recognized sites of conservation importance such as country parks, Sites of Special Scientific Interests (SSSI) and important habitats as stated in Annex 8 of the TM. The assessment area for the purpose of terrestrial ecological assessment shall include all areas within 500 m from the site boundary of the works areas of the Project.
- 3.4.7.4 If marine and/or terrestrial/freshwater ecological impact assessments are required, the Applicant shall examine the flora, fauna and other components of the ecological habitats within the assessment area. The aim shall be to protect, maintain or rehabilitate the natural environment. In particular, the Project shall avoid impacts on recognized sites of conservation importance and ecological sensitive areas/species (e.g. natural woodland, natural stream course and any sensitive coral sites). The assessment shall identify and quantify the potential ecological impacts to the natural environment and the associated wildlife and habitats arising from the proposed Project, including the impacts of any haul roads, temporary work sites and access, wastewater and cooling water discharge and other marine construction works, such as dredging, backfilling, temporary reclamation, etc. The assessment shall cover impacts, including the impacts of affecting the water-table due to the underground works, on woodland, natural stream course, and any other important habitats from the railway or from its construction. In addition, ecological impact due to maintenance dredging of marine sediment for the immersed tube tunnel, or other construction method(s), if necessary, during the operation phase of the Project should also be assessed.
- 3.4.7.5 Following Section 3.4.7.4 above, the assessment shall include the following:
- (i) A review of the findings of relevant studies and collating all the available information regarding the ecological characters of the assessment area;
 - (ii) Evaluation of the information collated and identification of any information gap relating to the assessment of potential ecological impacts to the terrestrial and aquatic environment;

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- (iii) Carrying out the necessary ecological field surveys for a duration of at least 4 months including (i) the wet season, and investigations to verify the information collected, fill in information gaps identified and fulfill objectives of the EIA study; and (ii) a dive survey for corals if marine works affecting the seabed ecology is involved;
- (iv) Establishment of the general ecological profile of the assessment area and description of the characteristics of the habitats found. Major information to be provided shall include:
 - (a) description of the physical environment, including all recognized sites of conservation importance and ecological sensitive areas (e.g. sensitive coral sites) and assess whether these sites will be affected by the proposed Project or not;
 - (b) habitat maps of suitable scale (1:1000 to 1:5000) showing the types and locations of the habitats in the assessment area;
 - (c) ecological characteristics of each habitat type such as size, vegetation type, species present, dominant species found, species diversity and abundance, community structure, inter-dependence of the habitats and species as well as the presence of any features of ecological importance (e.g. corals);
 - (d) representative colour photos of each habitat type and any important ecological features identified;
 - (e) investigate and describe the existing wildlife uses of various habitats with special attention to those wildlife groups and habitats with conservation interests, including but not limited to corals, marine benthic communities, vertebrates, macroinvertebrates, shrubland, woodland, natural stream course and other habitats and wildlife groups identified as having special conservation interests by the study; and
 - (f) species found that are of conservation importance, rare, endangered and/or listed under local legislation, international conventions for conservation for wildlife/habitats or red data book.
- (v) Using suitable methodology, identification and quantification as far as practicable any direct, indirect, (e.g. changes in water qualities, hydrodynamic properties, sedimentation rates and patterns, hydrology), on-site, off-site, primary, secondary and cumulative ecological impacts such as destruction of habitats, reduction of species abundance/diversity, loss of feeding grounds, reduction of ecological carrying capacity and habitat fragmentation; and in particular the following:
 - (a) removal or disruption of potentially valuable benthic communities; and

- (b) deterioration or disturbance to corals or other marine habitats of conservation value, including any discovered during the course of the assessment.
- (vi) Evaluation of the significance and acceptability of the ecological impacts identified using well-defined criteria;
- (vii) Recommendations for all practicable alternatives, such as modifications of layout and design and practicable mitigation measures to avoid, minimize, and/or compensate for the adverse ecological impacts identified;
- (viii) Evaluation of the feasibility and effectiveness of the recommended mitigation measures and definition of the scope, type, location, implementation arrangement, resources requirement, subsequent management and maintenance of such measures;
- (ix) Deterioration of environmental qualities (e.g. water and sediment quality, wastewater and cooling water discharges, level of water-table, maintenance dredging) and the subsequent impacts to the biological communities;
- (x) Determination and quantification as far as practicable of the residual ecological impacts after implementation of the proposed mitigation measures; and
- (xi) Review of the need for and recommendation for any ecological monitoring programme required.

3.4.8 Fisheries Impact

- 3.4.8.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing fisheries impact as stated in Annexes 9 and 17 of the TM.
- 3.4.8.2 Fisheries impact assessment is required only if there are proposed marine works that would disturb the seabed, e.g. dredging for constructing the cross harbour tunnel railway and any future maintenance dredging. The assessment area for fisheries shall be the same as the water quality impact assessment as stated in paragraph 3.4.1.3 and include any areas likely to be impacted by the Project.
- 3.4.8.3 Following Section 3.4.8.2 above, the assessment shall cover potential impacts on both capture and culture fisheries due to the marine works during construction and operation of the Project.
- 3.4.8.4 Existing information regarding the study area shall be reviewed. Based on the review results, data gap shall be identified and the need for any field surveys shall be determined. If field surveys are considered necessary, recommendations shall be made on the methodology, duration and timing for the surveys.

3.4.8.5 The fisheries impact assessment shall include the following tasks:

- (i) description of the physical environmental background;
- (ii) description and quantification of the existing capture and culture fisheries activities;
- (iii) description and quantification of the existing fisheries resources (e.g. major fisheries products and stocks);
- (iv) identification of parameters (e.g. water quality parameters) and areas of fisheries importance which will be affected by the Project;
- (v) identification and, as far as practicable, quantification of any direct and indirect, onsite and offsite impacts on fisheries (e.g. loss of fishing ground, spawning ground and nursery area, and water quality deterioration at sites of capture and culture fisheries importance);
- (vi) evaluation of impacts and recommendation of environmental mitigation measures with details on justification, feasibility, cope and programme, as well as staff and financial implications including those related to the subsequent management and maintenance requirements of such mitigation measures; and
- (vii) review for the need of monitoring and, if necessary, recommendation of a monitoring and auditing programme.”

3.4.9 Hazard to Life

3.4.9.1 If the Project will involve use of explosives, the Applicant shall describe the statutory/licensing requirements with respect to explosives under the Dangerous Goods Ordinance (Cap. 295). The Applicant shall also document any guidelines and/or advice obtained from relevant departments/ authorities on the proposed transport and storage of explosives for the blasting activities.

3.4.9.2 If the proposed use of explosives for rock blasting is required and the location of overnight storage of explosives is in close vicinity to populated areas and/or Potentially Hazardous Installation site, the Applicant shall carry out hazard assessment as follows:

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

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

3.4.9.3 There is a pair of submarine town gas pipelines between Hung Hom and Kellett Island across the Victoria Harbour close to the proposed Project railway alignment. It is noted that the fuel gas safety matters are controlled under the Gas Safety Ordinance (Cap. 51). Making reference to the Gas Safety Ordinance, the Code of Practice on Avoiding Danger From Gas Pipes (which can be downloaded from the www.emsd.gov.hk) issued by the Electrical and Mechanical Services Department and/or other relevant guidelines, the Applicant shall:

- (a) contact the Hong Kong and China Gas Company Limited (HKCG) to obtain the setting out information of the submarine pipelines and consult/liaise with the HKCG on the proposed construction method of the Project in the vicinity of onshore/offshore town gas pipelines and associated town gas installations with respect to gas safety, gas supply inventory and gas security; and
- (b) describe measures identified to avoid and minimize the hazard to life issue in relation to fuel gas safety.

3.4.10 Construction Dust Impact

3.4.10.1 The Applicant shall follow the requirements of the Air Pollution Control (Construction Dust) Regulation in dust control to ensure 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 during construction stage shall be initiated to verify the effectiveness of the control measures and to ensure that the construction dust levels be brought under control.

3.4.10.2 If the Applicant anticipates a significant construction dust impact that will likely cause exceedance of the recommended limits in the TM at the Air Sensitive Receivers (ASRs) despite incorporation of the dust control measures stated in Section 3.4.10.1 above, a quantitative assessment should be carried out to evaluate the construction dust impact at the identified ASRs. The Applicant shall follow the methodology below when carrying out the quantitative assessment. The construction dust impact assessment shall include the following:

- (i) The Applicant shall follow the criteria and guidelines for evaluating and assessing construction dust impact as stated in section 1 of Annex 4 and Annex 12 of the TM, respectively.
- (ii) The assessment area for construction dust impact assessment shall generally be defined by a distance of 500 m from the Project alignment and from any works sites, including works sites away from the Project alignment, proposed under the Project, yet it may be extended depending on the circumstances and the scale of the Project.

- (iii) The Applicant shall assess the air pollutant concentrations with reference to relevant sections of the Guidelines for Local-Scale Air Quality Assessment Using Models in **Appendices D-1 to D-3** of this study brief, or any other methodology as agreed with the Director (with reference to S.4.4.2(c) of TM) prior to the commencement of the assessment.
- (iv) Background and Analysis of Activities
- (a) Provide background information relating to air quality issues relevant to the Project, e.g. description of the types of activities of the Project.
- (b) Give an account, where appropriate, of the consideration / measures that had been taken into consideration in the planning of the Project to abate the construction dust impact. That is, the Applicant shall consider alternative construction method(s) / phasing programme(s) to minimize the construction dust impact.
- (c) Present the background air quality levels in the assessment area for the purpose of evaluating the cumulative construction dust impacts.
- (v) Identification of 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. The Applicant shall select the assessment points of the identified ASRs such that they represent the worst impact point of these ASRs. A map showing the location and a description including the name of the buildings, their uses and height of the selected assessment points shall be given. The separation distances of these ASRs from the nearest emission sources should also be given.
- (b) Provide a list of air pollutant emission sources, including any nearby emission sources which are likely to have impact on the Project. Examples of construction stage emission sources include stock-piling, blasting, concrete batching and vehicular movements on unpaved haul roads on site, etc.
- (vi) Quantitative Assessment Methodology
- (a) The Applicant shall apply the general principles enunciated in the modeling guidelines while making allowance for the specific characteristic 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 assessment report to grasp how the model is set up to simulate the situation at hand without referring to the model input files. Details of the calculation of the emission rates of air pollutants for input to the modeling 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 of the methodology between the Applicant and the Director 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 construction dust impact at the identified ASRs and compare these results against the criteria set out in section 1 of Annex 4 in the TM. The predicted construction dust impacts (both unmitigated and mitigated) shall be presented in the form of summary table and pollution contours, for comparison with relevant air quality standards and examination of the land use implications of these impacts. Plans of suitable scale should be used for presentation of pollution contour for determining buffer distances required.
- (d) The Applicant shall propose remedies and mitigation measures where the predicted construction dust impact exceeds the criteria set in section 1 of Annex 4 in the TM. These measures and any constraints on future land use planning shall be agreed with the relevant government departments / authorities and documented. The Applicant shall demonstrate quantitatively that the resultant impacts after incorporation of the proposed mitigating measures will comply with the criteria stipulated in section 1 of Annex 4 in the TM.
- (e) Input and output file(s) of the model run(s) shall be submitted to the Director in electronic format.

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

3.4.11.1 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) of all environmental issues/media to be assessed 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 all related supporting documents shall be provided in the form of an appendix to the EIA study report.

3.4.12 Impacts Summary

3.4.12.1 To facilitate effective retrieval of pertinent key information, a summary of environmental impacts in the form of a table (or in any other form agreed with 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.

3.4.13 Summary of Environmental Outcomes

3.4.13.1 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.

3.4.14 Environmental Monitoring and Audit (EM&A) Requirements

- 3.4.14.1 The Applicant shall identify and justify in the EIA study whether there is any need for EM&A activities during construction and operation phases of the Project and, if affirmative, to define the scope of EM&A requirements for the Project.
- 3.4.14.2 Subject to confirmation of EIA findings, the Applicant shall comply with requirements as stipulated in Annex 21 of the TM. The Applicant shall also propose real-time reporting of monitoring data for the Project through a dedicated internet website.
- 3.4.14.3 The Applicant shall prepare a project implementation schedule (in the form of a checklist as shown in **Appendix E** to this Study Brief) containing the EIA study recommendations and mitigation measures with reference to the implementation programme.

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) 40 copies of the EIA report in English and 40 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. Additional copies of the EIA report and the executive summary shall be supplied upon advice by the Director.
 - (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 20 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 above documents available to the public, subject to payment by the interested parties of full costs of printing.
- 5.4 In addition, to facilitate public inspection of the EIA report via the EIAO Internet Website, the Applicant shall provide electronic copies of both the EIA report and the executive summary prepared in HyperText Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 1.3 or later), 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 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.

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-358/2008), 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 ---

Environmental Assessment Division,
Environmental Protection Department
July 2008

Appendix A

Hydrodynamic and Water Quality Modelling Requirements

Modelling software general

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

Model details – Calibration & Validation

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

<u>Criteria</u>	<u>Level of fitness with field data</u>
• tidal elevation (@)	< 8 %
• maximum phase error at high water and low water	< 20 minutes
• maximum current speed deviation	< 30 %
• maximum phase error at peak speed	< 20 minutes
• maximum direction error at peak speed	< 15 degrees
• maximum salinity deviation	< 2.5 ppt

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@ Root mean square of the error including the mean and fluctuating components shall meet the criteria at no less than 80% of the monitoring stations in the model domain

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

Model details – Simulation

1. The water quality modelling results shall be qualitatively explainable, and any identifiable trend and variations in water quality shall be reproduced by the model. The water quality model shall be able to simulate and take account of the interaction of dissolved oxygen, phytoplankton, organic and inorganic nitrogen, phosphorus, silicate, BOD, temperature, suspended solids, contaminants release of dredged and disposed material, air-water exchange, *E. coli* and benthic processes. It shall also simulate salinity. Salinity results simulated by hydrodynamic models and water quality models shall be demonstrated to be consistent.
2. The sediment transport module for assessing impacts of sediment loss due to marine works shall include the processes of settling, deposition and re-erosion. The values of the modelling parameters shall be agreed with EPD. Contaminants release and DO depletion during dredging and dumping shall be simulated by the model.
3. The thermal model shall be based on the flow field produced by the hydrodynamic model. It shall incorporate the physical processes of thermal / cooled water discharge and abstraction flow, buoyancy effect of the thermal plume, and surface heat exchange. Dispersion of biocides in the discharge shall also be simulated with appropriate decay rates.
4. The models shall at least cover the Hong Kong waters, the Pearl Estuary and the Dangan Channel to incorporate all major influences on hydrodynamic and water quality. A fine grid model may be used for detailed assessment of this study. It shall either be linked to a far field model or form part of a larger model by gradual grid refinement. The coverage of the fine grid model shall be properly designed such that it is remote enough so that the boundary conditions would not be affected by the project. The model coverage area shall be agreed with EPD.
5. In general, grid size at the area affected by the project shall be less than 400 m in open waters and less than 75 m around sensitive receivers. The grid shall also be able to reasonably represent coastal features existing and proposed in the project. The grid schematization shall be agreed with EPD.

Modelling assessment

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

- END -

Appendix B**Guidelines for Marine Archaeological Investigation (MAI)****(As at Nov 2006)**

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

(1) Baseline Review

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

(2) Geophysical Survey

- 2.1 Extensive geophysical survey of the study area should deploy high resolution boomer, side scan sonar, an echo sounder and high resolution multi beam sonar. The multi beam data must be presented as processed digital terrain models to facilitate the archaeological analysis. The data received from the survey would be analysed in detail to provide:
 - a. Exact definition of the areas of greatest archaeological potential.
 - b. Assessment of the depth and nature of the seabed sediments to define which areas consist of suitable material to bury and preserve archaeological material.
 - c. Detailed examination of the boomer and side scan sonar records to map anomalies in and on the seabed which may be archaeological material.
 - d. Detailed examination of the multi beam sonar data to assess the archaeological potential of the sonar contacts.

(3) Establishing Archaeological Potential

- 3.1 The data examined during Task 1 and 2 will be analysed to provide an indication of the likely character and extent of archaeological resources within the study area. This would facilitate formulation of a strategy for investigation.
- 3.2 The results would be presented as a written report and charts. If there is no indication of archaeological material there would be no need for further work.
- 3.3 Charts should be presented at 1:500 scale and show each survey contact. Its dimensions and exact location should also be shown.

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

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

Report

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

Appendix C**Guidelines for Cultural Heritage Impact Assessment**

(as at 8 July 2008)

Introduction

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

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

(1) Baseline Study

1.1 A baseline study shall be conducted:

- a. to compile a comprehensive inventory of heritage sites within the proposed project area, which include:
 - (i) all archaeological sites (including marine archaeological sites);
 - (ii) all pre-1950 buildings and structures;
 - (iii) selected post-1950 buildings and structures of high architectural and historical significance and interest; and
 - (iv) cultural landscapes include places associated with historic event, activity, or person or exhibiting other cultural or aesthetic values, such as sacred religious sites, battlefields, a setting for buildings or structures of architectural or archaeological importance, historic field patterns, clan graves, old tracks, *fung shui* woodlands and ponds, and etc.
- b. to identify the direct and indirect impacts on the heritage sites at the planning stage in order to avoid causing any negative effects. The impacts include the direct loss, destruction or disturbance of an element of cultural heritage, impact on its settings or impinging on its character through inappropriate siting or design, potential damage to the physical fabric of archaeological remains, historic buildings or historic landscapes through air pollution, change of ground water level, vibration, ecological damage, new recreation or other daily needs to be caused by the new development. The impacts listed are merely to illustrate the range of potential impacts and not intended to be exhaustive.

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

1.3. Desk-top Research

- 1.3.1 Desk-top research should be conducted to analyse, collect and collate extant

information. It shall include but not limited to:

- a. List of declared monuments protected by the Antiquities and Monuments Ordinance (Chapter 53).
- b. Graded historic buildings and sites.
- c. Government historic sites identified by the Antiquities and Monuments Office (AMO).
- d. Proposed monument and deemed monuments.
- e. Lists and archives kept in the Reference Library of the Antiquities and Monuments Office of the Leisure and Cultural Services Department including archaeological sites, declared monuments and recorded historical building & structures identified by the AMO.
- f. 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.
- g. 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.
- h. Any other unpublished archaeological investigation and excavation reports kept by the AMO.
- i. 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.
- j. Cartographic and pictorial documents. Old and recent maps and aerial photos searched in the Maps and Aerial Photo Library of the Lands Department.
- k. Existing geological information (for archaeological desk-top research).
- l. Discussion with local informants.

1.4 Field Evaluation

1.4.1 General

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

1.4.2 Field survey on historic buildings and structures

- a. Field scan of all the historic buildings and structures within the project area.
- b. Photographic recording of each historic building or structure including the exterior (the elevations of all faces of the building premises, the roof, close up for the special architectural details) and the interior (special architectural

details), if possible, as well as the surroundings, the associated cultural landscape features and the associated intangible cultural heritage (if any) of each historic building or structure.

- c. Interview with local elders and other informants on local historical, architectural, anthropological and other cultural information related to the historic buildings and structures.
- d. Historical and architectural appraisal of the historic buildings and structures, their associated cultural landscape and intangible cultural elements.

1.4.3 Archaeological Survey

- a. Appropriate methods for pricing and valuation of the archaeological survey, including by means of a Bill of Quantities or a Schedule of Rates should be considered in preparing specifications and relevant documents for calling tenders to carry out the archaeological survey. The specifications and relevant documents should be sent to the Antiquities and Monuments Office for agreement prior to calling tenders to conduct the archaeological survey.
- b. A licence shall be obtained from the Antiquities Authority for conducting an archaeological survey. It takes at least two months to process the application.
- c. A detailed archaeological survey programme should be designed to assess the archaeological potential of the project area. The programme should clearly elaborate the strategy and methodology adopted, including what particular question(s) can be resolved, how the archaeological data will be collected and recorded, how the evidence will be analyzed and interpreted and how the archaeological finds and results will be organized and made available. Effective field techniques should also be demonstrated in the programme. The programme should be submitted to the Antiquities and Monuments Office for agreement prior to applying for a licence.
- d. The following methods of archaeological survey (but not limited to) should be applied to assess the archaeological potential of the project area:
 - (i) Definition of areas of natural land undisturbed in the recent past.
 - (ii) Field scan of the natural land undisturbed in the recent past in detail with special attention paid to areas of exposed soil which were searched for artifacts.
 - (iii) Conduct systematic auger survey and test pitting. The data collected from auger survey and test pitting should be able to establish the horizontal spread of cultural materials deposits.
 - (iv) Excavation of test pits to establish the vertical sequence of cultural materials. The hand digging of 1 x 1 m or 1.5 x 1.5 m test pits to determine the presence or absence of deeper archaeological deposits and their cultural history.
 - (v) The quantity and location of auger holes and test pits should be agreed with the Antiquities and Monuments Office prior to applying for a

licence.

(vi) A qualified land surveyor should be engaged to record reduced levels and coordinates as well as setting base points and reference lines in the course of the field survey.

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

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

1.5 The Report of Baseline Study

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

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

1.5.3 Historic Buildings/ Structures/ Sites

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

1.5.4 Archaeological Sites

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

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

1.6 Finds and Archives

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

1.7 Safety Issue

- 1.7.1 During the course of the CHIA Study, all participants shall comply with all Ordinances, Regulations and By-laws which may be relevant or applicable in safety aspect in connection with the carrying out of the CHIA Study, such as site safety, insurance for personal injuries, death and property damage as well as personal safety apparatuses, etc.
- 1.7.2 A Risk Assessment for the fieldwork shall be carried out with full consideration to all relevant Ordinances, Regulations and By-laws.

(2) Impact Assessment Study

2.1 Identification of impact on heritage

- 2.1.1 The impact assessment study must be undertaken to identify the impacts on the heritage sites which will be affected by the proposed development subject to the result of desktop research and field evaluation. The prediction of impacts and an evaluation of their significance must be undertaken by expert(s) in local heritage.
- 2.1.2 During the assessment, both the direct impacts such as loss or damage of important features as well as indirect impacts should be clearly stated, such as adverse visual impact on built heritage, landscape change to the associated cultural landscape features of the built heritage, temporary change of access to the heritage sites during the work period, change of ground level or water level which may affect the preservation of the archaeological and built heritage *in situ* during the implementation stage of the project.
- 2.1.3 The evaluation of heritage impact assessment may be classified into five levels of significance based on type and extent of the effects concluded in the CHIA study:
- a. Beneficial impact: the impact is beneficial if the project will enhance the preservation of the heritage site(s) such as improving the flooding problem of the historic building after the sewerage project of the area;
 - b. Acceptable impact: if the assessment indicates that there will be no significant effects on the heritage site(s);

- c. Acceptable impact with mitigation measures: if there will be some adverse effects, but these can be eliminated, reduced or offset to a large extent by specific measures, such as conduct a follow-up Conservation Proposal or Conservation Management Plan for the affected heritage site(s) before commencement of work in order to avoid any inappropriate and unnecessary interventions to the building;
- d. Unacceptable impact: if the adverse effects are considered to be too excessive and are unable to mitigate practically;
- e. Undetermined impact: if the significant adverse effects are likely, but the extent to which they may occur or may be mitigated cannot be determined from the study. Further detailed study will be required for the specific effects in question.

- 2.1.4 Preservation in totality must be taken as the first priority as it will be a beneficial impact and will enhance the cultural and socio-economical environment if suitable measures to integrate the heritage site into the proposed project are carried out.
- 2.1.5 If, due to site constraints and other factors, only preservation in part is possible, this must be fully justified with alternative proposals or layout designs which confirm the impracticability of total preservation.
- 2.1.6 Total destruction must be taken as the very last resort in all cases and shall only be recommended with a meticulous and careful analysis balancing the interest of preserving local heritage as against that of the community as a whole. Assessment of impacts on heritage sites shall also take full account of, and follow where appropriate, paragraph 4.3.1(c), item 2 of Annex 10, items 2.6 to 2.9 of Annex 19 and other relevant parts of the Technical Memorandum on Environmental Impact Assessment Process.

2.2 Mitigation Measures

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

minimizing the potential impacts and the preservation of the heritage site, such as physically relocating it. Measures like amendments of the sitting, screening and revision of the detailed design of the development are required to lessen its degree of exposure if it causes visual intrusion to the heritage site and affects the character and integrity of the heritage site.

- 2.2.5 A rescue programme, when required, may involve preservation of the historic building or structure together with the relics inside, and its historic environment through relocation, detailed cartographic and photographic survey or preservation of an archaeological site “by record”, i.e. through excavation to extract the maximum data as the very last resort.
- 2.2.6 For major renovation or adaptive reuse projects for built heritage, conservation management plan and/or conservation maintenance manual may be required as mitigation measures for the construction and operation phase of the project subject to the nature and scope of the project.

2.3 The Impact Assessment Report

- 2.3.1 A detailed description and plans should be provided to elaborate on the heritage site(s) to be affected. Besides, please also refer to paragraph 4.3.1(d), items 2.10 to 2.14 of Annex 19 and other relevant parts of the Technical Memorandum, other appropriate presentation methods for mitigation proposals like elevations, landscape plan and photomontage shall be used in the report extensively for illustrating the effectiveness of the measures.
- 2.3.2 To illustrate the landscape and visual impacts on built heritage, as well as effects of the mitigation measures, choice of appropriate presentation methods is important. These methods include perspective drawings, plans and section/elevation diagrams, photographs on scaled physical models, photo-retouching and photomontage. These methods shall be used extensively to facilitate communication among the concerned parties.
- 2.3.3 The implementation programme for the agreed mitigation measures should be able to be executed and should be clearly set out in the report together with the funding proposal. These shall form an integral part of the overall redevelopment project programme and financing of the proposed redevelopment project. Competent professionals must be engaged to design and carry out the mitigation measures.
- 2.3.4 For contents of the implementation programme, reference can be made to Annex 20 of the Technical Memorandum on Environmental Impact Assessment Process. In particular, item 6.7 of Annex 20 requires to define and list out clearly the proposed mitigation measures to be implemented, by whom, when, where, to what requirements and the various implementation responsibilities. A comprehensive plan and programme for the protection and conservation of the partially preserved heritage site, if any, during the planning and design stage of the proposed project must be addressed in details.

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

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

Annex 1**Guidelines for Archaeological Reports**
(As at November 2007)**I. General**

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

II. Suggested Format of Reports

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

archaeological work, its aims and main results, and should include reference to authorship and commissioning body.

4. Introduction

This should set out background leading to the commission of the reports. The location, area, scope and date of conducting the archaeological work must be given. The location of archaeological work should be shown on maps in appropriate scales and with proper legends.

5. Aims of archaeological work

These should reflect the aims set in the project design.

6. Archaeological, historical, geological and topographical background of the site

Supporting aerial photos and maps (both old and present) in appropriate scales, with proper legends and with the site locations clearly marked on should be provided.

7. Methodology

The methods used including any variation to the agreed project design should be set out clearly and explained as appropriate.

8. Result

This should outline the findings, known and potential archaeological interests by period and/or type. Their significance and value with reference/inclusion of supporting evidence should be indicated. For impact assessment, the likely effect of the proposed development on the known or potential archaeological resource should be outlined.

9. Conclusion

This should include summarization and interpretation of the result.

10. Recommendation

Recommendations on further work and the responsible party as well as a brief planning framework should be outlined.

11. Reference and bibliography

A list of all primary and secondary sources used should be given. Director and members of the archaeological team and author of the report should be listed.

12. Supporting illustrations

They should be clearly numbered and easily referenced to the text. They should be scanned and saved in TIFF or JPEG formats.

A. Maps

Archaeological work locations, such as auger hole and test pit locations (with relevant coordinates certified by a qualified land surveyor), should be clearly shown on maps in appropriate scales, with proper legends, grid references (in 8 digits) and captions.

B. Drawings of test pits, archaeological features and finds

The below scales should be followed:

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

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

C. Photos of site and finds

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

13. Supporting data in appendices

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

14. Comment and Response

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

III. Green Measures

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

Annex 2**Guidelines for Handling of Archaeological Finds and Archives**

(As at Oct 2006)

General

1. Site Code

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

I. Archaeological Finds

2. Cleaning

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

3. Marking

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

¹ *Steps for “Sandwich” technique*

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

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- 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 artifacts, e.g. the pottery vessel should not be applied on the finds.
6. Finds register
- A clear finds register with information about the finds description, quantity, form, weight, dimensions and field data should be prepared for handover to the CAR.

II. Field Archives and Laboratory Records

7. Field archives include field 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.

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

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upon the completion of the finalized excavation report.

- Separate handover forms for finds and archives should be signed by the representatives of the Licensee and the AMO.

Appendix D-1

Guidelines on Choice of Models and Model Parameters

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

1. Introduction

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

2. Choice of Models

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

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

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

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

3. Model Input Requirements

3.1 Meteorological Data

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

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

Day time:

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

Night time:

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

This is a common practice with using 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, needs to be provided as input to the CALINE4 model. Typical values of range from 12° for rural areas to 24° for highly urbanised areas under 'D' class stability. For semi-rural such as new development areas, 18° is more appropriate under the same stability condition. The following reference can be consulted for typical ranges of standard deviation of wind direction under different stability categories and surface roughness conditions.

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

3.2 Emission Sources

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

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

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

3.3 Urban/Rural Classification

Emission sources may be located in a variety of settings. For modelling purposes these are 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 µ m) and RSP (< 10 µ m) compositions should be used.

3.7 NO₂ to NO_x Ratio

The conversion of NO_x to NO₂ 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 NO₂:

- (a) Ambient Ratio Method (ARM) - assuming 20% of NO_x to be NO₂; or
- (b) Discrete Parcel Method (DPM, available in the CALINE4 model); or
- (c) Ozone Limiting Method (OLM) - assuming the tailpipe NO₂ emission to be 7.5% of NO_x and the background ozone concentration to be in the range of 57 to 68 µ g/m³ depending on the land use type (see also the EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts' in Appendix D-2).

3.8 Odour Impact

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

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

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

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

Technology, Air & Waste Management Association, 1991.

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

3.9 Plume Rise Options

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

3.10 Portal Emissions

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

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

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

3.10 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. Please make reference to the paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts' in Appendix D-2 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 D-2

Guidelines on Assessing the 'TOTAL' Air Quality Impacts

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

1. Total Impacts - 3 Major Contributions

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

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

2. Nature of Emissions

2.1 Primary contributions

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

2.2 Secondary contributions

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

2.3 Background contributions

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

3. Background Air Quality - Estimation Approach

3.1 The approach

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

3.2 Categorisation

The monitored air quality data, by 'district-averaging' are further divided into three categories, viz, Urban, Industrial and Rural/New Development. The background pollutant concentrations to be adopted for a project site would depend on the geographical constituency to which the site belongs. The categorisation of these constituencies is given in Section 3.4. The monitoring stations suggested for the 'district-averaging'(arithmetic means) to derive averages for the three background air quality categories are listed as follows:

Urban: Kwun Tong, Sham Shui Po, Tsim Sha Tsui and Central/Western

Industrial: Kwun Tong, Tsuen Wan and Kwai Chung

Rural/New Development: Sha Tin, Tai Po, Junk Bay, Hong Kong South and Yuen Long

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

3.3 Background pollutant values

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

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

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

In cases where suitable air quality monitoring data representative of the study site such as those obtained from a nearby monitoring station or on-site sampling are not available for the prescription of background air pollution levels, the above tabulated values can be adopted instead. Strictly speaking, the suggested values are only appropriate for long term assessment. However, as an interim measure and until a better approach is formulated, the same values can also be used for short term assessment. This implies that the short term background values will be somewhat under-estimated, which compensates for the fact that some of the monitoring data are inherently influenced by secondary sources because of the monitoring station location.

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

3.4 Site categories

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

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

Tuen Mun	Rural / New Development
Tai Po	Rural / New Development
Yuen Long	Rural / New Development
Northern	Rural / New Development

3.5 Provisions for 'double-counting'

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

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

where E stands for emission.

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

4. Conclusions

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

Appendix D-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 E

Implementation Schedule

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

