

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

Environmental Impact Assessment Study Brief No. ESB - 210/2009

Project Title: **Proposed Low-rise and Low-density Residential Development at Various Lots and their Adjoining Government Land in D.D. 104, East of Kam Pok Road, Mai Po, Yuen Long, N.T. (hereafter known as the Project)**

Name of Applicant: **Glory Queen Limited (hereinafter known as the “Applicant”)**

1. BACKGROUND

An application (No. ESB-210/2009) for an Environmental Impact Assessment (EIA) study brief under section 5(1)(a) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by the captioned Applicant on 24 August 2009 with a project profile (No. PP-398/2009).

The Applicant proposes to develop the project site for low-rise, low-density residential development. The project site occupies about 3.8ha area and is permitted to have a maximum plot ratio of 0.2 and a maximum building height of 2 storeys of 6m high. The location plan of the Project showing the approximate project boundary is given as Figure 1.

According to Item P of Part I, Schedule 2 of the EIAO, the Project is a Designated Project since it is a residential development other than New Territories exempted house within the Deep Bay Buffer Zone 2.

Pursuant to section 5(7)(a) of the EIAO, the Director of Environmental Protection (the Director) issues this EIA study brief to the Applicant to carry out an EIA study.

The purpose of this EIA study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and related activities taking place concurrently. This information will contribute to decisions by the Director on:

- (i) the 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 and associated works together with the requirements for carrying out the Project;
- (ii) to identify and describe the elements of the community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the Project, including both the natural and man-made environment;
- (iii) to identify and quantify all environmental sensitive receivers, emission sources and determine the significance of impacts on sensitive receivers and potential affected uses;
- (iv) to identify and systematically evaluate any potential losses or damage to flora, fauna and wildlife habitats;
- (v) to identify any negative impacts on sites of cultural heritage and to propose measures to mitigate these impacts;
- (vi) to identify and systematically evaluate any potential landscape and visual impacts and to propose measures to mitigate these impacts;
- (vii) to propose the provision of infrastructure or mitigation measures so as to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;
- (viii) to identify, predict and evaluate the residual (i.e. after practicable mitigation) environmental impacts and the cumulative effects expected to arise during the construction and operation phases of the Project in relation to the sensitive receivers and potential affected uses;
- (ix) to identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operation of the Project which are necessary to mitigate these environmental impacts and reducing them to acceptable levels;
- (x) to investigate the extent of 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;
- (xi) to identify, within the study area, any individual project(s) that fall under Schedule 2 and/or Schedule 3 of the EIA Ordinance; to ascertain whether the findings of this EIA study have adequately addressed the environmental impacts of those projects; and where necessary, to identify the outstanding issues that need to be addressed in any further detailed EIA study; and
- (xii) to design and specify the environmental monitoring and audit requirements, if required, to ensure the implementation and the effectiveness of the environmental protection and pollution control measures adopted.

3. DETAILED REQUIREMENTS OF THE EIA STUDY

3.1 The purpose of this study brief is to scope the key issues of the EIA study. 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.

The Scope

3.2 The scope of this EIA study shall cover the Project and associated works mentioned in section 1.2 above. The EIA study shall cover the combined impacts of all the Project and the cumulative impacts of the existing, committed and planned developments in the vicinity of the Project in accordance with the requirements laid down in section 3.4 of the TM. The environmental impacts of on-site and off-site works and facilities associated with the Project shall be addressed. The EIA study shall address the likely key issues described below, together with any issues identified in the course of the EIA study:

- (i) noise impacts arising from construction and operation of the Project to the nearby village areas and development;
- (ii) the air quality impacts on air sensitive receivers in the assessment area due to air pollutant emission sources identified according to sub-section 3.9.1.4(ii)(b) of this study brief during the construction and operation of the Project;
- (iii) landscape and visual impacts during construction and operation of the Project;
- (iv) the potential water quality impacts caused by site formation, pond draining and filling, drainage diversion, and any other works activities during construction; the potential water quality impacts caused by the operation of the Project;
- (v) the potential impacts on sites of cultural heritage from construction and operation of the Project;
- (vi) direct and indirect terrestrial and aquatic ecological impacts, in particular the potential impacts of disturbance and fragmentation to the recognized sites of conservation importance in the vicinity including, for example, the Mai Po Nature Reserve, Mai Po Inner Deep Bay Ramsar Site, Mai Po Village Site of Special Scientific Interest (SSSI), Mai Po Marshes SSSI, Wetland Conservation Area (WCA) and Wetland Buffer Area (WBA) [both were defined under Town Planning Board Guidelines TPB PG-No. 12B] and important habitats such as fishponds and egrettries, due to the construction and operation of the Project;
- (vii) fisheries impacts during construction and operation of the Project; and
- (viii) collection and disposal of potentially contaminated dredged spoil arising from the Project.

Consideration of Alternatives

3.3 Purposes and Objectives for the Project

The Applicant shall provide information on the purposes and objectives of the Project, and describe the scenarios with and without the Project.

3.4 Consideration of Alternative Layout Options

The Applicant shall consider alternative layout options for the Project, provide justification regarding how the proposed layout option is arrived at, including the descriptions of the environmental factors considered in the option selection. A comparison of the environmental benefits and dis-benefits of alternative layout options shall be made with a view to recommending the preferred option to avoid and minimize adverse environmental effects to the maximum practicable extent and to enhance the landscape and visual quality of the area. In particular, consideration shall be given to avoid or minimize the disturbance to the adjacent recognized sites of conservation importance especially WCA during the construction and operation of the Project. Alternative layouts and measures which can enhance the landscape and visual qualities will be considered in the EIA Study.

3.5 Consideration of Alternative Construction Methods and Sequences of Works

Taking into consideration the combined effect with respect to the severity and duration of the construction impacts to the affected sensitive receivers, the EIA study shall explore alternative construction methods and sequences of works for the Project, with a view to avoid prolonged adverse environmental impacts to the maximum practicable extent. A comparison of the environmental benefits and dis-benefits of applying different construction methods and sequence of works shall be made. Consideration should be given to the proper scheduling of construction programme to avoid the peak period of migratory birds, if adverse impacts during the construction phase are anticipated.

3.6 Selection of Preferred Scenario

Taking into consideration of the findings in sections 3.4 and 3.5 above, the Applicant shall recommend/justify the adoption of the preferred scenario to avoid and minimize adverse environmental effects arising from the Project, and adequately describe the part that environmental factors played in arriving at the final selection.

Technical Requirements

3.7 The Applicant shall conduct the EIA study to address all environmental aspects of the works and activities as described in the scope set out above.

3.8 The EIA study shall take into consideration and compare clearly and objectively the environmental impacts of different development options considered in the study. In formulating the preferred development option, the Applicant shall seek to avoid adverse environmental effects to the maximum practicable extent. It is important to describe adequately in the report the part environmental factors played in the selection of the preferred option(s).

3.9 The EIA study shall include the following technical requirements on specific impacts.

3.9.1 Air Quality Impact

3.9.1.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing air quality impact as stated in section 1 of Annex 4 and Annex 12 of the TM respectively. The assessment shall be based on the best available information at the time of the assessment.

3.9.1.2 The study area for air quality impact assessment shall generally be defined by a distance of 500 m from the boundary of the project site as shown in Figure 1. The assessment shall take into account the existing, committed and planned sensitive receivers within the impact assessment area defined in the first sentence of this section. Subject to the agreement of the Director, the assessment area could be extended to include major emission sources that may have bearing on the environmental acceptability of the Project.

3.9.1.3 The Applicant shall assess the air pollutant concentrations with reference to the Guidelines for Local-Scale Air Quality Assessment Using Models given in Appendices 1 to 3 or other methodology as agreed by the Director.

3.9.1.4 The air quality impact assessment shall include the following:

(i) Background and Analysis of Activities

- (a) Provide background information relating to air quality issues relevant to the Project, including the existing odour sources leading to the prevailing odour strength that has the potential to adversely affect the proposed developments, description of the types of activities of the Project that may affect air quality during both constructional and operational stages.
- (b) Give an account, where appropriate, of the consideration/ measures that had been taken into consideration in the planning of the Project to abate the air pollution impact. That is, the Applicant should consider alternative construction methods/phasing programmes and alternative modes of operation to minimize the odour, constructional and operational air quality impact respectively.
- (c) Present the background air quality levels in the assessment area for the purpose of evaluating the cumulative constructional and operational air quality impacts.

(ii) Identification of ASRs and Examination of Emission/Dispersion Characteristics

- (a) Identify and describe representative existing and planned/ committed air sensitive receivers (ASRs) that would likely be affected by the Project, including those earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans, Layout Plans and other relevant published land use plans. 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 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 shall also be given. For phased development, the Applicant should review the development programme, and where appropriate, to include occupiers of early phases as constructional impact ASRs if they may be affected by works of later phases.

- (b) Provide a list of air pollutant emission sources, including any nearby emission sources which are likely to have impact on the Project based on the analysis of the constructional and operational activities of the Project in sub-section 3.9.1.4(i) above. Examples of constructional stage emission sources include stock piling, blasting, concrete batching and vehicular movements on unpaved haul roads on site, etc. Examples of operational stage emission sources include exhaust emissions from vehicles and odour emissions from drainage channel and sewage treatment works, etc. Confirmation of the validity of the assumptions and the magnitude of the activities (e.g. volume of construction materials handled, etc.) shall be obtained from the relevant government department/authorities and documented.
- (c) The Applicant shall identify chimneys and obtain relevant chimney emission data in the study area by carrying out a survey for assessing the cumulative air quality impact of air pollutants through chimneys. The Applicant shall ensure and confirm that the chimney emission data used in their assessment have been validated and updated by their own survey. If there are any errors subsequently found in their chimney emission data used, the Applicant shall be fully responsible and the submission might be invalidated.
- (d) The emissions from any concurrent projects, identified as relevant during the course of the EIA study, shall be taken into account as contributing towards the overall cumulative air quality impact. The impacts as affecting the existing, committed and planned air sensitive receivers within the assessment area (section 3.9.1.2 of this study brief) shall be assessed, based on the best information available at the time of assessment.

(iii) Constructional Phase Air Quality Impact

- (a) The Applicant shall follow the requirements of the Air Pollution Control (Construction Dust) Regulation to ensure constructional dust impacts are controlled within the relevant standards as stipulated in section 1 of Annex 4 of the TM. An audit and monitoring program during constructional stage shall be devised to verify the effectiveness of the control measures and to ensure that the construction dust levels be brought under proper control.
- (b) If the Applicant anticipates a significant construction dust impact that will likely cause exceedance of the recommended limits in the TM at the ASRs despite incorporation of the dust control measures stated in sub-section 3.9.1.4(iii) a above, a quantitative assessment shall be carried

out to evaluate the constructional dust impact at the identified ASRs. The Applicant shall follow the methodology set out in subsection sub-section 3.9.1.4(v)(b) to (d) below when carrying out the quantitative assessment.

(iv) Operational Phase Air Quality Impact

The Applicant shall assess the expected air pollutant impacts at the identified ASRs based on an assumed reasonably worst-case scenario under normal operating conditions. If the assessment indicates likely exceedances of the recommended limits in the TM at the development and the nearby ASRs, a quantitative impact evaluation following the methodology in sub-section 3.9.1.4(v)(a) to (e) below shall be carried out.

(v) Quantitative Assessment Methodology

- (a) The air pollution impacts of future road traffic shall be calculated based on the highest emission strength from the road within the next 15 years upon commissioning of the proposed comprehensive development. The Applicant shall demonstrate that the selected year of assessment represents the highest emission scenario given the combination of vehicular emission factors and traffic flow for the selected year. The Fleet Average Emission Factors used in the assessment shall be agreed with the Director. If necessary, the Fleet Average Emission Factors shall be determined by a motor vehicle emission model such as EMFAC-HK model to be agreed with the Director. All the traffic flow data and assumptions that used in the assessment shall be clearly and properly documented in the EIA report.
- (b) The Applicant shall conduct the quantitative assessment with reference to relevant sections of the modelling guidelines stated in section 3.9.1.3 above or any other methodology as agreed with the Director. The 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. Detailed calculations of the pollutant emission rates and a map showing all the road links for input to the modelling shall be presented in the EIA report. The Applicant must ensure consistency between the text description and the model files at every stage of submission. In case of doubt, prior agreement between the Applicant and the Director on the specific modelling details shall be sought.
- (c) The Applicant shall identify the key/representative air pollutant parameters (types of pollutants and the averaging time concentrations) to be evaluated and provide explanation for choosing these parameters for the assessment of the impact of the Project.
- (d) The Applicant shall calculate the cumulative air pollutant concentrations at the identified ASRs and compare these results against the criteria set out in section 1 of Annex 4 in the TM. The predicted air quality impacts (both unmitigated and mitigated) shall be presented in the form of

summary table and pollution contours, to be evaluated against the relevant air quality standards and examination of the land use implications of these impacts. Plans of suitable scale should be used for presentation of pollution contour to allow proper determination of buffer distance requirements.

- (e) If there is any direct technical noise remedy recommend in the Study, its air quality implications shall be assessed. For instance, if barriers that may affect dispersion of air pollutants are proposed, then the implications of such remedies on air quality impact shall be assessed. The Applicant shall highlight clearly the locations and types of agreed noise mitigating measures (where applicable), be they barriers, and affected ASRs, on the contour maps for easy reference.

- (vi) Mitigating measures for non-compliance

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

- (vii) Submission of model files

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

3.9.2 Noise Impacts

3.9.2.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing noise impact as stated in Annexes 5 and 13 of the TM respectively.

3.9.2.2 The noise impact assessment shall include the following:

- (i) Determination of Assessment Area

The study area for the noise impact assessment shall generally be defined by a distance of 300m from the boundary of the project site; with consideration be given to extend the area to include major emission sources that may have a bearing on the environmental acceptability of the Project. The assessment area could be reduced accordingly if the first layer of noise sensitive receivers, closer than 300m from the boundary of the Project (including the access road) as shown in Figure 1, provides acoustic shielding to those receivers at further distance behind. The area shall be expanded to include NSRs at larger distance, which would be affected by the construction and operation of the Project.

- (ii) Provision of Background Information and Existing Noise Levels

The Applicant shall provide all background information relevant to the Project, 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 all existing NSRs and all planned/committed noise sensitive developments and uses earmarked on the relevant Outline Zoning Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by Lands Department and any land use and development applications approved by the Town Planning Board. Photographs of all existing NSRs shall be appended to the EIA report.
- (b) The Applicant shall select assessment points to represent all identified NSRs for carrying out quantitative noise assessment described below. A map showing the location and description such as name of building, use, and floors of each and every selected assessment point shall be given. For planned noise sensitive land uses without committed site layouts, the Applicant should use the relevant planning parameters to work out site layouts for operational noise assessment purpose. However, such assumptions together with any constraints identified, such as setback of building, building orientation, extended podium, shall be agreed with the relevant responsible parties including Planning Department and Lands Department in accordance with section 6.3 of Annex 13 of the TM.

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

The Applicant shall provide an inventory of noise sources including representative construction equipment for construction noise assessment, and traffic flow/fixed plant equipment, as appropriate, for operational noise assessment. Confirmation of the validity of the inventory shall be documented in the EIA report.

(v) Construction Noise Assessment

- (a) The assessment shall cover the cumulative noise impacts due to the construction works of the Project and other 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 daytime, i.e. 7am to 7pm, on weekdays other than general holidays in accordance with methodology in paragraph 5.3 and 5.4 of Annex 13 of the TM. The criteria in Table 1B of Annex 5 of TM shall be adopted in the assessment.
- (c) If the unmitigated construction noise levels are found exceeding the relevant criteria, the Applicant shall propose practicable direct mitigation measures (including movable barriers, enclosures, quieter alternative methods, re-scheduling and restricting hours of operation of

noisy task) to minimise the impact. If the mitigated noise levels still exceed the relevant criteria, the duration of the noise exceedance shall be given.

- (d) In case the Applicant would like to evaluate whether construction works in restricted hours as defined under the Noise Control Ordinance (NCO) are feasible or not in the context of programming construction works, reference should be made to the relevant technical memoranda issued under the NCO. Regardless of the results of the construction noise impact assessment for restricted hours, the Noise Control Authority will process the Construction Noise Permit (CNP) application, if necessary, based on the NCO, the relevant technical memoranda issued under the NCO, and the contemporary conditions/situations. This aspect should be explicitly stated in the noise chapter and the conclusions and recommendations chapter in the EIA report.

(vi) Operational Noise Assessment

(a) Road Traffic Noise

The Applicant shall assess any adverse traffic noise impact on the development of the Project. The following assessment requirements shall be followed.

(a1) Calculation of Noise Levels

The Applicant shall calculate the expected road traffic noise using methods described in the U.K. Department of Transport's "Calculation of Road Traffic Noise" (1988). Calculations of future road traffic noise shall be based on the peak hour traffic flow in respect of the maximum traffic projection within the expected operation years of the Project.

The EIA shall contain sample calculations as considered necessary and requested by the Director, and drawings of appropriate scale to show the road segments, topographic barriers (if any) and assessment points input into the traffic noise model. The Applicant shall provide input data sets of traffic noise prediction model adopted in the EIA study.

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

(a2) Presentation of Noise Levels

The Applicant shall present the prevailing and future noise levels in L_{10} (1 hour) at the NSRs at various representative floor levels (in m.P.D.) on tables and plans of suitable scale.

A quantitative assessment at the NSRs shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM. The potential noise impact of the Project shall be quantified by estimating the total number of dwellings and other noise sensitive elements that will be exposed to noise levels exceeding the criteria set in Table 1A of Annex 5 in the Technical Memorandum.

(a3) Proposals for Noise Mitigation Measures

After rounding of the predicted noise levels according to the U.K. Department of Transport's "Calculation of Road Traffic Noise" (1988), the Applicant shall propose noise mitigation measures in all situations where the predicted traffic noise level exceeds the criteria set in Table 1A of Annex 5 in the TM. Specific reasons for not adopting certain noise mitigation measures in the design to reduce the traffic noise to a level meeting the criteria in the TM or to maximize the protection for the NSRs as far as possible should be clearly quantified and laid down.

The total number of dwellings and other noise sensitive element that will be benefited by the provision of noise mitigation measures should be provided. In order to clearly present the extents/locations of the recommended noise mitigation measures, plans prepared from 1:1,000 or 1:2,000 survey maps showing the mitigation measures (e.g. barriers) shall be included in the EIA report. The total number of dwellings and other noise sensitive elements that will still be exposed to noise above the criteria with the implementation of all recommended noise mitigation measures shall be quantified.

(b) Fixed Noise Sources

(b1) The Applicant shall identify any fixed noise sources including but not limited to the sewage treatment plant, pumping stations, pump houses and electricity stations that may have a bearing on the environmental acceptability of the Project and those caused by the Project. The Applicant shall calculate expected noise using standard acoustics principles. Calculations for expected noise shall be based on assumed plant inventories and utilization schedule for worst-case scenario. The Applicant shall calculate noise levels taking into account correction of tonality, impulsiveness and intermittency in accordance with Technical Memorandum for Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites issued under NCO.

(b2) 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 (in m P.D.) on tables and plans of suitable scale. A quantitative assessment at the NSRs for the proposed fixed noise source(s) shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM.

(b3) **Proposals for Noise Mitigation Measures**

The Applicant shall propose direct technical remedies within the project limits in situations where the predicted noise level exceeds the criteria set out in Table 1A of Annex 5 of the TM to protect the affected NSRs.

(vii) **Assessment of Side Effects and Constraints**

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

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

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

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

3.9.3 Water Quality Impact

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

3.9.3.2 The assessment area for the water quality impact assessment shall include all areas within 500m from the project boundary. This assessment area could be extended to include other areas such as stream courses and the associated water systems, existing and planned drainage system in the vicinity being impacted by the Project if found justifiable.

3.9.3.3 The Applicant shall identify and analyze physical, chemical and biological disruptions of inland water, existing and new drainage system(s) during the construction and operation of the Project.

3.9.3.4 The Applicant shall address water quality impacts due to the construction and operation of the Project. Essentially the assessment shall address the following:

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

- (iii) Identify and analyze physical, chemical and biological disruptions of inland water, existing and planned drainage system arising from the proposed developments and associated works.
- (iv) Identify and analyze relevant existing and planned future activities, beneficial uses and sensitive receivers related to the affected water system(s).
- (v) Identify pertinent water quality objectives and establishment of other appropriate water quality criteria or standards for the water system(s) and all the sensitive receivers as mentioned in sub-section (i), (ii) and (iii) above, including ecological sensitive receivers for the assessments covered in Section 3.9.6.
- (vi) Identify any alternation of water courses, natural streams, manmade fishponds, wetlands, change of drainage system, change of flow regimes.
- (vii) Report on the adequacy of the existing sewerage and sewage treatment facilities for the handling, treatment and disposal of wastewater arising from the Project as required in Section 3.9.4.
- (viii) Subject to the assessment findings and recommendations from the Sewerage and Sewage Treatment Implications under Section 3.9.4, the Applicants shall identify and quantify the water quality impacts due to such findings and recommendations. The water quality concerns could include, but not limited to, possible sewage overflow or emergency bypass due to capacity constraints of the sewerage system, emergencies arising from the Project.
- (ix) Identify and quantify existing and likely future water pollution sources including point discharges and non-point sources to surface water runoff. An emission inventory on the quantities and characteristics of these existing and likely future pollution sources in the assessment area shall also be provided. Field investigation and laboratory test, as appropriate, shall be conducted to fill relevant information gaps.
- (x) Predict and quantify the impacts on the identified water systems and sensitive receivers. All effluent generated shall require appropriate collection, treatment and disposal to ensure that there is no net increase in pollution load to Deep Bay.
- (xi) Possible impacts include change in hydrology, flow regime, water quality and the effects on the aquatic organisms due to such changes. The prediction shall also take into account and include likely different construction stages or sequences, different operational stage.
- (xii) Assess the cumulative impacts due to other related concurrent and planned projects, activities or pollution sources along the identified water system(s) and sensitive receivers that may have a bearing on the environmental acceptability of the Project.
- (xiii) Develop effective infrastructure upgrading or provision, water pollution prevention and mitigation measures to be implemented during the construction and operational stages so as to reduce the water quality impacts to within standards. No net increase of pollution load to Deep Bay should be ensured.

Requirement to be incorporated in the project contract document shall also be proposed.

- (xiv) Analyze the provision and adequacy of the existing and planned future facilities to reduce pollution arising from the storm water drainage system and surface water runoff during construction and operation of the Project; establish a storm water pollution control plan to minimize the potential water quality impact. The plan shall incorporate details such as locations, sizes and types of measures/installations and the best management practices.
- (xv) Evaluate and quantify residual impacts on the affected water system(s) and the sensitive receivers with regard to the appropriate water quality criteria, standards or guidelines.

3.9.4 Sewerage and Sewage Treatment Implications

- 3.9.4.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing impacts on the downstream public sewerage, sewage treatment and disposal facilities as stated in section 6.5 in Annex 14 of the TM.
- 3.9.4.2 The Applicant shall investigate and determine the need and the feasibility of having central pre-treatment facilities and/or a separate sewage treatment plant within the study area. Taking into consideration any programme gap between provision of public sewerage and the occupation of the proposed residential development, the Applicant shall also investigate and determine the need and feasibility of providing interim sewage treatment facilities.
- 3.9.4.3 The Applicant shall study and assess the need and impacts of discharging sewage to the existing/planning sewerage systems in North West New Territories. The assessment shall include the following:
 - (i) investigate and review the adequacy of the existing/planned sewerage and treatment facilities for absorbing part or all of the sewage discharge from the Project within the scope of EIA study as defined in section 3.2 above. The Applicant shall confirm in the EIA report that whether the existing/planning sewerage systems and sewage treatment works in North West New Territories will provide adequate capacity for the Project. The appropriate treatment level of interim discharge, if required, shall be assessed;
 - (ii) the assessment should take into account any additional sewage flows and flow projections from other existing/planned developments to be connected to the existing/planning sewerage systems and sewage treatment works in North West New Territories. The water quality impacts arising from the interim and ultimate effluent discharge, if any, shall be assessed in accordance with section 3.5.3 above.
 - (iii) based on the above items (i) and (ii), if the existing/planned sewerage layout or capacities cannot cope with the maximum discharges, the Applicant shall propose an optimal and cost-effective upgrading works to improve the existing/planned sewerage and sewage treatment facilities or to provide new sewerage and sewage treatment facilities to receive and transport the sewage arising during the construction and operation of the Project. Any proposed

sewerage system and/or on-site sewage treatment facility should be designed to meet the current government standards and requirements. InfoWorks compatible computerized analysis techniques may be used in the preliminary design if necessary.

- (iv) identify and quantify the water quality and ecological impacts due to the emergency discharge from on-site sewage treatment plant/pumping stations and sewer bursting discharge, and to propose measures to mitigate these impacts;
- (v) identify the appropriate alignment and layouts of the new sewerage to connect to the existing/planned/future sewerage system in North West New Territories; investigate and assess the technical feasibility of connection (e.g. technical feasibility and details for direct connection to public sewer and sewage pumping station);
- (vi) set out the design, operation and maintenance requirements and identify the party responsible for the construction and maintenance of any proposed sewerage and sewage treatment facilities, such as pumping station(s) and central pre-treatment facilities for food catering effluent (if recommended), including electrical and mechanical components to eliminate the problem of septicity incurred in long rising main(s) during low flows and to facilitate maintenance. The above shall be agreed by DSD and EPD (Twin rising mains for each pumping station should be provided to make sure that the proposed sewage rising mains are maintainable without shutting down and discharging untreated sewage into the natural stream/drainage channel directly).

3.9.5 Waste Management Implications

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

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

(i) Analysis of Activities and Waste Generation

The Applicant shall identify the quantity, quality and timing of the waste arising as a result of the construction and operational activities of this Project, based on the sequence and duration of these activities.

(ii) Proposal for Waste Management

- (a) Prior to considering the disposal options for various types of wastes, opportunities for reducing waste generation, on-site or off-site re-use and recycling shall be 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 methods/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 stockpiling, labeling, 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 emission;
 - noise;
 - wastewater discharge; and
 - public transport.

(iii) Dredging/Excavation, Filling and Dumping

- (a) The Applicant shall identify and quantify as far as practicable of all dredging/excavation, fill extraction, filling, reclamation, sediment/mud transportation and disposal activities and requirements. Potential fill source and dumping ground to be involved shall also be identified. Field investigation, sampling and chemical and biological laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. 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 and document in the EIA report for consideration. The categories of sediment/mud which are to be disposed of in accordance with a permit granted under the Dumping at Sea Ordinance (DASO) shall be identified by both chemical and biological tests and their quantities shall be estimated. If the presence of any serious contamination of sediment/mud which requires special treatment/disposal is confirmed, the Applicant shall identify the most appropriate treatment and/or disposal arrangement and demonstrate its feasibility. The Applicant shall provide supporting document, such as agreement by the relevant facilities management authorities, to demonstrate the viability of any treatment/disposal plan.
- (b) The Applicant shall identify and evaluate the best practical dredging/excavation methods to minimize dredging/excavation and dumping requirements and demand for fill sources based on the criterion that existing sediment/mud shall be left in place and not to be disturbed as far as possible.

(iv) Land Contamination

If any contaminated land uses as stated in Sections 3.1 and 3.2 of Annex 19 in the TM is identified, the Applicant shall carry out the land contamination assessment as detailed from sub-section (a) to (f) below and propose measures

to avoid disposal:

- (a) 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.
- (b) The Applicant shall identify the potential land contamination site(s) within the study boundary and, if any, the boundaries of all associated areas (e.g. work areas) of the Project.
- (c) The Applicant shall provide a clear and detailed account of the present land use (including description of the activities, chemicals and hazardous substances handled, with clear indication of their storage and location, by reference to a site layout plan) and a complete past land uses history in relation to possible land contamination (including accident records and change of land use(s) and the like).
- (d) During the course of the EIA study, the Applicant shall submit a Contamination Assessment Plan (CAP) to the Director for endorsement prior to conducting an actual contamination impact assessment of the 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 land or site(s).
- (e) 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) to formulate viable remedial measures with supporting documents, such as agreement by the relevant facilities management authorities, shall be submitted to the Director for approval. The Applicant shall then clean up the contaminated land or site(s) according to the approved RAP, and a Remediation Report (RR) to demonstrate adequate clean-up should be prepared and submitted to the Director for endorsement prior to the commencement of any development works within the site. The CAP, CAR and RAP shall be documented in the EIA report.
- (f) If there is/are potential contaminated site(s) is 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:
 - a review of the available information;
 - an initial contamination evaluation of this/these site(s) and possible remediation methods;
 - a confirmation of whether the contamination problem at this/these site(s) would be surmountable;
 - a sampling and analysis proposal which shall aim at determining the nature and the extent of the contamination of this/these site(s); and
 - a schedule of submission of revised CAP (if necessary), CAR, RAP and RR upon this/these site(s) is/are accessible.

3.9.6 Ecological Impact (Terrestrial and Aquatic)

- 3.9.6.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing ecological impact as stated in Annexes 8 and 16 of the TM respectively during the construction and operational phases. The assessment shall include the ecological survey of the “Assessment Area” as defined in section 3.9.6.2 below
- 3.9.6.2 The “Assessment Area” for the purpose of terrestrial and aquatic ecological impact assessment shall include all areas within 500m distance from the boundary of the Project (including the access road) as shown in Figure 1, and any area likely to be impacted by the Project.
- 3.9.6.3 In the ecological impact assessment, 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 other ecologically sensitive areas. The assessment shall identify and quantify as far as possible the potential ecological impacts associated with the Project.
- 3.9.6.4 The assessment shall include the following major tasks:
- (i) review and incorporate the findings of relevant studies and collate all the available information regarding the ecological characters of the “Assessment Area”;
 - (ii) identify any information gap relating to the assessment of potential ecological impacts to the terrestrial and aquatic environment;
 - (iii) carry out necessary field surveys, the duration of which shall be at least six months to cover both wet and dry season, and investigations to fill the information gaps identified and fulfil the objectives of the EIA study;
 - (iv) describe all recognized sites of conservation importance such as the Wetland Conservation Area, Wetland Buffer Area, Mai Po Inner Deep Bay Ramsar Site, Mai Po Nature Reserve, Mai Po Village SSSI and Mai Po Marshes SSSI in the project site and its vicinity;
 - (v) establish the general ecological profile and describe the characteristics of each habitat found in the Assessment Area. This should reflect the condition prior to the pond-filling, in case there is any unauthorized pond-filling within the project site. Major information to be provided shall include:
 - (a) description of the physical environment;
 - (b) habitat maps of suitable scale (1:1000 to 1:5000) showing the types and locations of habitats in the “Assessment Area”;
 - (c) ecological characteristics of each habitat type such as size, vegetation type, species present, dominant species found, species diversity, community structure, inter-dependence of the habitats and species, and presence of any features of ecological importance, as well as any ecological linkage between the habitats;
 - (d) representative colour photographs of each habitat type and any important

- ecological features identified; and
- (e) species found that are rare, endangered and/or listed under local legislation or international conventions for conservation of wildlife/habitats or Red Data Books.
- (vi) investigate and describe the existing wildlife uses of various habitats with special attention to:
 - (a) wetlands including fish ponds, wet agricultural land and marshes;
 - (b) roosting, breeding and feeding sites for wetland birds; and
 - (c) any other habitats identified as having special conservation interests by this study.
- (vii) using suitable methodology, identify and quantify as far as possible any direct, indirect, on-site, off-site, primary, secondary and cumulative ecological impacts such as destruction of habitats, reduction of species abundance/diversity, loss of feeding grounds, reduction of ecological carrying capacity, loss in ecological linkage and function, habitat fragmentation and other possible disturbances caused by the Project and the activities of the residents;
- (viii) evaluate the significance and acceptability of the ecological impacts identified using well-defined criteria;
- (ix) recommend all possible alternatives (such as modifications of layout and design) and practicable mitigation measures to avoid, minimize and/or compensate for the adverse ecological impacts identified. If off-site mitigation measures are considered necessary to mitigate the residual impacts, the guidelines and requirements laid down in the TM shall be followed;
- (x) evaluate the feasibility and effectiveness of the recommended mitigation measures and define the scope, type, location, implementation arrangement, subsequent management, resources requirement and maintenance of such measures;
- (xi) determine and quantify as far as possible the residual ecological impacts after implementation of the proposed mitigation measures;
- (xii) evaluate the severity and acceptability of the residual ecological impacts using well-defined criteria; and
- (xiii) review the need for and recommend any ecological monitoring programme.

3.9.7 Fisheries Impact

- 3.9.7.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing fisheries impact as stated in Annexes 9 and 17 of the TM respectively.
- 3.9.7.2 The study area for the purpose of this fisheries impact assessment shall include all areas within a distance of 500m from the boundaries of the development. This study area shall be extended to include other areas with fish ponds and associated water system(s) if they are found also being impacted by the construction or operation of the Project during the course of the EIA study. Special attention

should be given to the surrounding pond culture resources and activities as well as any water courses which serve as water sources for fish ponds.

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

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

3.9.8 Impact on Cultural Heritage

3.9.8.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing impacts on cultural heritage as stated in section 2 of both Annexes 10 and 19 of the TM respectively.

3.9.8.2 The cultural heritage impact assessment (CHIA) shall comprise an Archaeological Impact Assessment (AIA) and a Built Heritage Impact Assessment (BHIA). The Applicant shall refer to Appendix 4 Guidelines for Cultural Heritage Impact Assessment for the detailed requirements.

(i) Archaeological Impact Assessment (AIA)

The Applicant shall engage a qualified archaeologist to conduct the AIA in accordance with relevant sections of the Guidelines for CHIA. If existing information is insufficient to ascertain the archaeological potential of the Project area, further field investigation shall be conducted to obtain archaeological data. The archaeologist shall obtain a licence from the Antiquities Authority before undertaking field investigation under the provision of the Antiquities and Monuments Ordinance (Cap. 53).

(ii) Built Heritage Impact Assessment (BHIA)

The Applicant shall draw necessary reference to relevant sections of the Guidelines for CHIA to conduct the BHIA to identify known and unknown built heritage items within the assessment area that may be affected by the Project and its associated works and to assess direct and indirect impacts on built heritage items. The impacts include visual impact, impacts on the fung shui/visual corridor of the historic buildings and structures through change of water-table, vibration caused by the Project. Assessment of impacts on cultural heritage shall also take full account of, and allow where appropriate, the Guidelines for Landscape and Visual Impact Assessment of Annex 18 of the TM.

- 3.9.8.3 The Applicant shall demonstrate that the disturbance, including access, to those sites of cultural heritage are avoided to the maximum practicable extent by modification of the alignment, layout and design of the Project. For those sites of cultural heritage that might still be directly and indirectly affected by the Project, the Applicant shall recommend practicable mitigation measures and monitoring to avoid or keep the adverse impacts on the site of cultural heritage to the minimum. A checklist including the affected sites of cultural heritage, impacts identified, recommended mitigation measures as well as the implementation agent and period shall also be included in the EIA report.

3.9.9 Landscape and Visual Impact

- 3.9.9.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing landscape and visual impacts as stated in Annexes 10 and 18 of the Technical Memorandum and EIAO Guidance Note No. 8/2002.
- 3.9.9.2 The assessment area for the landscape impact assessment shall include all areas within a 500m distance from the boundary of the Project (including the access road) as shown in Figure 1. The assessment area for the visual impact assessment shall be defined by visual envelope of the proposed Project and associated works. The defined visual envelope should be shown on plan.
- 3.9.9.3 The Applicant shall review relevant outline development plans, outline zoning plans, layout plans, planning briefs and studies which may identify areas of high landscape value and recommended conservation areas (e.g. "Site of Special Scientific Interest" and special zones in rural or suburban areas with intention of protection of rural character and ecological value, as well as the Wetland Conservation Area and Wetland Buffer Areas with Deep Bay Area as defined in TPB Guideline No. 12B), green belt, recreation, open space and other specified use. Any guidelines on urban design concept, landscape framework, building height profiles, designated view corridors that may affect the appreciation of the Project should also be reviewed. The aim is to gain an insight to the future outlook of the area and provide a basis to assess whether the Project can fit into surrounding setting. Any conflict with statutory town plan(s) and any published land use plans should be highlighted and appropriate follow-up action should be recommended.
- 3.9.9.4 The Applicant shall describe, appraise and analyse the existing landscape resources and character of the assessment area. The sensitivity of the landscape framework and its ability to accommodate change shall be particularly focused on. A system should be derived for judging impact significance. The Applicant shall identify

the degree of compatibility of the Project with the existing landscape. The assessment shall quantify the potential landscape impacts as far as possible, so as to illustrate the significance of such impacts arising from the Project. Clear mapping of the baseline landscape resource, existing and planned landscape character areas and landscape impacts are required.

3.9.9.5 The Applicant shall assess the visual impacts of the Project at the construction stage and operation stage. A system should be derived for judging the visual impact significance. Clear illustrations in support of the visual impact assessment are required. The assessment shall include the following:

- (i) identification and plotting of visual envelop of the Project;
- (ii) identification of the key groups of visually sensitive receivers (including existing and planned sensitive receivers if any) within the visual envelope and their views at 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 study areas as defined in section 3.9.9.2;
- (iv) the severity of visual impacts in terms of compatibility of the Project with the surrounding landscape, duration of impacts under construction and operation phases, scale of development, reversibility of change, viewing distance, potential blockage of view and sensitivity of receivers towards the visual impacts;
- (v) alternative layouts options should be examined with a view to selecting the best option to minimize any adverse visual impact and to enhance the visual quality of the area; and
- (vi) clear evaluation and explanation of all the factors considered in arriving the significance thresholds of visual impact.

3.9.9.6 Alternative layouts and design that would avoid or reduce the identified landscape and visual impacts and enhance the landscape and visual quality of the area shall be evaluated for comparison before adopting other mitigation or compensatory measures to alleviate the impacts. The Applicant shall recommend mitigation measures to minimize the adverse effects identified above, including provision of a landscape design and mitigation measures to ensure compatibility of the development with the surrounding rural landscape. The mitigation measures shall include but not limited to provision of screen planting and road side berms, revegetation of disturbed land, compensatory planting, provisioning of amenity areas and open spaces, provision of finishes to structures, deposition of buildings, colour scheme and texture of material used and any measures to mitigate the impact on existing and planned sensitive receivers. Parties shall be identified and in-principle agreement with the related authorities should be reached in the EIA stage for the on going management and maintenance of the proposed mitigation works to ensure their effectiveness throughout the operation phase of the Project. The mitigation measures proposed shall not only be concerned with damage reduction but should also include consideration of potential enhancement of existing landscape and visual quality. A practical programme and funding proposal for the implementation of the recommended measures shall be provided.

3.9.9.7 Annotated illustration materials such as coloured perspective drawings, plans and section/elevation diagrams, annotated oblique aerial photographs, photo-retouching and computer-generated photomontage shall be adopted to fully illustrate the landscape and visual impacts of the Project to the satisfaction of the Director. The landscape and visual impacts of the Project with and without mitigation measures from representative viewpoints, particularly from views of the most adversely affected visually sensitive receivers (i.e. worst case scenario), shall be properly illustrated in existing and planned setting at four stages (existing condition, Day 1 with no mitigation measures, Day 1 with mitigation measures and Year 10 with mitigation measures) by computer-generated photomontage so as to demonstrate the effectiveness of the proposed mitigation measures. All computer graphics shall be compatible with Microstation DGN file format. The Applicant shall record the technical details such as system set-up, software, data files and function in preparing the illustration which may need to be submitted for verification of the accuracy of the illustrations.

3.9.10 Impacts Summary

To facilitate easy retrieval of important information, an impacts summary in the form of a table, or any other form approved by the Director, showing the assessment points, results of impact predictions, relevant standard or criteria, extent of exceedance predicted, if any, mitigation measures proposed and residual impacts, if any, after mitigation measures are implemented, etc., should be given at the end of each chapter on individual impact in the EIA report as well as the Executive Summary.

3.9.11 Summary of Environmental Outcomes

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.

3.9.12 Environmental Monitoring and Audit (EM&A) Requirements

3.9.12.1 The Applicant shall identify and justify in the EIA study whether there is any need for EM&A and environmental management system (EMS) activities during the construction and operation phases of the Project and, if affirmative, to define the scope of the EM&A requirements for the Project in the EIA study.

3.9.12.2 Subject to the confirmation of EIA study findings, the Applicant shall comply with the 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.

3.9.12.3 The Applicant shall prepare a Project Implementation Schedule (in the form of a checklist as shown in Appendix 3 or as approved by the Director) containing all the EIA study recommendations and mitigation measures with reference to the implementation programme. The Project Implementation Schedule shall include the explicit agreement reached between the Applicant and relevant parties on the responsibility for funding, implementation, management and maintenance of mitigation measures. Alternatively, the Project Implementation Schedule shall

include an undertaking from the Applicant to assume the responsibility of all those mitigation measures until an agreement is reached between the Applicant and relevant parties on the funding, implementation, management and maintenance of mitigation measures. To facilitate issue of Environmental Permits (EPs) in future, the implementation schedules shall be grouped under individual works packages in separate DPs where applicable.

3.9.13 Monitoring and Audit Requirement of the Project

The Applicant should note the monitoring and audit requirement stipulated in paragraph 8.1 of the TM. The Proponent shall propose an environmental monitoring and audit programme in the EIA report to verify the predictions and the effectiveness of mitigation measures including audit on compliance during the operation phase of the Project.

4. DURATION OF VALIDITY

The Applicant shall notify the Director of the commencement of the EIA study. If the EIA study does not commence within 36 months after the date of issue of the EIA study brief, the Applicant shall apply to the Director for a fresh EIA study brief afresh 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 hard copies of the EIA report and the Executive Summary:
 - (i) 50 hard copies of the EIA report and 80 hard copies of the bilingual (in both English and Chinese) Executive Summary as required under section 6(2) of the EIAO to be supplied at the time of application for approval of the EIA report, unless advised otherwise by the Director;
 - (ii) where necessary, addendum to each copy of the EIA report and the Executive Summary submitted in sub-section 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 hard copies of the EIA report and 50 hard copies of the bilingual (in both English and Chinese) Executive Summary 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 make additional hard copies of the above documents available to the public, subject to payment by the interested parties of full costs of printing.
- 5.4 In addition, to facilitate public inspection of the EIA Report via the EIAO Internet Website, the Applicant shall provide electronic copies of both the EIA Report and the Executive Summary Report prepared in HyperText Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 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 Report shall be included in the beginning of the document. Hyperlinks to all figures, drawings and tables in the EIA Report and Executive Summary shall be provided in the main text from where the respective references are made. All graphics in the report shall be in interlaced GIF format unless otherwise agreed by the Director.

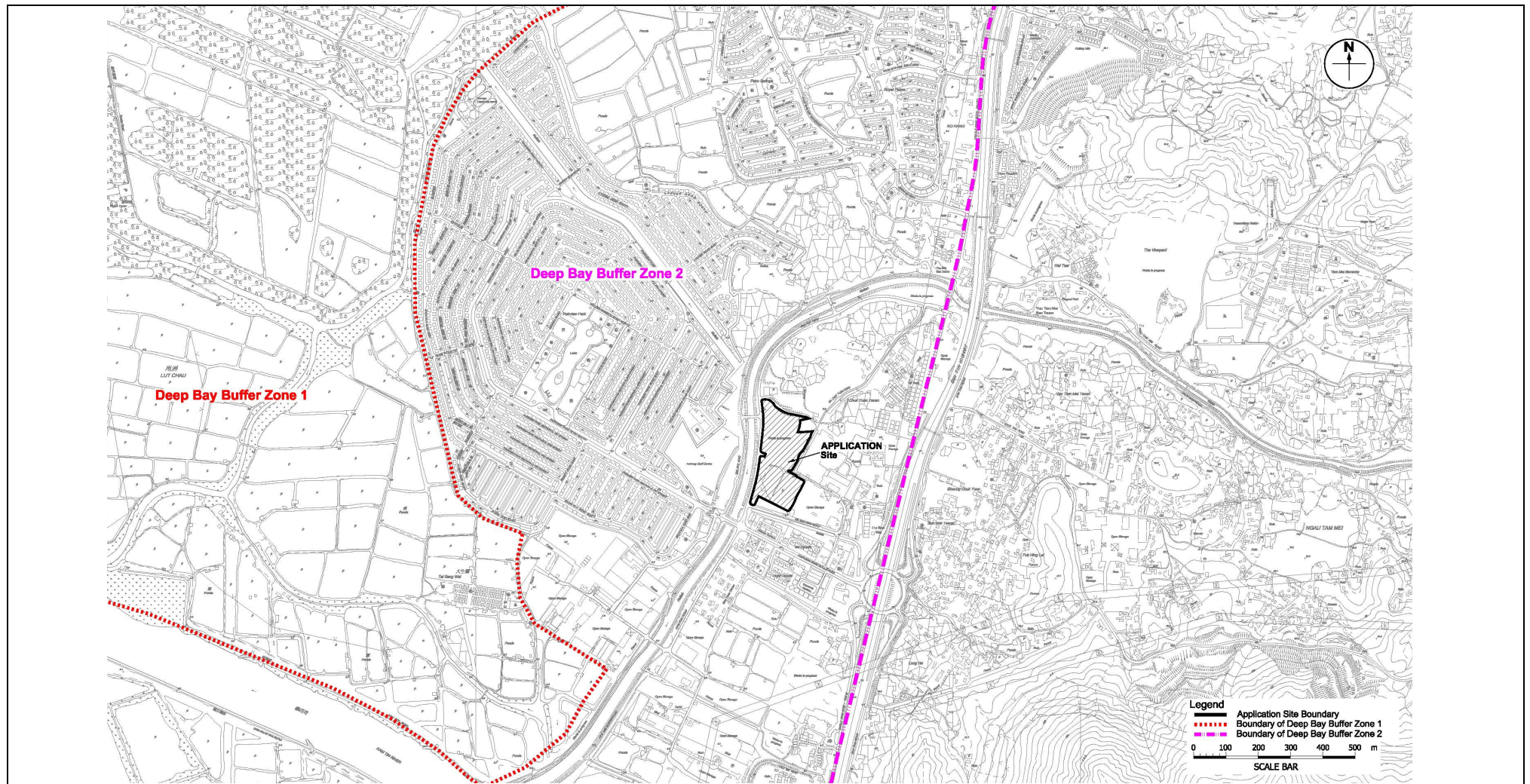
- 5.5 The electronic copies of the EIA report and the Executive Summary shall be submitted to the Director at the time of application for approval of the EIA Report.
- 5.6 When the EIA Report and the Executive Summary are made available for public inspection under section 7(1) of the EIA Ordinance, the content of the electronic copies of the EIA Report and the Executive Summary must be the same as the hard copies and the Director shall be provided with the most updated electronic copies.
- 5.7 To promote environmentally friendly and efficient dissemination of information, both hardcopies and electronic copies of future EM&A reports recommended by the EIA study shall be required and their format shall be agreed by the Director.
- 5.8 To facilitate public involvement in the EIA process, the applicant shall produce 3-dimensional electronic visualisations of the major findings and elements of the EIA report, including baseline environmental information, the environmental situations with and without the Project, key mitigated and unmitigated environmental impacts, and key recommended environmental mitigation measures so that the public can understand the Project and the associated environmental issues. The visualisations shall be based on the EIA report and released to the public. The visualisations shall be submitted in CD-ROM or other suitable means agreed with the Director in commonly readable formats. Unless otherwise advised or agreed by the Director, the number of copies of CD-ROM required shall be the same as that for EIA reports under Section 5.2.

6. OTHER PROCEDURAL REQUIREMENTS

- 6.1 During the EIA study, if there is any change in the name of Applicant for this EIA study brief, the Applicant in this study brief must notify the Director immediately.
- 6.2 If there is any key change in the scope of the Project mentioned in section 1.2 of this EIA study brief and in Project Profile No. PP-398/2009, 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 another EIA study brief afresh.

--- END OF EIA STUDY BRIEF ---

September 2009
Environmental Assessment Division,
Environmental Protection Department



Project Title - Proposed Low-rise and Low-density Residential Development at Various Lots and their Adjoining Government Land in D.D. 104, East of Kam Pok Road, Mai Po, Yuen Long, New Territories

Figure 1 – Location Plan

EIA Study Brief No. : ESB-210/2009



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

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

3.2 Emission Sources

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

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

entered.

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

3.3 Urban/Rural Classification

Emission sources may be located in a variety of settings. For modelling purposes these are 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 μm) and RSP (< 10 μm) 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 $\mu\text{g}/\text{m}^3$ depending on the land use type (see also the EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts' in Appendix B-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 B-3.

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

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

3.11 Background Concentrations

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

3.12 Output

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

Schedule 1

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

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

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

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

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

Appendix 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 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.
- 2.2.1 On performance evaluation, the required approach and extent of demonstration varies depending on whether a Schedule 1 model is already available and suitable in simulating the situation under consideration. In cases where no Schedule 1 model is found applicable, the proponent must demonstrate that the proposed model passes the screening test as set out in

USEPA Document "Protocol for Determining the Best Performing Model" (Ref. 1).

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

- 2.2.2 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).
- 2.2.3 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.
- 2.2.4 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.
- 2.2.5 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.

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Appendix 4

Guidelines for Cultural Heritage Impact Assessment (as at December 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 sitting or design, potential damage to the physical fabric of archaeological remains, historic buildings or historic landscapes through air pollution, change of ground water level, vibration, ecological damage, new recreation or other daily needs to be caused by the new development. The impacts listed are merely to illustrate the range of potential impacts and not intended to be exhaustive.

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

1.3. Desk-top Research

- 1.3.1 Desk-top research should be conducted to analyse, collect and collate extant information. It shall include but not limited to:
 - a. List of declared monuments protected by the Antiquities and Monuments Ordinance (Chapter 53).
 - b. Graded historic buildings and sites.
 - c. Government historic sites identified by the Antiquities and Monuments Office (AMO).
 - d. Lists and archives kept in the Reference Library of the Antiquities and Monuments Office of the Leisure and Cultural Services Department including archaeological sites, declared monuments, proposed monuments,

- deemed monuments and recorded historical building & structures identified by the AMO.
- e. Publications on local historical, architectural, anthropological, archaeological and other cultural studies, such as, Journals of the Royal Asiatic Society (Hong Kong Branch), Journals of the Hong Kong Archaeological society, Antiquities and Monuments Office Monograph Series and so forth.
 - f. Other unpublished papers, records, archival and historical documents through public libraries, archives, and the tertiary institutions, such as the Hong Kong Collection and libraries of the Department of Architecture of the University of Hong Kong and the Chinese University of Hong Kong, Public Records Office, photographic library of the Information Services Department and so forth.
 - g. Any other unpublished archaeological investigation and excavation reports kept by the AMO.
 - h. Historical documents in the Public Records Office, the Land Registry, District Lands Office, District Office and the Hong Kong Museum of History and so forth.
 - i. Cartographic and pictorial documents. Old and recent maps and aerial photos searched in the Maps and Aerial Photo Library of the Lands Department.
 - j. Existing geological information (for archaeological desk-top research).
 - k. Discussion with local informants.

1.4 Field Evaluation

1.4.1 General

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

1.4.2 Field survey on historic buildings and structures

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

1.4.3 Archaeological Survey

- a. Appropriate methods for pricing and valuation of the archaeological survey, including by means of a Bill of Quantities or a Schedule of Rates should be considered in preparing specifications and relevant documents for calling tenders to carry out the archaeological survey. The specifications and relevant documents should be sent to the Antiquities and Monuments Office for agreement prior to calling tenders to conduct the archaeological survey.

- b. A licence shall be obtained from the Antiquities Authority for conducting an archaeological survey. It takes at least two months to process the application.
 - c. A detailed archaeological survey programme should be designed to assess the archaeological potential of the project area. The programme should clearly elaborate the strategy and methodology adopted, including what particular question(s) can be resolved, how the archaeological data will be collected and recorded, how the evidence will be analyzed and interpreted and how the archaeological finds and results will be organized and made available. Effective field techniques should also be demonstrated in the programme. The programme should be submitted to the Antiquities and Monuments Office for agreement prior to applying for a licence.
 - d. The following methods of archaeological survey (but not limited to) should be applied to assess the archaeological potential of the project area:
 - (i) Definition of areas of natural land undisturbed in the recent past.
 - (ii) Field scan of the natural land undisturbed in the recent past in detail with special attention paid to areas of exposed soil which were searched for artifacts.
 - (iii) Conduct systematic auger survey and test pitting. The data collected from auger survey and test pitting should be able to establish the horizontal spread of cultural materials deposits.
 - (iv) Excavation of test pits to establish the vertical sequence of cultural materials. The hand digging of 1 x 1 m or 1.5 x 1.5 m test pits to determine the presence or absence of deeper archaeological deposits and their cultural history.
 - (v) The quantity and location of auger holes and test pits should be agreed with the Antiquities and Monuments Office prior to applying for a licence.
 - (vi) A qualified land surveyor should be engaged to record reduced levels and coordinates as well as setting base points and reference lines in the course of the field survey.
 - e. A Marine Archaeological Investigation (MAI) following *Guidelines for MAI* may be required for projects involving disturbance of seabed.
- 1.4.4 If the field evaluation identifies any additional heritage sites within the study area which are of potential historic or archaeological importance and not recorded by AMO, the findings should be reported to the AMO as soon as possible.

1.5 The Report of Baseline Study

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

- 1.5.2 A master layout plan showing all the identified archaeological and built heritage within the study area should be provided in the report. All the identified heritage sites should be properly numbered with their locations indicated on the master layout plan.
- 1.5.3 Historic Buildings/ Structures/ Sites
 - a. A map in 1:1000 scale showing the boundary of each historic item.
 - b. Photographic records of each historic item.
 - c. Detailed recording form of each historic item including its construction year, previous and present uses, architectural characteristics, as well as legends, historic persons and events, cultural landscape features and cultural activities associated with the structure.
 - d. A cross-referenced checklist including the reference number of each historical item, their photo and drawing reference, as well as the page number of the detailed recording form of each identified historical item for easy cross-checking of individual records.
- 1.5.4 Archaeological Sites
 - a. A map showing the boundary of each archaeological site as supported and delineated by field walking, augering and test-pitting;
 - b. Drawing of stratigraphic section of test-pits excavated which shows the cultural sequence of a site.
 - c. Reduced levels, coordinates, base points and reference lines should be clearly defined and certified by a qualified land surveyor.
 - d. *Guidelines for Archaeological Reports* should be followed (Annex 1).
- 1.5.5 A full bibliography and the source of information consulted should be provided to assist the evaluation of the quality of the evidence. To facilitate verification of the accuracy, the AMO will reserve the right to examine the full details of the research materials collected under the baseline study.
- 1.6 Finds and Archives
 - 1.6.1 Archaeological finds and archives should be handled following *Guidelines for Handling of Archaeological Finds and Archives (Annex 2)*.
- 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.
- 2.3 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 December 2008)

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 5 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 approximate 150 - 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 including electronic sources used should be given in full detail.
12. Archaeological Team
The director and members of the archaeological team and the author of the report should be clearly specified.
13. 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.

14. 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.

15. 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.
- 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.

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.

5. Conservation
 - To refit and reconstruct pottery vessels by appropriate adhesive. A heat and waterproof adhesive, e.g. product of H. Marcel Guest Ltd., is recommended.
 - Any adhesives which are not reversible or will damage artefacts, e.g. the pottery vessel should not be applied on the finds.
6. Finds register

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

II. Field Archives and Laboratory Records

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

Handover of Finds

9. Packing
 - Every special finds should be protected with tissue paper, bubble sheet or P.E. foam with shock-proofed packing. No packing material other than the aforesaid items should be used.
 - All the general finds should be stored in heavy duty plastic container with shock-proofed packing.
 - The heavy duty plastic container, e.g. product of the Star Industrial Co., Ltd. (No. 1849 or 1852), is recommended.
 - For oversized finds, prior advice on packing method should be sought from the AMO.
10. Handover procedure
 - The Licensee should arrange to transport the finds and archives to the CAR upon the completion of the finalized excavation report.
 - Separate handover forms for finds and archives should be signed by the representatives of the Licensee and the AMO.