
Environmental Impact Assessment Ordinance (Cap. 499), Section 5 (7)**Environmental Impact Assessment Study Brief No. ESB-250/2012****Project Title: Expansion of Hong Kong International Airport into a Three-Runway System****(hereinafter known as the "Project")****Name of Applicant: Airport Authority Hong Kong****(hereinafter known as the "Applicant")****1. BACKGROUND**

- 1.1 An application (No. ESB-250/2012) for an Environmental Impact Assessment (EIA) study brief under section 5(1)(a) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by the Applicant on 28 May 2012 with a project profile (No. PP-469/2012) (the Project Profile). On 8 June 2012, the Applicant was requested to give further information concerning the Project Profile under section 5(4) of the EIAO. On 29 June 2012, the Applicant submitted the further information and advertised the availability of the additional information.
- 1.2 The Applicant proposes to develop a third runway and associated Airport infrastructure and facilities. The Project mainly comprises (i) land formation of about 650 ha to the north of the existing Airport island including a portion over the contaminated mud pits; (ii) construction of a third runway, related taxiway systems and navigation aids, and airfield facilities; (iii) construction of the third runway aprons and passenger concourses; (iv) expansion of part of the midfield freighter apron on the existing Airport island; (v) expansion of the existing passenger Terminal 2 on the existing Airport island; (vi) extension of the automated people mover from the existing Airport island to the passenger concourses of the third runway; (vii) extension of the baggage handling system from the existing Airport island to the aprons of the third runway; (viii) improvement of the road network in the passenger and cargo areas and new landside transportation facilities including new car parks on the existing Airport island; (ix) a greywater recycling system at the proposed Airport expansion area; (x) necessary modifications to existing marine facilities including the underwater aviation fuel pipelines and 11kV submarine cable between Hong Kong International Airport and the off-airport fuel receiving facilities, sea rescue facilities and aids to navigation; and (xi) any other modification, reconfiguration, and/or improvement of the existing facilities on the existing Airport island as a result of the third runway. The location of the Project is shown in Figure 1 of this EIA study brief.

- 1.3 The Project includes the following designated projects defined under Schedule 2 of the EIAO:
- (i) Reclamation works more than 5 ha in size (Item C.1, Part I, Schedule 2);
 - (ii) An airport (including its runway and the development and activities related to aircraft maintenance, repair, fueling and fuel storage, engine testing or air cargo handling) (Item B.1, Part I, Schedule 2);
 - (iii) A railway and its associated stations (Item A.2, Part I, Schedule 2);
 - (iv) A road or railway tunnel more than 800 m in length between portals (Item A.7, Part I, Schedule 2);
 - (v) An activity for the reuse of treated sewage effluent from a treatment plant (Item F.4, Part I, Schedule 2); and
 - (vi) A submarine gas pipeline or submarine oil pipeline (Item H.2, Part I, Schedule 2)
- 1.4 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.
- 1.5 The purpose of this EIA study is to provide information on the environmental impacts arising from the construction and operation of the Project and associated activities that will take place concurrently. This information will contribute to decisions by the Director on:
- (i) the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project and associated works, and their staged implementation;
 - (ii) the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences; and
 - (iii) the acceptability of residual impacts, if any, 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 and

environmental benefits 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 and the associated environmental constraints;
- (iii) to identify and quantify emission sources and determine the significance of impacts on sensitive receivers and potentially affected uses;
- (iv) to identify and quantify any potential losses or damage to flora, fauna and natural habitats;
- (v) to identify any negative impacts on sites of cultural heritage and to propose measures to mitigate these impacts;
- (vi) to propose the provision of infrastructure or mitigation measures to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;
- (vii) to investigate the feasibility, effectiveness and implications of the proposed mitigation measures;
- (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 residual environmental impacts and cumulative effects and reduce them to acceptable levels;
- (x) to design and specify the environmental monitoring and audit requirements; and
- (xi) to identify any additional studies necessary to implement the mitigation measures or monitoring and proposals recommended in the EIA report.

3. DETAILED REQUIREMENTS OF THE EIA STUDY

3.1 The Purpose

The purpose of this EIA study brief is to set out the purposes and objectives of the EIA study, the scope of environmental issues which shall be addressed, the requirements that the EIA study shall need to fulfil, and the necessary procedural and reporting requirements. The Applicant shall demonstrate in the EIA report whether 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 complied with.

3.2 The Scope

3.2.1 The scope of this EIA study shall cover the Project and associated works mentioned in sub-section 1.2 above. For the purpose of assessing whether the environmental impacts shall comply with the criteria of the TM, the EIA study shall address the key issues described below, together with any other key issues identified during the course of the EIA study:

- (i) potential air quality impact due to the construction and operation of the Project and associated works;
- (ii) potential hazard to human life due to construction activities affecting the existing aviation fuel pipelines and modification works of the underwater aviation fuel pipelines, the use of new aviation fuel pipelines and new fuel hydrant systems for aircraft refuelling at the new aircraft stands and the operation of diesel, gasoline and LPG storage facilities in the Airport expansion area;
- (iii) potential noise impact on sensitive receivers due to the Project and associated works, including impact from construction equipment during construction and operational noise impact from aircraft, road traffic, railways, marine vessels and fixed noise sources;
- (iv) potential water quality impact due to the Project and associated works, such as works associated with reclamation during construction and accidental fuel spillage during operation;
- (v) potential sewerage and sewage treatment implications arising from the Project;
- (vi) potential waste management implications arising from the construction and operation of the Project;
- (vii) potential land contamination arising from the Project;

- (viii) potential impact on ecological sensitive areas due to the construction and operation of the Project;
- (ix) potential fisheries impacts due to the construction and operation of the Project;
- (x) potential landscape and visual impacts during the construction and operation of the Project;
- (xi) potential impacts on sites of cultural heritage due to construction and operation of the Project;
- (xii) potential health impacts on human due to the operation of the Project; and
- (xiii) potential cumulative environmental impacts of the Project, through interaction or in combination with other existing, committed and planned projects, and that the impacts of these projects may have a bearing on the environmental acceptability of the Project.

3.3 Consideration of Alternatives

3.3.1 Need of the Project

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

3.3.2 Consideration of Alternative Development Options

The Applicant shall consider alternative development options including siting and alignment for the Project in conjunction with the existing airport, provide justifications regarding how the proposed development option is arrived at. The Applicant shall describe the environmental factors considered in the option selection and compare the environmental benefits and dis-benefits of alternative development options with a view to recommending the preferred option to avoid adverse environmental effects.

3.3.3 Consideration of Alternative Construction Methods

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 for the Project (if any). A comparison of the environmental benefits and dis-benefits of applying different construction methods shall be made.

3.3.4 Selection of Preferred Scenario

The Applicant shall, taking into consideration of the findings in sections 3.3.2 and 3.3.3 above, recommend and justify the adoption of the preferred scenario and describe the part that environmental factors played in arriving at the final selection.

3.4 Technical Requirements

3.4.1 The Applicant shall conduct the EIA study to address the environmental aspects of the activities as described in section 3.2 above. The assessment shall be based on the best and latest information available during the course of the EIA study. The EIA report shall include the construction and operational programme as well as approaches and methodologies for assessing environmental impacts of the Project. The EIA report shall provide the time frame, staged implementation programme, and works programme of the Project and other concurrent projects, for assessing the cumulative environmental impacts from the Project and the interacting projects identified in the EIA study.

3.4.2 The EIA study shall follow the technical requirements specified below and in the Appendices of this EIA study brief.

3.4.3 Air Quality Impact

3.4.3.1 The Applicant shall follow the criteria and guidelines as stated in section 1 of Annex 4 and Annex 12 of the TM, respectively, for evaluating and assessing air quality impact.

3.4.3.2 The study area for the air quality impact assessment shall generally be defined by a distance of 500 metres from the boundary of the Project site, yet it shall be extended to include major existing and planned/committed air pollutant emission sources identified to have a bearing on the environmental acceptability of the Project. The assessment shall include the existing and planned/committed air sensitive receivers within the study area as well as areas where the air quality may be significantly affected by the project. The assessment shall be based on the best available information at the time of the assessment.

3.4.3.3 The assessment of the air quality impact arising from the construction and operation of the Project shall follow the detailed technical requirements given in section I of Appendix A of this EIA Study Brief.

3.4.3.4 The Applicant shall assess the air pollutant concentrations with reference to the relevant sections of the “Guidelines for Local-Scale Air Quality Assessment Using Models” in Appendices A-1 to A-3 attached to this EIA Study Brief, or other methodology as agreed by the Director.

3.4.4 **Hazard to Human Life**

3.4.4.1 The Applicant shall follow the criteria for evaluating hazard to human life as stated in section 2 of Annex 4 of the TM.

3.4.4.2 The assessment shall include the hazard to human life due to construction activities affecting the existing aviation fuel pipelines and modification works of the underwater aviation fuel pipelines, the use of new aviation fuel pipelines and new fuel hydrant systems for aircraft refuelling at the new aircraft stands and the operation of diesel, gasoline and LPG storage facilities in the Airport expansion area.

3.4.4.3 The hazard to human life assessment shall follow the detailed technical requirements given in Appendix B.

3.4.5 **Noise Impact**

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

3.4.5.2 Assessment shall include aircraft noise^a, fixed noise including ground noise^b, construction noise, road traffic noise and marine traffic noise impact assessment of the existing, committed and planned NSRs earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by the Lands Department and any land use and development applications approved by the Town Planning Board, in the vicinity of the project.

3.4.5.3 The noise impact assessment of the Project shall follow the detailed technical requirements given in section I of Appendix C.

^a *Aircraft noise associated with the operation of the Hong Kong International Airport (HKIA) shall include noise sources from aircraft in flight while departing from and arriving at the HKIA, noise sources of the take-off ground roll and use of reverse thrust after landing.*

^b *Ground noise shall include sources of aircraft noise-generating activities on Hong Kong International Airport such as taxiing, engine testing, maintenance activities and use of auxiliary power-units etc and non-aircraft sources within the airport boundary.*

3.4.6 **Water Quality Impact**

3.4.6.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing water

quality impact as stated in Annexes 6 and 14 of the TM.

3.4.6.2 The study area for the water quality impact assessment shall include the North Western Water Control Zone, North Western Supplementary Water Control Zone, Deep Bay Water Control Zone, Western Buffer Water Control Zone, as designated under the Water Pollution Control Ordinance (Cap. 358) and the water sensitive receivers in the vicinity of the Project. The study area can be extended to include other areas such as stream courses, existing and new drainage system, and the associated water system(s) in the vicinity if they are found also being affected by the Project during the EIA study and have a bearing on the environmental acceptability of the Project.

3.4.6.3 The water quality impact assessment shall follow the detailed technical requirements given in Appendix D1.

3.4.7 Sewerage and Sewage Treatment Implication

3.4.7.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing impacts on the public sewerage, sewage treatment and disposal facilities as stated in section 6.5 in Annex 14 of the TM.

3.4.7.2 The assessment shall include the public sewerage systems at North Lantau.

3.4.7.3 The assessment of the sewerage and sewage treatment implication shall follow the detailed technical requirements given in Appendix D2.

3.4.8 Waste Management Implication

3.4.8.1 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.

3.4.8.2 The assessment of the waste management implication shall follow the detailed technical requirements given in Appendix E1.

3.4.9 Land Contamination

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

3.4.9.2 The assessment of the potential land contamination issues shall follow the detailed requirements given in Appendix E2.

3.4.10 **Ecological Impact (Terrestrial and Marine)**

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

3.4.10.2 The study area for the purpose of terrestrial ecological impact assessment shall include the Tai Ho Stream Site of Special Scientific Interest (SSSI), San Tau Beach SSSI, Lung Kwu Chau, Tree Island and Sha Chau SSSI and any other areas likely to be impacted by the Project. For marine ecology, the study area shall be the same as the water quality impact assessment as stipulated in Section 3.4.6.2 or the area likely to be impacted by the Project.

3.4.10.3 The ecological impact assessment shall follow the detailed technical requirements given in Appendix F.

3.4.11 **Fisheries Impact**

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

3.4.11.2 The study area shall be the same as the water quality impact assessment as stipulated in Section 3.4.6.2. The study area shall be extended to include other areas if they are also found likely to be impacted by the construction or operation of the Project during the course of the EIA study. Special attention shall be given to potential loss or disturbance of fishing grounds, fisheries habitats, spawning or nursery grounds; aquaculture sites, or artificial reefs.

3.4.11.3 The fisheries impact assessment shall follow the detailed technical requirements given in Appendix G.

3.4.12 **Landscape and Visual Impact**

3.4.12.1 The Applicant shall follow the criteria and guidelines as stated in Annexes 10 and 18 of the TM, the EIAO Guidance Note No. 8/2010 on “Preparation of Landscape and Visual Impact Assessment under the Environmental Impact Assessment Ordinance” and the report of “Landscape Value Mapping of Hong Kong” for evaluating and assessing the landscape and visual impacts.

3.4.12.2 The study area for the landscape impact assessment shall include areas within 500 metres distance from the boundary of the potential land formation footprint for the proposed airport expansion and the existing Airport island. The cumulative impacts on landscape resources and characters from other projects should be included in this assessment. The study area for the visual impact assessment shall be defined by the visual envelope of the Project.

3.4.12.3 The landscape and visual impact assessments shall follow the detailed technical requirements given in Appendix H.

3.4.13 **Impact on Cultural Heritage**

3.4.13.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing the cultural heritage impact as stated in Annexes 10 and 19 of the TM.

3.4.13.2 A marine archaeological investigation (MAI) shall be conducted. It shall include area to be affected by the marine works of the Project.

3.4.13.3 The marine archaeological investigation shall follow the detailed technical requirements given in Appendix I.

3.4.14 **Health Impact**

3.4.14.1 The health impact assessment shall be conducted to assess the potential health impact on human in relation to:

(i) toxic air pollutants (TAP) from the aircraft emissions and associated activities arising from the operation of the Project in accordance with the technical requirements given in section II of Appendix A; and

(ii) aircraft noise arising from the operation of the Project in accordance with the technical requirements given in section II of Appendix C.

3.4.14.2 The health impact assessment shall be based on established practices in countries around the world. A literature search shall be carried out to determine the best approach and methodology for the health impact assessment, including any codes of practices, guidelines, etc. applied locally in Hong Kong and elsewhere in the world. The approach and methodology to be adopted shall be agreed by the Director prior to the commencement of assessment.

3.4.15 **Environmental Monitoring and Audit (EM&A) Requirements**

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

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

requirements as stipulated in Annex 21 of the TM.

3.4.15.3 The Applicant shall prepare a Project Implementation Schedule (in the form of a checklist as shown in Appendix J) containing the EIA study recommendations and mitigation measures with reference to the implementation programme.

3.5 Presentation of Summary Information

3.5.1 Summary of Environmental Outcomes

The EIA report shall contain a summary of key environmental outcomes arising from the EIA study, including estimated population protected from various environmental impacts, environmentally sensitive areas protected, environmentally friendly options considered and incorporated in the preferred option, environmental designs recommended, key environmental problems avoided, compensation areas included and the environmental benefits of environmental protection measures recommended.

3.5.2 Summary of Environmental Impacts

To facilitate effective retrieval of pertinent key information, the EIA report shall contain a summary table of environmental impacts showing the assessment points, results of impact predictions, relevant standards or criteria, extents of exceedances predicted, impact avoidance measures considered, mitigation measures proposed and residual impacts (after mitigation). This summary shall cover each individual impact and shall also form an essential part of the executive summary of the EIA report.

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

The EIA report shall contain a summary including the assessment methodologies and key assessment assumptions adopted in the EIA study, the limitations of these assessment(s) methodologies/assumptions, if any, plus all relevant prior agreement(s) with the Director or other Authorities on individual environmental media assessment components. The proposed use of any alternative assessment tool(s) or assumption(s) have to be justified by the Applicant, with supporting documents based on cogent, scientific and objectively derived reason(s) before seeking the Director's agreement. The supporting documents shall be provided in the EIA report.

4. DURATION OF VALIDITY

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

5. REPORT REQUIREMENTS

- 5.1 In preparing the EIA report, the Applicant shall refer to Annex 11 of the TM for the contents of an EIA report. The Applicant shall accompany with the submission of the EIA report a summary, pointing out where in the EIA report the respective requirements of this EIA Study have been addressed and fulfilled.
- 5.2 The Applicant shall supply the Director with hard and electronic copies of the EIA report and the executive summary in accordance with the requirements given in Appendix K of this EIA study brief. The Applicant shall, upon request, make additional copies of the above documents available to the public, subject to payment by the interested parties of full costs of printing.

6. OTHER PROCEDURAL REQUIREMENTS

- 6.1 If there is any change in the name of Applicant for this EIA study brief during the course of the EIA study, the Applicant must notify the Director immediately.
- 6.2 If there is any key change in the scope of the Project mentioned in sub-section 1.2 of this EIA study brief and in Project Profile (No. PP-469/2012), the Applicant must seek confirmation from the Director in writing on whether or not the scope of issues covered by this EIA study brief can still cover the key changes, and the additional issues, if any, that the EIA study must also address. If the changes to the Project fundamentally alter the key scope of the EIA study brief, the Applicant shall apply to the Director for a fresh EIA study brief.

7. LIST OF FIGURE AND APPENDICES

- 7.1 This EIA study brief includes the following figure and appendices:

Figure 1 – Project Location Plan

Appendix A – Requirements for Air Quality Impact Assessment, and Health Impact Assessment of Toxic Air Pollutants

Appendix B – Requirements for Hazard to Human Life Assessment

Appendix C – Requirements for Noise Impact Assessment, and Health Impact Assessment of Aircraft Noise

Appendix D1 – Requirements for Water Quality Impact Assessment

Appendix D2 – Requirements for Assessment of Sewerage and Sewage Treatment Implication

Appendix E1 – Requirements for Assessment of Waste Management Implication

Appendix E2 – Requirements for Land Contamination Assessment

Appendix F – Requirements for Ecological Impact Assessment

Appendix G – Requirements for Fisheries Impact Assessment

Appendix H – Requirements for Landscape and Visual Impact Assessment

Appendix I – Requirements for Marine Archaeological Investigation

Appendix J – Implementation Schedule

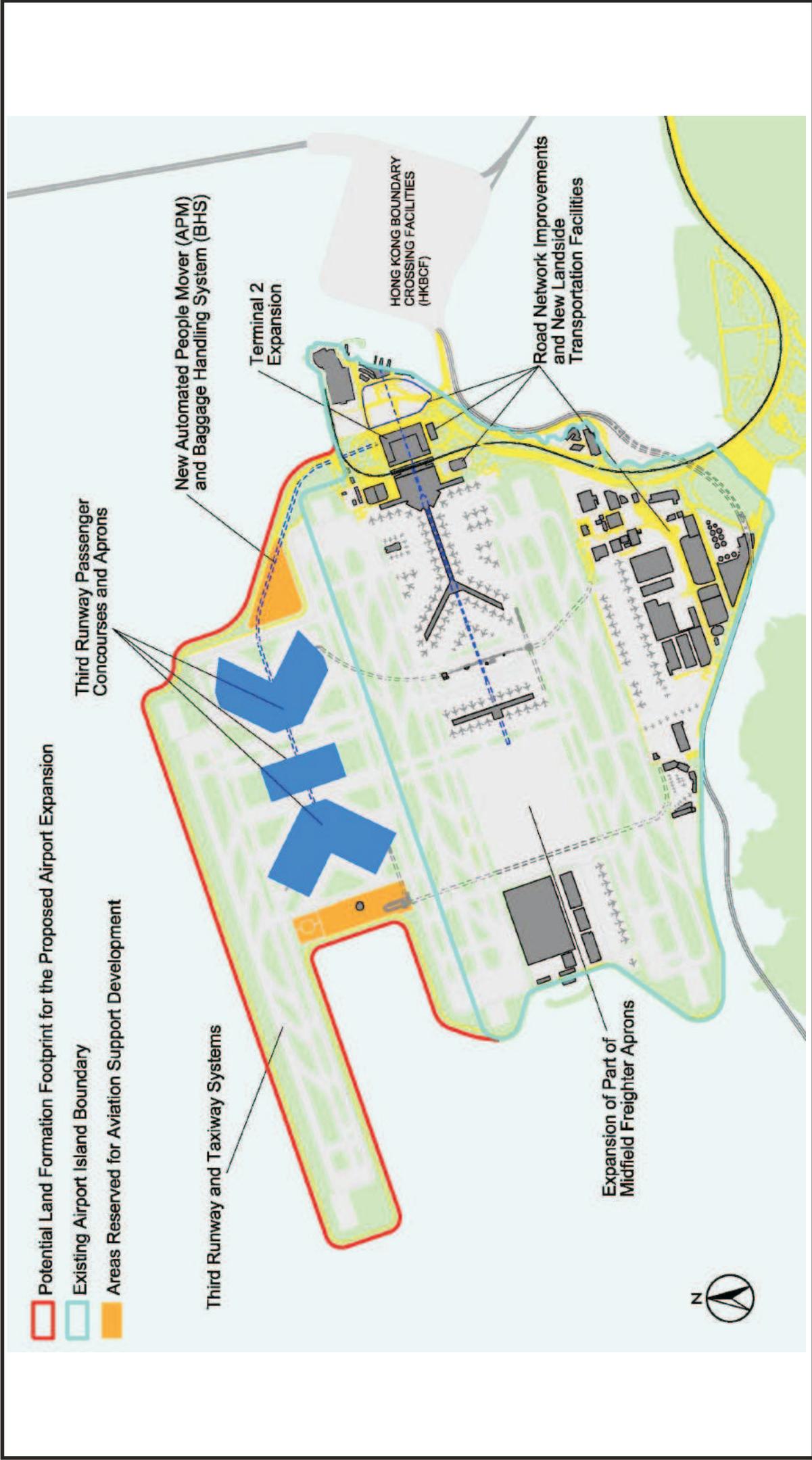
Appendix K – Requirements for EIA Report Documents

--- END OF EIA STUDY BRIEF ---

August 2012

Environmental Assessment Division

Environmental Protection Department



(Plan originated from Figure 1.1 of Application for EIA Study Brief no. ESB-250/2012)

Project Title: Expansion of Hong Kong International Airport into a Three-Runway System

Project Location: Hong Kong International Airport

Environmental Protection Department
 環境保護署

EIA Study Brief No.: ESB-250/2012

Figure 1

Appendix A**Requirements for Air Quality Impact Assessment, and Health Impact Assessment of Toxic Air Pollutants****I Requirements for Air Quality Impact Assessment**

The air quality impact assessment shall include the following:

1. Background and Analysis of Activities
 - (i) Provide background information relating to air quality issues relevant to the Project, e.g. description of the types of activities of the Project that may affect air quality during both construction and operational stages of the Project.
 - (ii) Provide an account, where appropriate, of the consideration/measures that have been taken into consideration in the planning of the Project to abate the air pollution impact. The Applicant shall consider alternative construction methods/phasing programmes, and alternative operation modes to minimise the air quality impact during the construction and operation stages of the Project.
 - (iii) Present the background air quality levels in the study area for the purpose of evaluating cumulative air quality impacts during construction and operational stages of the Project. The Applicant may establish the existing air quality conditions based on properly collected ambient air quality monitoring data, and in case necessary, augmented with air quality modelling tools. The PATH model may be used to estimate the future background air quality.
2. Identification of Air Sensitive Receivers (ASRs) and Examination of Emission/Dispersion Characteristics
 - (i) Identify and describe existing, planned and committed 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, including plans and drawings published by the Lands Department and any land use and development applications approved by the Town Planning Board. The Applicant shall select the assessment points of the identified ASRs that represent the reasonable worst impact location of these ASRs. A map clearly showing the location and table with description such as name of 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.
 - (ii) Provide a list of air pollutant emission sources, which are related to the Project based on the analysis of the construction and operational activities in section 1 above. Examples of construction stage emission sources include stock piling, blasting, concrete batching, material handling and vehicular movements on paved or unpaved haul roads on site. Examples of operational stage emission sources include aircraft main engines, on-board auxiliary power units (APUs), ground support equipment (GSE), fugitive emissions from fuel tanks and aircraft refuelling, stationary and area sources from various supporting activities on airport. The Applicant shall consider

relevant information such as the aircraft fleet mix (including aircraft type, size, engine type, number and age), landing take-off (LTO) cycles (approach, taxi/idle-in, taxi/idle-out, takeoff and climbout) and time-in-mode for the aircraft emissions. Similar information shall also be considered for other mobile sources such as GSE, APUs and on-airport vehicles. The Applicant may refer to assessment guidelines issued by national or international organizations such as the US Federal Aviation Administration (FAA) for emission assessment methodologies. Confirmation regarding the validity of assumptions adopted and the magnitude of the activities (e.g. volume of construction material handled, number of aircraft LTOs, etc.) shall be obtained from the relevant government departments/authorities and documented.

- (iii) Identify and obtain relevant chimney emission data in the study area by carrying out a properly designed survey for assessing the cumulative air quality impact of air pollutants through the chimneys. The Applicant shall ensure the validity of the emission data used in the assessment. Any errors found in the emission data used, may render the submission invalidated.
- (iv) Identify other sources of the emissions which are likely to have an impact related to the Project, such as chimneys, marine and road traffic, as well as any concurrent projects identified as relevant during the course of the EIA study for incorporation into the assessment of the overall cumulative air quality impact. The impact as affecting the existing, planned/committed ASRs within the study area shall be assessed, based on the best information available at the time of assessment.

3. Construction Phase Air Quality Impact

- (i) The Applicant shall follow the requirements stipulated under the Air Pollution Control (Construction Dust) Regulation to ensure that construction dust impacts are controlled within the relevant standards as stipulated in section 1 of Annex 4 of the TM.
- (ii) If the Applicant anticipates that the Project will give rise to significant construction dust impacts likely to exceed recommended limits in the TM at ASRs within 500m from the project boundary despite the incorporation of the dust control measures proposed, a quantitative assessment shall be carried out to evaluate the construction dust impact at the identified ASRs. The Applicant shall follow the methodology set out in section 5(i) below when carrying out the quantitative assessment.
- (iii) A monitoring and audit programme for the construction phase of the Project shall be devised to verify the effectiveness of the control measures proposed so as to ensure proper construction dust control.

4. Operational Phase Air Quality Impact

- (i) The Applicant shall quantify the expected air pollutant concentrations at the identified ASRs within 5 km from the project boundary based on the highest aircraft emission scenario under normal operating conditions with the Project. The evaluation shall be based on the strength of the emission sources identified in section 2 above. The Applicant shall follow the methodology set out in section 5 below when carrying out the quantitative assessment.

5. Quantitative Assessment Methodology

- (i) The Applicant shall apply the general principles enunciated in the modelling guidelines in Appendices A-1 to A-3 while making allowance for the specific characteristic of the Project.
- (ii) For the purpose of assessing the compliance with the criteria as stated in Annex 4 of the TM, the Applicant shall identify the key/representative air pollution parameters (types of pollutants and the averaging time concentrations) to be evaluated and provide explanation for selecting these parameters for assessing the impact of the Project.
- (iii) Calculation of the relevant pollutant emission rates for input to the model and a map showing the emission sources shall be presented in the EIA report. A summary table of the emission rates shall be presented in the EIA report. The Applicant shall ensure consistency between the text description and the model files at every stage of submissions for review.
- (iv) The air pollution impacts of the future air traffic shall be calculated based on the highest aircraft emissions, due specifically to aircraft LTO cycles, within the period when the project commences operation to the year the project reaches and operates at full capacity. The Applicant shall demonstrate that the selected year of assessment represents the highest aircraft emission scenario, taking into consideration the number of landing take-off cycles and the corresponding aircraft engine emission factors for the selected year.
- (v) The Applicant may use established modelling tools specifically designed to model airport emission sources, such as the latest version of the US FAA required EDMS model, or other models as agreed by the Director.
- (vi) For on-road vehicle emissions, the Applicant may use the EMFAC-HK model to determine the Fleet Average Emission Factors, taking into account vehicle fleet mix and traffic speed, or other models as agreed by the Director.
- (vii) For estimating the future background air quality, the Applicant may use EPD's PATH model or results, taking into consideration the major air pollutant emission sources projected for Hong Kong and nearby regions, or other models as agreed by the Director. Details of the adopted emission sources should be presented.
- (viii) Ozone Limiting Method (OLM) or Discrete Parcel Method (DPM) or other appropriate method shall be used to estimate the conversion ratio of NO_x to NO₂ if NO₂ has been identified as a key/representative air pollutant.
- (ix) The Applicant shall calculate the cumulative air quality impact at the ASRs identified under section 2 above and compare these results against the criteria set out in section 1 of Annex 4 in the TM. The predicted air quality impacts (both unmitigated and mitigated) shall be presented in the form of summary table(s) and pollution contours, to be evaluated against the relevant air quality standards and on any effect they may have on the land use implications. Plans of a suitable scale shall be used to present pollution contours to allow buffer distance requirements to be determined properly.
- (x) The Applicant shall identify the key non-criteria toxic air pollutant(s) emitted by the

Project for a health impact assessment with reference to relevant local and/or overseas studies/guidelines in the aviation sector.

- (xi) If there are any direct technical noise remedies recommended in the study, the air quality implication due to these technical remedies 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. If noise enclosure is proposed, then portal emissions of the enclosed road section and air quality inside the enclosed road section shall also be addressed. The Applicant shall highlight clearly the locations and types of agreed noise mitigating measures (where applicable), be they noise barriers, road enclosures and their portals, and affected ASR's, on contour maps for reference.

6. Mitigation Measures for Air Quality Impact

Consideration for Mitigation Measures

- (i) Where the predicted air quality impact exceeds the criteria set in section 1 of Annex 4 in the TM, the Applicant shall consider mitigation measures to reduce the air quality impact on the identified ASRs. The feasibility, practicability, programming and effectiveness of the recommended mitigation measures shall be assessed and documented in the EIA report. Specific reasons for not adopting certain workable mitigation measures to reduce the air quality to a level meeting the criteria in the TM or to maximise the protection of the ASRs as far as possible should be clearly substantiated and documented in the EIA report.

Evaluation of Residual Air Quality Impact

- (ii) Upon consideration of mitigation measures, if the mitigated air quality impact still exceeds the relevant criteria in Annex 4 of TM, the Applicant shall identify, predict, evaluate the residual air quality impact in accordance with Section 4.4.3 of the TM and estimate the total number of existing dwellings, classrooms and other air sensitive elements that will be exposed to residual air quality impacts exceeding the criteria set in Annex 4 in the TM.

7. Submission of Emission Calculation Details and Model files

- (i) Input and output file(s) of model run(s) including those files for generating the pollution contours shall be submitted to the Director in electronic format together with the submission of the EIA report.

II Requirements for Health Impact Assessment of Toxic Air Pollutants

1. The health impact assessment regarding Toxic Air Pollutants (TAP) from the aircraft emissions and associated activities arising from the operation of the Project shall include the following key steps:
 - (i) identification of key components of TAP from the aircraft emissions and associated activities during the operation of the Project for health impact assessment;

- (ii) an assessment of the likelihood and consequences of exposure to the identified key components of TAP emissions;
 - (iii) an identification of means by which the health impact could be further reduced; and
 - (iv) recommendation of reasonably practicable measures, if any, to reduce the health impact during the operation of the Project.
2. The environmental health impact assessment on TAP shall include pathways by which the TAP may enter the human body, including inhalation, direct dermal contact as well as consumption of food and water which may be contaminated by the TAP emitted from aircraft and relevant existing, committed and planned sources.

Appendix A-1**Guidelines on Choice of Models and Model Parameters**

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

1. Introduction

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

2. Choice of models

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

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

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

2.2 Note that both FDM and CALINE4 have a height limit on elevated sources (20 m and 10m, respectively). Source of elevation above these limits will have to be modelled using the ISCST3 model or suitable alternative models. In using the latter, reference should be made to the 'Guidelines on the Use of Alternative Computer Models in Air Quality Assessment'.

2.3 The models can be used to estimate both short-term (hourly and daily average) and long-term (annual average) ambient concentrations of air pollutants. The model results, obtained using appropriate model parameters (refer to Section 3) and assumptions, allow direct comparison with the relevant air quality standards such as the Air Quality Objectives (AQOs) for the relevant pollutant and time averaging period.

3. Model input requirements

3.1 Meteorological Data

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

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

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

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

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

3.1.3 For situations where, for example, (i) the model (such as CALINE4) does not allow easy handling of one full year of meteorological data; or (ii) model run time is a concern, the followings can be adopted in order to determine the daily and annual average impacts:

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

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

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

3.1.5 An additional parameter, namely, the standard deviation of wind direction, 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 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 µgm) and RSP (< 10 µgm) 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 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 µg/m³ depending on the land use type (see also EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts').

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

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.

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. Refer to EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts' 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 (USEPA)

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 USEPA.

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

Appendix A-2**Guidelines on Assessing the “Total” Air Quality Impacts**

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

1. Total Impacts - 3 Major Contributions

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

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

2. Nature of Emissions**2.1 Primary contributions**

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

2.2 Secondary contributions

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

2.3 Background contributions

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

3. Background Air Quality - Estimation Approach**3.1 The approach**

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

3.2 Categorisation

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

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

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

3.3 Background pollutant values

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

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

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

In cases where suitable air quality monitoring data representative of the study site such as those obtained from a nearby monitoring station or on-site sampling are not available for the prescription of background air pollution levels, the above tabulated values can be adopted

instead. Strictly speaking, the suggested values are only appropriate for long term assessment. However, as an interim measure and until a better approach is formulated, the same values can also be used for short term assessment. This implies that the short term background values will be somewhat under-estimated, which compensates for the fact that some of the monitoring data are inherently influenced by secondary sources because of the monitoring station location.

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

3.4 Site categories

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

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

3.5 Provisions for “double-counting”

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

$(1.0 - E_{\text{Secondary contributions}}/E_{\text{Territory}})$ where E stands for emission.

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

4. Conclusions

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

Appendix A-3**Guidelines on the Use of Alternative Computer Models in Air Quality Assessment**

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

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) complexity of situation to be modelled far exceeds capability of Schedule 1 models; and
 - (ii) performance of an alternative model is comparable or better than the Schedule 1 models.
- 1.4 This paper outlines the demonstration / submission required in order to support the use of an alternative air quality model for regulatory applications for Hong Kong.

2. Required Demonstration / Submission

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

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

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

- 2.2 To provide technical details of the proposed model, the proponent should submit documents containing at least the following information:
- (i) mathematical formulation and data requirements of the model;
 - (ii) any previous performance evaluation of the model; and
 - (iii) a complete set of model input and output file(s) in commonly used electronic format.
- 2.3 On performance evaluation, the required approach and extent of demonstration varies depending on whether a Schedule 1 model is already available and suitable in simulating the situation under consideration. In cases where no Schedule 1 model is found applicable, the

proponent must demonstrate that the proposed model passes the screening test as set out in USEPA Document "Protocol for Determining the Best Performing Model"

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

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

2.5 Should EPD find the information on technical details alone sufficient to indicate the acceptability of the proposed model, information on further performance evaluation as specified in Sections 2.3 and 2.4 above would not be necessary.

2.6 If the proposed model is an older version of one of the Schedule 1 models or was previously included in Schedule 1, the technical documents mentioned in Section 2.2 are normally not required. However, a performance demonstration of equivalence as stated in Section 2.4 (i) would become necessary.

2.7 If EPD is already in possession of some of the documents that describe the technical details of the proposed model, submission of the same by the proponent is not necessary. The proponent may check with EPD to avoid sending in duplicate information.

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

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

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Fugitive Dust Model (FDM) or the latest version developed by USEPA.

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

Appendix B**Requirements for Hazard to Human Life Assessment**Construction Phase: Aviation Fuel Hazards

1. The Applicant shall carry out hazard assessment to evaluate the risk due to construction works near the existing aviation fuel pipelines and storage facilities. The hazard assessment shall include the following:
 - (i) identify hazardous scenarios associated with construction work damage to aviation fuel pipelines and storage facilities and then determine a set of relevant scenarios to be included in a Quantitative Risk Assessment (QRA);
 - (ii) execute a QRA of the set of hazardous scenarios determined in item 1(i), expressing population risks in both individual and societal terms;
 - (iii) compare individual and societal risks with the criteria for evaluating hazard to human life stipulated in Annex 4 of the TM; and
 - (iv) identify and assess practicable and cost-effective risk mitigation measures.

The methodology to be used in the hazard assessment shall be consistent with previous studies having similar issues (e.g. Permanent Aviation Fuel Facility for Hong Kong International Airport; Integration of Siu Ho Wan and Silvermine Bay Water Treatment Works)

Operation Phase: Aviation Fuel Hazards

2. The Applicant shall carry out hazard assessment to evaluate the risk due to the operation of new aviation fuel pipelines (submarine and underground) and new fuel hydrant systems for aircraft refuelling operation at the new aircraft stands in the Airport expansion area. The hazard assessment shall include the following:
 - (i) identify hazardous scenarios associated with the operation of new aviation fuel pipelines and hydrant systems for aircraft refuelling and then determine a set of relevant scenarios to be included in a QRA;
 - (ii) execute a QRA of the set of hazardous scenarios determined in item 2(i), expressing population risks in both individual and societal terms;
 - (iii) compare individual and societal risks with the criteria for evaluating hazard to human life stipulated in Annex 4 of the TM; and
 - (iv) identify and assess practicable and cost-effective risk mitigation measures.

The methodology to be used in the hazard assessment shall be consistent with previous studies having similar issues (e.g. Permanent Aviation Fuel Facility for Hong Kong International Airport)

Operation Phase: Diesel, Gasoline and LPG Hazards

3. The Applicant shall also carry out hazard assessment to evaluate the risk due to new facilities for storage of dangerous goods (DG) (i.e. Fuel for airside vehicles / ground services equipment). Stored fuels may include diesel, gasoline and LPG in the Airport expansion area. The hazard assessment shall include the following:
- (i) identify hazardous scenarios associated with the above DG facilities and then determine a set of relevant scenarios to be included in a QRA;
 - (ii) execute a QRA of the set of hazardous scenarios determined in item 3(i), expressing population risks in both individual and societal terms;
 - (iii) compare individual and societal risks with the criteria for evaluating hazard to human life stipulated in Annex 4 of the TM; and
 - (iv) identify and assess practicable and cost-effective risk mitigation measures.

The methodology to be used in the hazard assessment shall be consistent with previous studies having similar issues (e.g. Kai Tak Development)

Appendix C**Requirements for Noise Impact Assessment, and Health Impact Assessment of Aircraft Noise****I Requirements for Noise Impact Assessment**

The noise impact assessment shall include the following:

1. Description of the Noise Environment

- 1.1 The Applicant shall describe the prevailing aircraft noise environment in the EIA report by providing the Noise Exposure Forecast (NEF) contours based on the prevailing aviation operations data of the Hong Kong International Airport (HKIA), aircraft noise mitigation measures currently adopted and relevant references to previous studies including but not limited to (i) New Airport Master Plan Environmental Impact Assessment (NAMP-EIA) (12/91) and Supplement to NAMP-EIA (10/92) and (ii) New Airport Master Plan – Environmental Impact Assessment Update (1998).
- 1.2 The Applicant shall conduct prevailing background noise surveys to determine the standards for evaluating noise impact from fixed noise source and marine traffic noise sources. The respective noise environment should be documented in the EIA report.

2. Aircraft Noise Impact Assessment**2.1 Aircraft Noise Impact Assessment Methodology**

- 2.1.1 The Applicant shall carry out aircraft noise impact assessment in accordance with the guidelines set out by International Civil Aviation Organization (ICAO), Federal Aviation Administration (FAA) of United States Department of Transportation or other methodology as confirmed with the Director. In conducting aircraft noise impact assessment, the Applicant shall propose a computational model for agreement of the Director, prior to the commencement of the assessment.
- 2.1.2 The Applicant shall demonstrate that the adopted methodology and computational model are suitable for use in Hong Kong.

Assumptions and Data adopted for assessment

- 2.1.3 The Applicant shall explicitly state assumptions made for deriving the input data or other relevant data for the computational model, including but not limited to:
 - (a) airport operational data including the number of aircraft, aircraft fleet mix, runway utilization, flight tracks, type of aircraft which utilize each flight track on an annual average daily-basis;
 - (b) aircraft approaching operational data including glide slopes, glide slope intercept altitudes, and other relevant information needed to establish approach profiles along with the engine power levels needed to fly that approach profile;
 - (c) aircraft departure operational data including the flight profile which is term of altitude to distance from start-of-roll along with the engine power levels needed to fly that takeoff profile and the takeoff weight of the aircraft or some proxy for weight such as stage length, etc.
- 2.1.4 Validity of the above data shall be confirmed with Civil Aviation Department and documented in the EIA report.

Input Data of Computational Model

2.1.5 The Applicant shall provide a summary and input data sets of computational model adopted in the assessment for each scenario together with the EIA report.

2.2 Identification of Aircraft Noise Impact

Identification of Assessment Area and Noise Sensitive Receivers

2.2.1 The Applicant shall propose the assessment area for agreement of the Director before commencing the assessment. The assessment area for aircraft noise impact shall include area of existing, committed and planned NSRs under or near to the flight tracks/or in vicinity of the Hong Kong International Airport (HKIA), such as Ma Wan, Tuen Mun, Tsing Lung Tau, Shatin, Ma On Shan, Tsuen Wan, Sham Tseng, Tsing Yi, Tung Chung, Tai Kok Tsui, Siu Lam, Yuen Long, Kwai Chung and Sha Lo Wan etc., in association with the proposed Project.

2.2.2 For planned noise sensitive land uses without committed site layouts, the Applicant should use the relevant landuse and planning parameters and conditions to work out representative site layouts for aircraft noise assessment purpose. However, such parameters and conditions together with any constraints identified shall be confirmed with the relevant responsible parties including Planning Department and Lands Department.

Inventory of Noise Sources

2.2.3 The Applicant shall identify and quantify an inventory of noise sources for aircraft noise impact assessment. The inventory of noise sources shall include, but not limited to, aircraft noise characteristics (such as data representing noise emission and performance etc) for all potential aircraft operating at the HKIA in accordance with the operational procedural steps in the HKIA. The information of the aircraft noise characteristics shall be referred to the Aircraft Noise and Performance database of the ICAO or a database as confirmed with the Director.

2.2.4 Validity of the above data shall be confirmed with Civil Aviation Department and documented in the EIA report.

2.3 Prediction and Evaluation of Aircraft Noise Impact

Scenarios

2.3.1 The Applicant shall quantitatively assess the aircraft noise impact, with respect to the criteria set in Annex 5 of the TM, of unmitigated scenario and mitigated scenario at assessment years of various operation modes including, but not limited to,

- (a) the worst operation mode which represents the maximum noise emission in connection of combination of number of aircraft, type of aircraft which utilize each flight track in time periods for both approaches and departures for the selected year;
- (b) the interim phase operation modes which represent the operation of the 3rd runway with closure of either or both of two existing runways of the HKIA; and
- (c) full operation of the three runway system which represents the operation of proposed 3rd runway together with two existing runways at design capacity; and
- (d) any other operation modes as confirmed with the Director.

2.3.2 Validity of the above operation modes shall be confirmed with Civil Aviation Department and documented in the EIA report.

Prediction of Noise Impact

- 2.3.3 The Applicant shall present the predicted aircraft noise impact in Noise Exposure Forecast (NEF) contours, with reference to Annex 5 of the TM, including contours for each scenario assessed under various operation modes, on plans of suitable scale and documented in the EIA report.
- 2.3.4 The assessment shall cover the cumulative aircraft noise impact associated with the operation of the proposed project and HKIA on existing, committed and planned NSRs under or near to the flight tracks; or in vicinity of the HKIA.
- 2.3.5 To determine the extent of the impact, the Applicant shall provide maps at an adequately detailed scale (not less than 1:5000) to show the NEF contours, the HKIA and its environs indicating runway length, alignments, airport boundary, flight tracks and the relevant NSRs under or near to the flight tracks.
- 2.3.6 Where the predicted aircraft noise impact exceeds the criteria set in Annex 5 in the TM, the Applicant shall quantify the aircraft noise impact under different scenarios and operation modes by estimating the total number of dwellings, classrooms and other noise sensitive receivers that will be exposed to noise impact exceeding the criteria and shall made an evaluation of the anticipated changes and effects of aircraft noise impact in accordance with Section 4.3.1 (c) of TM.

2.4 Mitigation of Aircraft Noise Impact

Direct Mitigation Measures

- 2.4.1 Where the predicted aircraft noise impact exceeds the criteria set in Table 1A of Annex 5, TM, the Applicant shall consider and evaluate direct mitigation measures. In identification of applicable measures, the Applicant shall consider the feasibility and appropriateness of, including but not limited to, control of night flight movement over residential area, restriction of aircraft type in nighttime period, use of Required Navigation Performance (RNP) system, etc. The feasibility, practicability, programming and effectiveness of the recommended mitigation measures shall be assessed. Any direct mitigation measures recommended should be well documented in the report and suitably translated into workable clauses for subsequent implementation with confirmation of the validity from the Civil Aviation Department. Specific reasons for not adopting certain direct mitigation measures in the design to reduce the 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 substantiated and documented in the EIA report.

Indirect Mitigation Measures

- 2.4.2 Upon exhaust of direct mitigation measures, where the predicted aircraft noise impact still exceeds the criteria set in Table 1A of Annex 5 of the TM, the Applicant shall consider indirect mitigation measures in the form of window insulation and air-conditioning and evaluate in accordance with Section 6.2 in Annex 13 of the TM.
- 2.4.3 The Applicant shall identify and estimate the total number of existing dwellings, classrooms and other noise sensitive elements which may qualify for indirect mitigation measures, the associated costs and any implications for such implementation.

2.5 Evaluation of Residual Aircraft Noise Impact

- 2.5.1 Upon exhaust of direct and indirect mitigation measures, if the mitigated noise impact still exceeds the relevant criteria in Annex 5 of TM, the Applicant shall identify, predict and

evaluate the residual aircraft noise impact in accordance with Section 4.4.3 of the TM.

3. Fixed Noise Sources Impact Assessment

3.1 Fixed Noise Sources Impact Assessment Methodology

3.1.1 The Applicant shall carry out fixed noise sources impact assessment including ground noise impact from the Project in accordance with methodology in paragraph 5.2 of Annex 13 of the TM.

3.2 Identification of Fixed Noise Sources Impact

Identification of Assessment Area and Noise Sensitive Receivers

3.2.1 The Applicant shall propose the assessment area for agreement of the Director before commencing the assessment.

3.2.2 The Applicant shall identify all existing, committed and planned NSRs in the assessment area and select assessment points to represent identified NSRs for carrying out fixed noise sources impact assessment described below.

3.2.3 The assessment points shall be confirmed with the Director prior to the commencement of the quantitative fixed noise sources impact assessment and may be varied subject to the best and latest information available during the course of the EIA study.

3.2.4 A map showing the location and description such as name of building, use, and floor of each and every selected assessment point shall be given. Photographs of existing NSRs shall be appended to the EIA report.

3.2.5 For planned noise sensitive land uses without committed site layouts, the Applicant should use the relevant landuse and planning parameters and conditions to work out representative site layouts for fixed noise sources assessment purpose. However, such parameters and conditions together with any constraints identified shall be confirmed with the relevant responsible parties including Planning Department and Lands Department.

Inventory of Noise Sources

3.2.6 The Applicant shall identify and quantify an inventory of noise sources for fixed noise sources impact assessment. The inventory of noise sources shall include, but not limited to, noise associated with ground running of aircraft; aircraft operations and maintenance testing such as operations of Auxiliary Power Units and engine run test; automated people mover; baggage handling system; grey water recycle system, vehicles within airport boundary; and any permanent and temporary industrial noise sources including ventilation system(s) of building(s) and/or tunnel(s), ventilation shafts of railway, sewage pumping station(s), seawater pumping station(s) and electricity substation(s), etc.

3.2.7 The Applicant shall provide document or certificate, accepted by recognized national/international organization, for the sound power level of each type of fixed noise sources.

3.2.8 Validity of the inventory shall be confirmed with the relevant government departments/authorities and documented in the EIA report.

3.3 Prediction and Evaluation of Fixed Noise Sources Impact

Scenarios

- 3.3.1 The Applicant shall quantitatively assess the fixed noise sources impact, with respect to the criteria set in Annex 5 of the TM, of unmitigated scenario and mitigated scenario at assessment years of various operation modes including, but not limited to,
- (a) the worst operation mode which represents the maximum noise emission in connection of operating identified noise sources of the Project;
 - (b) the interim phase operation modes which represent the operation of the 3rd runway with closure of either or both of two existing runways of the HKIA; and
 - (c) full operation of the three runway system which represents the operation of proposed 3rd runway together with two existing runways at design capacity; and
 - (d) any other operation modes as confirmed with the Director.
- 3.3.2 Validity of the above operational modes shall be confirmed with Civil Aviation Department and documented in the EIA report.

Prediction of Noise Impact

- 3.3.3 The Applicant shall present the predicted noise levels in Leq (30 min) at the selected assessment points at various representative floor levels (in m P.D.) on tables and plans of suitable scale.
- 3.3.4 The assessment shall cover the cumulative fixed noise sources impact associated with the operation of the proposed project and HKIA on existing, committed and planned NSRs within the assessment area.
- 3.3.5 The potential fixed noise sources impact under different scenarios and operation modes shall be quantified by estimating the total number of dwellings, classrooms and other noise sensitive receivers that will be exposed to noise impact exceeding the criteria set in Annex 5 in the TM.

3.4 Mitigation of Fixed Noise Sources Impact

Direct Mitigation Measures

- 3.4.1 Where the predicted fixed noise sources impact exceeds the criteria set in Table 1A of Annex 5, TM, the Applicant shall consider and evaluate direct mitigation measures such as noise barrier/enclosure, screening by noise tolerant buildings, etc. The feasibility, practicability, programming and effectiveness of the recommended mitigation measures shall be assessed. Any direct mitigation measures recommended should be well documented in the report. Specific reasons for not adopting certain direct mitigation measures to reduce the 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 substantiated and documented in the EIA report.

3.5 Evaluation of Residual Fixed Noise Sources Impact

- 3.5.1 Upon exhaust of direct mitigation measures, if the mitigated noise impact still exceeds the relevant criteria in Annex 5 of TM, the Applicant shall identify, predict, evaluate the residual fixed noise sources impact in accordance with Section 4.4.3 of the TM and estimate the total number of existing dwellings, classrooms and other noise sensitive elements that will be exposed to residual noise impact exceeding the criteria set in Annex 5 in the TM.

4. Construction Noise Impact Assessment

4.1 Construction Noise Impact Assessment Methodology

- 4.1.1 The Applicant shall carry out construction noise impact assessment (excluding percussive piling) of the Project during daytime, i.e. 7am to 7pm, on weekdays other than general holidays in accordance with methodology in paragraphs 5.3 and 5.4 of Annex 13 of the TM.
- 4.1.2 For ground-borne construction noise impact, the Applicant shall propose assessment methodology and computational model which shall be confirmed with the Director, with reference to Section 4.4.2 of the TM, prior to the commencement of the assessment. Site measurements at appropriate locations may be required in order to obtain the empirical input parameters required in the computational model.

4.2 Identification of Construction Noise Impact

Identification of Assessment Area and Noise Sensitive Receivers

- 4.2.1 The Applicant shall propose the assessment area for agreement of the Director before commencing the assessment. The assessment area for the construction noise impact assessment shall generally include areas within 300 metres from the boundary of the Project and the works of the Project.
- 4.2.2 The Applicant shall identify all existing NSRs in the assessment area and select assessment points to represent identified NSRs for carrying out quantitative construction noise impact assessment described below.
- 4.2.3 The assessment points shall be confirmed with the Director prior to the commencement of the quantitative construction noise impact assessment and may be varied subject to the best and latest information available during the course of the EIA study.
- 4.2.4 A map showing the location and description such as name of building, use, and floor of each and every selected assessment point shall be given. Photographs of existing NSRs shall be appended to the EIA report.

Inventory of Noise Sources

- 4.2.5 The Applicant shall identify and quantify an inventory of noise sources for representative construction equipment (including construction phase marine vessels) to construction noise impact assessment.

4.3 Prediction and Evaluation of Construction Noise Impact

Phases of Construction

- 4.3.1 The Applicant shall identify representative phases of construction that would have noticeable varying construction noise emissions at existing NSRs at the assessment area for agreement of the Director before commencing the construction noise impact assessment.

Scenarios

- 4.3.2 The Applicant shall quantitatively assess the construction noise impact during different agreed phases of construction, with respect to criteria set in Annex 5 of the TM, of unmitigated scenario and mitigated scenario at different phases of construction of the Project.

Prediction of Noise Impact

- 4.3.3 The Applicant shall present the predicted noise levels in Leq (30 min) dB(A) at the selected assessment points at various representative floor levels (in m P.D.) on tables and plans of suitable scale.
- 4.3.4 The assessment shall cover the cumulative construction noise impact resulting from the construction works of the Project and other concurrent projects identified during the course of the EIA study on existing NSRs within the assessment area.
- 4.3.5 The potential construction noise impact under different phases of construction shall be quantified by estimating the total number of dwellings, classrooms and other noise sensitive receivers that will be exposed to noise impact exceeding the criteria set in Annex 5 in the TM.
- 4.3.6 The Applicant shall, as far as practicable, formulate a reasonable construction programme so that no work will be required in restricted hours as defined under the Noise Control Ordinance (NCO). In case the Applicant needs to evaluate whether construction works in restricted hours as defined under the NCO are feasible or not in the context of programming construction works, reference should be made to relevant technical memoranda issued under the NCO. Regardless of the results of construction noise impact assessment for restricted hours, the Noise Control Authority will process Construction Noise Permit (CNP) application, if necessary, based on the NCO, the relevant technical memoranda issued under the NCO, and the contemporary conditions/situations. This aspect should be explicitly stated in the noise chapter and the conclusions and recommendations chapter in EIA report.

4.4 Mitigation of Construction Noise Impact

Direct Mitigation Measures

- 4.4.1 Where the predicted construction noise impact exceeds the criteria set in Table 1B of Annex 5, TM, the Applicant shall consider and evaluate direct mitigation measures including but not limited to, movable barriers, enclosures, quieter alternative methods, re-scheduling, restricting hours of operation of noisy tasks, etc. The feasibility, practicability, programming and effectiveness of the recommended mitigation measures shall be assessed. Any direct mitigation measures recommended should be well documented in the report. Specific reasons for not adopting certain direct mitigation measures to reduce the 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 substantiated and documented in the EIA report.

4.5 Evaluation of Residual Construction Noise Impact

- 4.5.1 Upon exhaust of direct mitigation measures, if the mitigated noise impact still exceeds the relevant criteria in Annex 5 of TM, the Applicant shall identify, predict, evaluate the residual construction noise impact in accordance with Section 4.4.3 of the TM and estimate the total number of existing dwellings, classrooms and other noise sensitive elements that will be exposed to residual noise impact exceeding the criteria set in Annex 5 in the TM.

5. Road Traffic Noise Impact Assessment

5.1 Road Traffic Noise impact assessment Methodology

- 5.1.1 The Applicant shall carry out road traffic noise assessment in respect of each road section

(within the meaning of Items A.1, A.7 and A.8 under Part I, Schedule 2 of the EIAO and other road sections) and the noise levels from combined road sections of the Project at the NSRs in accordance with methodology in paragraphs 5.1 of Annex 13 of the TM.

Input Data of Computational Model

5.1.2 The Applicant shall provide the input data set of the road traffic noise computational model adopted in the assessment for various scenarios. The data shall be in electronic text file (ASCII format) containing road segments, barriers and noise sensitive receivers information. CD-ROM(s) containing the above data shall be submitted together with the EIA report.

5.2 Identification of Road Traffic Noise Impact

Identification of Assessment Area and Noise Sensitive Receivers

5.2.1 The Applicant shall propose the assessment area for agreement of the Director before commencing the assessment. The assessment area for the road traffic noise impact shall generally include areas within 300 metres from the boundary of the Project and the works of the Project.

5.2.2 The Applicant shall identify all existing, committed and planned NSRs in the assessment area and select assessment points to represent identified NSRs for carrying out quantitative road traffic noise impact assessment described below.

5.2.3 The assessment points shall be confirmed with the Director prior to the commencement of the quantitative road traffic noise impact assessment and may be varied subject to the best and latest information available during the course of the EIA study.

5.2.4 A map showing the location and description such as name of building, use, and floor of each and every selected assessment point shall be given. Photographs of existing NSRs shall be appended to the EIA report.

5.2.5 For planned noise sensitive land uses without committed site layouts, the Applicant should use the relevant landuse and planning parameters and conditions to work out representative site layouts for road traffic noise impact assessment purpose. However, such parameters and conditions together with any constraints identified, such as setback of building, building orientation, extended podium, shall be confirmed with the relevant responsible parties including Planning Department and Lands Department in accordance with section 6.3 of Annex 13 of the TM.

Inventory of Noise Sources

5.2.6 The Applicant shall analyse the scope of the proposed road alignment(s) to identify road sections for the purpose of road traffic noise impact assessment. Road sections to be included in road traffic noise impact assessment shall be confirmed with the Director prior to the commencement of the assessment.

5.2.7 Validity of the traffic flow prediction of road sections for the purpose of road traffic noise impact assessment shall be confirmed with Transport Department and documented in the EIA report.

5.3 Prediction and Evaluation of Road Traffic Noise Impact

Scenarios

5.3.1 The Applicant shall quantitatively assess the road traffic noise impact of the Project, with

respect to the criteria set in Table 1A of Annex 5, TM, of unmitigated scenario and mitigated scenario at assessment year. The assessment year shall be made reference to Section 5.1 in Annex 13 of the TM.

Prediction of Noise Impact

- 5.3.2 The Applicant shall present the predicted noise levels in L10 (1 hour) dB(A) at the selected assessment points at various representative floor levels (in m P.D.) on tables and plans of suitable scale.
- 5.3.3 The assessment shall cover the cumulative road traffic noise impact resulting from the road traffic noise due to the Project and existing road network on existing, committed and planned NSRs within the assessment area.
- 5.3.4 The potential road traffic noise impact under different scenarios shall be quantified by estimating the total number of dwellings, classrooms and other noise sensitive receivers that will be exposed to noise impact exceeding the criteria set in Annex 5 in the TM.

5.4 Mitigation of Road Traffic Noise Impact

Direct Mitigation Measures

- 5.4.1 Where the predicted road traffic noise impact exceeds the criteria set in Table 1A of Annex 5, TM, the Applicant shall consider and evaluate direct mitigation measures. The feasibility, practicability, programming and effectiveness of the recommended mitigation measures shall be assessed. Any direct mitigation measures recommended should be well documented in the report. Specific reasons for not adopting certain direct mitigation measures to reduce the 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 substantiated and documented in the EIA report.
- 5.4.2 For planned noise sensitive uses which will still be affected even with practicable direct mitigation measures in place, the Applicant shall propose, evaluate and confirm the practicability of additional direct mitigation 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.
- 5.4.3 The Applicant shall take into account agreed environmental requirements /constraints identified in the EIA study to assess the development potential of concerned sites which shall be made known to the relevant parties.

Indirect Mitigation Measures

- 5.4.4 Upon exhaust of direct mitigation measures, where the predicted road traffic noise impact still exceeds the criteria set in Table 1A of Annex 5, TM, the Applicant shall consider indirect mitigation measures in the form of window insulation and air-conditioning and evaluate in accordance with Section 6.2 in Annex 13 of TM.
- 5.4.5 The Applicant shall identify and estimate the total number of existing dwellings, classrooms and other noise sensitive elements which may qualify for indirect mitigation measures, the associated costs and any implications for such implementation.
- 5.4.6 For the purpose of determining eligibility of the affected premises for indirect mitigation measures, reference shall be made to methodology accepted by the recognized national/international organization or methodologies adopted for Hong Kong projects having similar issues on proposing an assessment methodology for determining eligibility of the

indirect mitigation measures which shall be confirmed with the Director with reference to Section 4.4.2 of the TM, prior to the commencement of the assessment.

5.5 Evaluation of Residual Road Traffic Noise Impact

5.5.1 Upon exhaust of direct and indirect mitigation measures, if the mitigated noise impact still exceeds the relevant criteria in Annex 5 of TM, the Applicant shall identify, predict and evaluate the residual road traffic noise impact in accordance with Section 4.4.3 of the TM and Section 6.2 in Annex 13 of the TM.

6. Marine Traffic Noise Impact Assessment

6.1 Marine Traffic Noise Impact Assessment Methodology

6.1.1 The Applicant shall propose methodology and computational model for agreement of the Director, with reference to Section 4.4.2 of the TM, prior to the commencement of the assessment.

6.2 Identification of Marine Traffic Noise Impact

Identification of Assessment Area and Noise Sensitive Receivers

6.2.1 The Applicant shall propose the assessment area for agreement of the Director before commencing of assessment.

6.2.2 The Applicant shall identify all existing, committed and planned NSRs in the assessment area and select assessment points to represent identified NSRs for carrying out marine traffic noise impact assessment described below.

6.2.3 The assessment points shall be confirmed with the Director prior to the commencement of the quantitative marine traffic noise impact assessment and may be varied subject to the best and latest information available during the course of the EIA study.

6.2.4 A map showing the location and description such as name of building, use, and floor of each and every selected assessment point shall be given. Photographs of existing NSRs shall be appended to the EIA report.

6.2.5 For planned noise sensitive land uses without committed site layouts, the Applicant should use the relevant landuse and planning parameters and conditions to work out representative site layouts for marine traffic noise assessment purpose. However, such parameters and conditions together with any constraints identified shall be confirmed with the relevant responsible parties including Planning Department and Lands Department.

Inventory of Noise Sources

6.2.6 The Applicant shall identify and quantify any marine traffic noise sources including but not limited to noise from operation activities on the moored vessels; manoeuvring of vessels using existing pier including fast ferry services, etc.

6.3 Prediction and Evaluation of Marine Traffic Noise Impact

Scenarios

6.3.1 The Applicant shall quantitatively assess the marine traffic noise impact, with respect to

proposed criteria which the applicant shall submit for agreement with the Director (with reference to section 4.4.2(c) of the TM), of unmitigated scenario and mitigated scenario at assessment years of various operation modes including, but not limited to, the worst operation mode which represents the maximum noise emission in connection with the maximum number of vessels operating within the assessment area.

Prediction of Noise Impact

- 6.3.2 The Applicant shall present the predicted noise levels at the selected assessment points at various representative floor levels (in m P.D.) on tables and plans of suitable scale.
- 6.3.3 The assessment shall cover the cumulative marine traffic noise impact associated with the operation of the proposed project and HKIA on existing, committed and planned NSRs within the assessment area.
- 6.3.4 The potential marine traffic noise impact under different scenarios and operation modes shall be quantified by estimating the total number of dwellings, classrooms and other noise sensitive receivers that will be exposed to noise impact exceeding the adopted criteria.

6.4 Mitigation of Marine Traffic Noise Impact

Direct Mitigation Measures

- 6.4.1 Where the predicted marine traffic noise impact exceeds the proposed criteria, the Applicant shall consider and evaluate direct mitigation measures. The feasibility, practicability, programming and effectiveness of the recommended mitigation measures shall be assessed. Any direct mitigation measures recommended should be well documented in the report. Specific reasons for not adopting certain direct mitigation measures to reduce the noise to a level meeting the proposed criteria should be clearly substantiated and documented in the EIA report.

6.5 Evaluation of Residual Marine Traffic Noise Impact

- 6.5.1 Upon exhaust of direct mitigation measures, if the mitigated noise impact still exceeds the adopted criteria, the Applicant shall identify, predict, evaluate the residual marine traffic noise impact in accordance with Section 4.4.3 of the TM and estimate the total number of existing dwellings, classrooms and other noise sensitive elements that will be exposed to residual noise impact exceeding the adopted criteria.

7. Environmental Monitoring and Audit

Aircraft Noise Monitoring

- 7.1 The Applicant shall, with reference to Section 8 and Annex 21 of the TM, design and recommend an aircraft noise monitoring and audit plan for verification of predictions on the effectiveness of measures to mitigate noise impact of the project.
- 7.2 The plan shall formulate audit requirements, including any necessary compliance and post-project audit program, in order to review the aircraft noise monitoring data and identify any remedial works required to redress unacceptable or unanticipated aircraft noise impact.
- 7.3 The plan shall, with reference to practices accepted by the recognized national/international organization, provide tools, procedures and supplementary information, including noise descriptor and flight tracks, which are useful and relevant for communicating the aircraft

noise of the proposed project to the public.

II Requirements for Health Impact Assessment of Aircraft Noise

1. Taking into account the findings of the aircraft noise impact assessment of the EIA study, the Applicant shall conduct a health impact assessment on aircraft noise on human arising from the operation of the Project, which shall include the following key steps:
 - (i) identification of the health impact from aircraft noise during the operation of the Project;
 - (ii) an assessment of the likelihood and consequences of exposure to the aircraft noise;
 - (iii) an identification of means by which the health impact could be further reduced; and
 - (iv) recommendations of reasonably practicable measures, if any, to reduce the health impact during the operation of the Project.

Appendix D1**Requirements for Water Quality Impact Assessment**

1. The Applicant shall identify and analyse physical, chemical and biological disruptions of the water system(s) arising from the construction and operation of the Project.
2. The Applicant shall predict, quantify and assess any water quality impacts arising from the construction and operation of the Project by appropriate mathematical modelling and/or other techniques proposed by the Applicant and approved by the Director. The mathematical modelling requirements are set out in Appendix D1-1. Possible impacts due to the dredging, fill extraction, backfilling, transportation and disposal of dredged materials, non-dredging ground treatment methods and other marine works activities, effluent discharge, thermal/cooling water and biocide discharge, overflow of sewage pumping stations and site runoff shall include changes in hydrology, flow regime, sediment erosion and deposition patterns, morphological change of seabed profile, shoreline change, water and sediment quality, marine and freshwater organisms/community. The prediction shall include possible different construction stages or sequences of the Project. Affected sensitive receivers shall be identified by the assessment tool with indications of degree of severity.
3. The assessment shall include, but not limited to the following:
 - (i) the water quality impacts of the site run-off generated during the construction stage such as the effluents generated from dewatering associated with piling activities, grouting and concrete washing and those specified in the ProPECC Practice Note 1/94;
 - (ii) the water quality impacts of the road runoff containing oil/grease and suspended solids during the operational stage; and
 - (iii) the water quality impacts on beaches, seawater intake points, river courses, drainages and other water sensitive receivers around the work sites.
4. The Applicant shall address water quality impacts due to the construction phase and operational phase of the Project. Essentially, the assessment shall address the following :
 - (i) collect and review background information on affected existing and planned water systems, their respective catchments and sensitive receivers which might be affected by the Project;
 - (ii) characterize water quality of the water systems 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 analyse relevant existing and planned future activities, beneficial uses and water sensitive receivers related to the affected water system(s). The Applicant should refer to, *inter alia*, those developments and uses earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans and Layout Plans, and any other relevant published landuse plans;

- (iv) identify pertinent water quality objectives and establish other appropriate water quality criteria or standards for the water system(s) and the sensitive receivers identified in (i), (ii) & (iii) above;
- (v) review the specific construction methods and configurations, and operation of the Project to identify and predict the likely water quality impacts arising from the Project;
- (vi) identify any alteration of any water courses, natural streams, ponds, change of water holding/flow regimes, change of catchment types or areas and any other hydrological changes in the study area;
- (vii) identify and quantify existing and likely future water pollution sources, including point discharges and non-point sources to surface water runoff, sewage from workforce and polluted discharge generated from the Project;
- (viii) provide an emission inventory on the quantities and characteristics of those existing and future pollution sources in the study area. Field investigation and laboratory test, shall be conducted as appropriate to fill relevant information gaps;
- (ix) assess 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 3.4.7. The water quality impacts should be assessed if any upgrading or expansion of the existing system is found necessary;
- (x) identify and quantify the water quality impacts based on the findings and recommendations from the Sewerage and Sewage Treatment Implications Assessment under section 3.4.7. The water quality concerns shall include, but not limited to, possible sewage overflow or emergency discharge due to capacity constraints of the sewerage system, and emergencies arising from the Project;
- (xi) predict and quantify the impacts on the water system(s) and their sensitive receivers due to the alterations, changes, and pollution sources identified above. Possible impacts include change in hydrology, flow regime, and release of contaminants during dredging and other marine works, etc. Water quality impacts due to periodical maintenance dredging of navigation channels in the vicinity of the Project should also be assessed. The prediction shall take into account and include possible different construction and operation stages of the Project;
- (xii) assess the cumulative impacts due to other related concurrent and planned projects, activities or pollution sources within the study area that may have a bearing on the environmental acceptability of the Project;
- (xiii) analyze the provision and adequacy of existing and planned future facilities to reduce pollution arising from the point and non-point sources identified in (vii) above;
- (xiv) develop effective infrastructure upgrading or provision, contingency plan, water pollution prevention and mitigation measures to be implemented during construction and operation stages, including emergency sewage discharge, so as to reduce the water quality impacts to within standards. Requirements to be incorporated in the project contract document shall also be proposed;

- (xv) investigate and develop best management practices to reduce storm water and non-point source pollution as appropriate; and
- (xvi) evaluate and quantify residual impacts on water system(s) and the sensitive receivers with regard to the appropriate water quality objectives, criteria, standards or guidelines; if the mitigated water quality impact still exceeds the relevant criteria in Annex 6 of TM, the Applicant shall identify, predict and evaluate the residual water quality impact in accordance with Section 4.4.3 of the TM and estimate the significance of the residual impact to the water system(s) and the water sensitive receivers.

5. The Applicant shall address and assess water quality impacts arising from the following concerns :

Waste Water and Non-point Sources Pollution

- (i) Proposal for upgrading or providing any effective infrastructure, water pollution prevention and mitigation measures to be implemented during the construction and operation stages so as to handle any wastewater generated and to reduce the water and sediment quality impacts to within standards. Requirements to be incorporated in the Project contract document shall also be proposed;
- (ii) Investigation of and proposal for, as appropriate, best management practices to reduce storm water and non-point source pollution; and
- (iii) Evaluation and quantification of residual impacts on the water systems(s) and the sensitive receivers with regard to appropriate water and sediment quality objectives, criteria, standards or guidelines. If the mitigated water quality impact still exceeds the relevant criteria in Annex 6 of TM, the Applicant shall identify, predict and evaluate the residual water quality impact in accordance with Section 4.4.3 of the TM and estimate the significance of the residual impact to the water system(s) and the water sensitive receivers.

Fuel Spillage

- (i) Assessment of the risk to environmental sensitive receivers due to significant accidental fuel spillage. The assessment shall include the followings :
 - a) Identification of fuel spillage scenarios associated with the operation of the Project, in particular the accidental spillage associated with storage, transfer and trans-shipment of fuel during the operation of the Project and the impact on environmental sensitive receivers by taking reference to results of the mathematical models as set out in Appendix D1-1;
 - b) Prediction and quantification of the impacts on the sensitive receivers due to fuel spillage scenarios identified in (a). The prediction shall take into account and include different likely operation stages; and
 - c) Derivation of emergency contingency plan for the operation phase of the Project with an aim to avoid and contain the spread and to remove accidental spillage in short notice and to prevent and/or to minimise the quantities of contaminants from reaching the environmental sensitive

receivers in a shortest practical time.

Appendix D1-1**Hydrodynamic and Water Quality Modelling Requirements****Modelling Software General**

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

Model Details – Calibration and Validation

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

Criteria

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

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

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

use other models subject to agreement with EPD.

Model Details – Simulation

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

Modelling Assessment

1. The assessment shall include the construction and operational phase of the project. Where appropriate, the assessment shall also include maintenance dredging. Scenarios to be assessed shall cover the baseline condition and scenarios with various different options proposed by the Applicant in order to quantify the environmental impacts and improvements that will be brought about by these options. Corresponding pollution load, bathymetry and coastline shall be adopted in the model set up.
2. The assessment shall cover accidental fuel spillage associated with the operation of the Project. Potential locations, quantities and rates of spill shall be identified and quantified. The spill modelling shall cover combinations of different tides, wind and season conditions. The methodology for modelling spill and scenarios to be covered should be agreed with EPD.
3. Hydrodynamic, sediment transport, fuel spillage and thermal modules, where appropriate,

shall be run for (with proper model spin up) at least a real sequence of 15 days spring-neap tidal cycle in both the dry season and the wet season.

4. Water quality module shall run for (with proper model spin up) a complete year incorporating monthly variations in Pearl River discharges, solar radiation, water temperature and wind velocity in the operational stage. Construction stage impacts, cooling water discharge and floating refuse and debris entrapment may be assessed by simulating typical spring-neap cycles in the dry and wet seasons.
5. For assessing temporary discharges via the emergency outfall, the Applicant shall estimate discharge loading, pattern and duration. The worst case scenario shall include discharge near slack water of neap tide. A period of at least 15 days spring-neap cycle in wet season, but long enough for recovery of the receiving water, shall be simulated. Detailed methodology shall be agreed with EPD.
6. The results shall be assessed for compliance of Water Quality Objectives. Any changes in hydrodynamic regime shall be assessed. Daily erosion / sedimentation rate shall be computed and its ecological impact shall be assessed.
7. The impact on all sensitive receivers shall be assessed.
8. Cumulative impacts due to other projects, activities or pollution sources within a boundary to the agreement of EPD shall also be predicted and quantified.

Appendix D2**Requirements for Assessment of Sewerage and Sewage Treatment Implication**

1. 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 development, the Applicant shall also investigate and determine the need and feasibility of providing interim sewage treatment facilities.
2. The Applicant shall study and assess the need and impacts of discharging sewage to the existing/planning public sewerage systems in North Lantau. The assessment shall include the following:
 - (i) review to establish whether there is adequate capacity in the existing and committed sewerage systems and sewage treatment works in North Lantau for the Project, taking into account the sewage arising from the existing sources, and committed and planned developments within the sewage catchment. The Applicant shall quantitatively address the impacts of the Maximum Development Flows on the sewerage system under different development phases. The appropriate treatment level of interim discharge, if required, shall be assessed. The water quality impacts arising from the interim and ultimate effluent discharge, if any, shall be assessed;
 - (ii) employ the latest version of the computer model “InfoWorks” or equivalent computer models to assess impacts of future development under different phases on the existing and planned sewerage network in North Lantau sewage catchment;
 - (iii) propose and undertake all required measures to mitigate any forecast shortfalls in the sewerage system as a result of the Project under different development phases and demonstrate the proposed measures would be adequate for the Maximum Development Flows under different development phases. Any proposed sewerage system and/or on-site sewage treatment facility should be designed to meet the current government standards and requirements and agreed by DSD and EPD;
 - (iv) identify and quantify the water quality and ecological impacts due to the emergency discharge from on-site sewage treatment plant/pumping stations, if any, 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 systems in North Lantau and investigate and assess the technical feasibility of connection (eg. technical feasibility and details for connection to public sewer and sewage pumping station); and
 - (vi) set out the design, operation and maintenance requirements and undertake or obtain agreement to undertake the construction and maintenance of any proposed sewerage and sewage treatment facilities identified by the Project, such as pumping station(s) and sewage treatment plant, 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).

Appendix E1**Requirements for Assessment of Waste Management Implication**

The assessment of waste management implications shall cover the following:

1. Analysis of Activities and Waste Generation

- (i) The Applicant shall identify the quantity, quality and timing of the waste arising as a result of the construction and operation activities of the Project based on the sequence and duration of these activities, e.g. dredged/excavated sediment/mud, construction and demolition materials (C&DM), floating refuse and other wastes which will be generated during construction and operational stages.
- (ii) The Applicant shall adopt appropriate design, general layout, construction methods and programme to minimize the generation of public fill/inert C&DM and maximize the use of public fill/inert C&DM for other construction works.

2. Proposal for Waste Management

- (i) 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 which can be taken in planning and design stages e.g. by modifying the design approach and in the construction stage for maximizing waste reduction shall be separately considered.
- (ii) The Applicant shall consider alternative project designs/measures to avoid/minimize floating refuse accumulation/entrapment and measures/proposals for the potential floating refuse problem, e.g. streamlining the shoreline design; measures to improve the tidal flushing capacity; alternative seawall design to facilitate floating refuse collection; and regular collection of the floating refuse along the shoreline. Regarding the potential trapping of floating refuse along the shoreline of the Project, the Applicant shall estimate as far as practicable the amount of floating refuse to be found/trapped along the shoreline of the Project in construction stage and after the completion of the Project. The Applicant shall develop an effective plan/design to avoid/minimize the trapping of floating refuse. If floating refuse is identified and needs to be dealt with, the Applicant shall propose appropriate measures to deal with this floating refuse in a proper and acceptable manner e.g. to collect, recycle, reuse, store, transport and dispose of.
- (iii) 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 of the result of the assessment in (v) below.
- (iv) The EIA report shall also state clearly the transportation routings and the frequency of the trucks/vessels involved, any barging point or conveyor system to be used, the stockpiling areas and the disposal outlets for the waste identified.
- (v) The impact caused by handling (including stockpiling, labelling, packaging and

storage), collection, transportation and re-use/disposal of wastes shall be addressed in detail and appropriate mitigation measures shall be proposed. This assessment shall cover the following areas :

- potential hazard;
- air and odour emissions;
- noise;
- wastewater discharge;
- ecology; and
- public transport.

3. Dredging/Excavation, Filling and Dumping

- (i) Identification and quantification as far as practicable of all dredging/excavation, fill extraction, filling, reclamation, sediment/mud transportation and disposal activities and requirements shall be conducted. Potential fill source and dumping ground to be involved shall also be identified. Field investigation, sampling and chemical and biological laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. The ranges of parameters to be analyzed; the number, type and methods of sampling; sample preservation; chemical and biological laboratory test methods to be used shall be agreed with the Director (with reference to Section 4.4.2(c) of the TM) prior to the commencement of the tests and documented 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.
- (ii) Identification and evaluation of the best practicable dredging/excavation methods, treatment methods, reuse/recycling options and construction programme 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.

Appendix E2**Requirements for Land Contamination Assessment**

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 item (i) to (vi) below and propose measures to avoid disposal:

- (i) 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.
- (ii) 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.
- (iii) The Applicant shall provide a clear and detailed account of the present land use (including description of the activities, chemicals and hazardous substances handled, with clear indication of their storage and location, by reference to a site layout plan) 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).
- (iv) 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). Alternatively, the Applicant may refer to other previously agreed and still relevant and valid CAP(s) for the concerned site(s).
- (v) 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 Remediation 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.
- (vi) 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) a review of the available information;
 - (b) an initial contamination evaluation of this/these site(s) and possible remediation methods;
 - (c) a confirmation of whether the contamination problem at this/these site(s) would be surmountable;

- (d) a sampling and analysis proposal which shall aim at determining the nature and the extent of the contamination of this/these site(s); and
- (e) a schedule of submission of revised CAP (if necessary), CAR, RAP and RR upon this/these site(s) is/are accessible.

Appendix F**Requirements for Ecological Impact Assessment (Terrestrial and Marine)**

1. In the ecological impact assessment, the Applicant shall examine the flora, fauna and other components of the ecological habitats within the study area. The aim shall be to protect, maintain or rehabilitate the natural environment. In particular, the Project shall avoid as far as possible impacts on recognized sites of conservation importance (including but not limited to Tai Ho Stream SSSI, San Tau Beach SSSI, Lung Kwu Chau, Tree Island and Sha Chau SSSI, Sha Chau and Lung Kwu Chau Marine Park, and the potential Marine Park at the Brothers Islands) wildlife groups or habitats/species with conservation interests [including but not limited to intertidal, subtidal and benthic marine habitats, marine mammal habitats, natural streams (in particular the estuaries), and avifauna (in particular migratory waterbirds, landbirds that may occur around the proposed runway and the egretty at Sha Chau)]. The assessment shall identify and quantify as far as possible the potential ecological impacts associated with the Project, both directly by physical disturbance and indirectly by changes of water quality and hydrodynamic regime to the natural environment and the associated wildlife groups and habitats/species including its construction as well as subsequent operation, management and maintenance phase.
2. The assessment shall include the following major tasks:
 - (i) review the findings of relevant studies/surveys and collate the available information regarding the ecological characters of the study area and bird strike information in relation to airport operation;
 - (ii) evaluate the information collected, identify any information gap relating to the assessment of potential ecological impacts to the natural environment, and determine the ecological field surveys and investigations that are needed for a comprehensive assessment as required under the following sections:
 - (a) carry out necessary ecological field surveys and investigations to verify the information collected, fill the information gaps as identified under sub-section (ii) above, and to fulfil the objectives of the EIA study. The field surveys shall cover but not be limited to flora, fauna and any other habitats/species of conservation importance, and shall include subtidal and intertidal survey, benthic community survey, and underwater dive survey for coral communities. The avifauna survey in particular shall cover at least 12 months including both the wet and dry seasons; and
 - (b) the ecological field surveys and investigations shall include the Hong Kong International Airport Approach Area (HKIAAA), in particular Area 3 which will be directly affected by the reclamation, to assess the status of the intertidal, subtidal soft- and hard-substrate benthic communities. If necessary, reference sites in western Hong Kong waters with similar ecological attributes should be selected and included in the survey design in order to accurately evaluate the ecological values of the various habitat types within the HKIAAA.
 - (iii) establish the general ecological profile of the study area based on information collected in the tasks mentioned in sub-section (i) to (ii) above, and describe the characteristics of each habitat found; the data set should be comprehensive and representative covering the variations of the wet and dry seasons, and is up to date and valid for the purpose of this assessment. Major information to be provided shall include :
 - (a) description of the physical environment, including all recognized sites of

- conservation importance and assessment of whether these sites will be affected by the Project or not;
- (b) habitat maps of suitable scale (1:1000 to 1:5000) showing the types and locations of habitats and species of conservation interest in the study area;
 - (c) ecological characteristics of each habitat type such as size, vegetation and/or substrate type, species present, dominant species found, species richness and abundance of major taxa groups, seasonal patterns, inter-dependence of the habitats and species, and presence of any features of ecological importance;
 - (d) representative colour photos of each habitat type and any important ecological features identified; and
 - (e) species found that are rare, endangered and/or listed under local legislation, international conventions for conservation of wildlife/habitats or red data books.
- (iv) investigate and describe the existing wildlife uses of various habitats with special attention to those wildlife groups and habitats with conservation interest, including but not limited to the following:
- (a) coastal/marine waters;
 - (b) subtidal shores/coral communities;
 - (c) benthic communities;
 - (d) sandy shores/rocky shores;
 - (e) mangroves/inter-tidal mudflats;
 - (f) seagrass beds at San Tau Beach SSSI;
 - (g) horseshoe crab breeding and nursery sites;
 - (h) marine mammals especially Chinese White Dolphins;
 - (i) aquatic fauna (e.g. crustaceans and marine fish);
 - (j) stream/estuarine fauna, in particular fish species of conservation interest at Tai Ho Stream SSSI, Tung Chung Bay and other nearby estuaries (e.g. *Plecoglossus altivelis*, *Acrossocheilus beijiangensis*, *Syngnathoides biaculeatus* and *S. schlegeli*, etc.);
 - (k) avifauna, including (i) migratory waterbirds which overwinter, stopover or breed in Hong Kong, (ii) landbirds which occur around the proposed runway and (iii) the egretty at Sha Chau which represents one of the largest egrettries in Hong Kong;
 - (l) herpetofauna;
 - (m) macroinvertebrates (including butterflies and odonates); and
 - (n) any other habitats / species identified as having special conservation interest by this EIA study.
- (v) using suitable methodologies (including but not limited to those adopted in other relevant EIA studies in Hong Kong), and considering also any works activities from other projects reasonably likely to occur at the time, identify and quantify as far as possible any direct (e.g. loss of habitats due to various elements such as reclamation and other associated works of the Project), indirect (e.g. water qualities, hydrodynamics properties, hydrology, noise and other disturbance generated by the construction and operational activities, etc), on-site, off-site, primary, secondary and cumulative ecological impacts on the wildlife groups and habitats identified such as destruction of habitats, reduction of species abundance/diversity, loss of feeding and breeding grounds, reduction of ecological carrying capacity and habitat fragmentation, in particular the following:
- (a) habitat loss and disturbance to the intertidal, subtidal and benthic communities especially within the HKIAAA due to reclamation;

- (b) impacts to the fish communities and intertidal organisms during construction and operation stage due to potential changes in water quality, hydrology and hydrodynamics properties and the consequential impacts to other habitats/species such as mangrove, seagrass bed, horseshoe crabs and corals;
 - (c) impacts to avifauna during construction and/or operation stage due to interference by increased aircraft operation and the associated impacts;
 - (d) cumulative impacts due to other planned and committed concurrent development projects at or near the Project area.
- (vi) evaluate ecological impact based on the best and latest information available during the course of the EIA study, using quantitative approach as far as practicable and covering construction and operational phases of the Project as well as the subsequent management and maintenance requirement of the Project;
 - (vii) recommend possible and practicable mitigation measures such as alternative design and alignment of the Project and modification/change of construction methods to avoid, minimize and/or compensate for the adverse ecological impacts identified during construction and operation of the Project;
 - (viii) evaluate feasibility and effectiveness of the recommended mitigation measures and definition of the scope, type, location, implementation arrangement, resources requirement, subsequent management and maintenance of such measures;
 - (ix) determine and quantify as far as possible of the residual ecological impacts after implementation of the proposed mitigation measures;
 - (x) evaluate the severity and acceptability of the residual ecological impacts using well-defined criteria in Annex 8 of the TM and determine if off-site mitigation measures are necessary to mitigate the residual impacts and if affirmative, guidelines and requirements laid down in Annex 16 of the TM should be followed; and
 - (xi) review the need for and recommend any ecological monitoring programme required.

3. Impacts on Marine Mammals

The assessment of impacts on marine mammals especially Chinese White Dolphins shall include the following tasks:

- (i) review and incorporate the findings of relevant studies including scientific and EIA studies and collate latest available information on the occurrence, distribution, abundance, fine-scale habitat use, social structure and geographic clustering, individual movement and range use, and residency pattern of Chinese White Dolphins in Hong Kong, in particular the detected declining trends in dolphin abundance in the past decade;
- (ii) evaluate the information collected and identify any information gap relating to the assessment of potential impacts on Chinese White Dolphins;
- (iii) carry out necessary field surveys/investigations to verify the information collected, fill the information gaps identified, and to fulfil the objectives of the EIA study. The surveys/investigations shall include, but not be limited to, the following:

- (a) marine mammal survey (shipboard or land-based survey) to investigate the dolphin usage, especially in the HKIAAA;
 - (b) investigation on the movement patterns of Chinese White Dolphins during different times of the years and different times of each day at or near the Project area, and identification of the travelling corridors of Chinese White Dolphins between their core areas of activities (i.e. Lung Kwu Chau, the Brothers Islands and West Lantau), employing suitable methods such as shore-based theodolite tracking, focal follow, passive acoustic monitoring system, and analysis of individual range use, in North and West Lantau waters, and especially within the HKIAAA;
 - (c) investigation on the existing marine traffic pattern and volume, and project with suitable methodology the future marine traffic in North Lantau or other areas, especially the traffic associated with the SkyPier facility, to facilitate the assessment of impact to Chinese White Dolphins due to changes in marine traffic as specified in Section (v) (e) below; and
 - (d) underwater acoustic study to collect data on anthropogenic noises generated by vessel traffic (e.g. examination of the noise characteristics of vessels departing from and arriving at the SkyPier), and acoustic behaviour of dolphins (e.g. in the presence and absence of vessel noise) for detailed assessment of acoustic disturbance to Chinese White Dolphins specified in Section (v) (f) below.
- (iv) compile and present survey/investigation findings including previous relevant studies and surveys/investigations carried out under this study;
- (v) assess the direct and indirect impacts to marine mammals during the construction and operational phases of the Project, in particular the following:
- (a) potential changes in dolphin distribution and abundance, usage pattern, interaction between the different social clusters of dolphins, and connectivity between their core areas of activities in Hong Kong;
 - (b) impacts to Chinese White Dolphins due to reclamation, in particular the direct and permanent loss of dolphin habitat, habitat fragmentation, and reduction in ecological carrying capacity for dolphins;
 - (c) extent of overlap of the reclamation footprint with the travelling corridors of Chinese White Dolphins and the impact of such narrowing of travelling corridors on their movement between core areas of activities, e.g. between NW and NE Lantau waters;
 - (d) impacts to Chinese White Dolphins (and also Indo-Pacific Finless Porpoises depending on the locations of fill source and disposal sites) associated with dredging, fill extraction, filling, transportation and disposal of dredged sediments within Hong Kong;
 - (e) impacts to Chinese White Dolphins, in particular changes in movement pattern between their core areas of activities and increased risk of vessel collision, associated with projected changes in marine traffic, especially vessel traffic to and from the SkyPier, during both construction and operation phases, including

- possible increase in marine traffic volume or density (especially high-speed ferries), changes in vessel traffic due to new/re-aligned routes, and narrowing of navigation channels;
- (f) disturbance to Chinese White Dolphins associated with underwater noise, including pilling, noise generated from additional work barges and vessels during the construction phase, and long term increase in underwater noise disturbance caused by the predicted changes in marine traffic during the operation phase;
 - (g) impacts to Chinese White Dolphins due to the proposed Deep Cement Mixing (DCM) method for reclamation over the contaminated mud pits;
 - (h) impacts to Chinese White Dolphins due to other associated works of the Project (e.g. re-alignment of the existing aviation fuel sub-sea pipeline part of which is within the Sha Chau and Lung Kwu Chau Marine Park);
 - (i) impacts to the prey resources of Chinese White Dolphins due to the loss of benthic habitat at the proposed reclamation area;
 - (j) impacts of changes in water quality/hydrodynamics properties to Chinese White Dolphins and their prey resources;
 - (k) risks of bioaccumulation of toxic contaminants released from the disturbed or dredged sediment in particular the contaminated mud pits, oil and chemical spillage from vessel/vehicle accidents, and aircraft accidents to Chinese White Dolphins;
 - (l) impacts to the existing Sha Chau and Lung Kwu Chau Marine Park especially the likely increase in marine traffic volume/density and changes in overall hydrology and sedimentation as a result of the narrowing of passage between the southern boundary of the marine park and the HKIAAA boundary which will be extended northward during the operation phase of this Project;
 - (m) impacts to the potential Marine Park at Brothers Islands which is regarded as a core area for Chinese White Dolphins in Hong Kong, and to dolphin movement from Northwest and West Lantau to this potential Marine Park; and
 - (n) impacts of additional high-speed ferry traffic, reclamation and changes in water quality/hydrodynamics properties resulted from the Project on the functionality of the existing Sha Chau and Lung Kwu Chau Marine Park and potential Marine Park at Brothers Islands as the major dolphin protected areas.
- (vi) assess the overall cumulative ecological impacts on the Chinese White Dolphins due to this Project and any planned and on-going development projects (e.g. the SkyPier, Hong Kong-Zhuhai-Macau Bridge - Hong Kong Boundary Crossing Facilities & Hong Kong Link Road, Tuen Mun – Chek Lap Kok Link, Remaining Development in Tung Chung, Sediment Disposal Facility in South of Brothers, Lantau Logistic Park, Integrated Waste Management Facilities);
 - (vii) identify and recommend practicable mitigation measures to avoid, minimize and/or compensate for the adverse ecological impacts identified during construction and operation of the Project to the Chinese White Dolphins. In identification of applicable

measures, the Applicant shall consider the feasibility and appropriateness of, including but not limited to, the following:

- (a) measures aim at increasing the overall capacity for Chinese White Dolphins to survive in Hong Kong waters, including enhancement of the ecological connectivity between their core areas of activities or between the identified social clusters;
 - (b) alternative construction methods to avoid/minimize the size of reclamation as far as possible;
 - (c) adopting construction methods with less disturbance to Chinese White Dolphins;
 - (d) programming of construction activities to minimize impacts to Chinese White Dolphins (e.g. avoid overlapping with other projects in the vicinity such as Hong Kong-Zhuhai-Macau Bridge-Hong Kong Boundary Crossing Facilities & Hong Kong Link Road);
 - (e) reducing the volume of marine traffic, especially those to and from the SkyPier, imposing speed limits, realignment of marine traffic routes (e.g. move the high-speed ferry route south of Lantau Island further south);
 - (f) setting up additional marine park, extend or connect together existing, planned or potential marine parks, but subject to the requirements in Section (viii)(b) below; and
 - (g) enhancing the quality of degraded dolphin habitats to increase the overall amount of available habitat for Chinese White Dolphins (e.g. reducing or diverting high-speed ferry traffic away from the Urmston Road or South Lantau Vessel Fairway where dolphin usage could be affected by heavy marine traffic).
- (viii) evaluate and demonstrate feasibility and effectiveness of the recommended mitigation measures, assess possible secondary impacts arising from the implementation of the recommended mitigation measures, and specify the scope, type, location, implementation arrangement, resources requirement, subsequent management and maintenance of such measures, special attention should be paid to the following:
- (a) if artificial reef deployment is proposed as a mitigation measure for enhancing prey resources for Chinese White Dolphins, supporting information should be provided to demonstrate that existing artificial reefs in western waters are effective in enhancing fisheries resources;
 - (b) if marine park establishment or extension is proposed as a mitigation measure for impacts on Chinese White Dolphins, full justifications should be provided on how such measure could offset the identified impacts (e.g. extensive permanent habitat loss, blockage, narrowing or disruption of travelling corridors, and reduced connectivity between their core areas of activities or between different social clusters); and
 - (c) if night time work is required (e.g. for the DCM), mitigation measures that are effective to implement during day time may become impractical or impossible (e.g.

monitored exclusion zone by visual observation), suitable mitigation measures specifically designed for night time work shall then be developed.

- (ix) evaluate the severity and acceptability of the overall residual ecological impact on Chinese White Dolphins, after implementation of the mitigation measures as identified above; and
- (x) review the need for and recommend any dolphin monitoring programme.

Appendix G**Requirements for Fisheries Impact Assessment**

1. Existing information regarding the study area shall be reviewed. Based on the review results, the assessment shall identify data gap and determine if there is any need for field surveys to collect adequate baseline information. If field surveys are considered necessary, the assessment shall recommend appropriate methodology, duration and timing for such surveys.
2. The fisheries impact assessment shall cover any potential short-term and long-term impacts on capture and culture fisheries during the construction and operation phases of the Project.
3. The fisheries impact assessment shall provide the following information:-
 - (i) description of the physical environmental background;
 - (ii) description and quantification of the existing fisheries activities;
 - (iii) description and quantification of the existing fisheries resources;
 - (iv) identification of parameters (e.g. water quality parameters) and areas of fisheries importance;
 - (v) prediction and evaluation of any direct/indirect, onsite/offsite impacts on fisheries (such as potential loss or disturbance of fishing grounds, fisheries habitats, spawning or nursery grounds; aquaculture sites, or artificial reefs) caused by the project (including the impacts of any measures during the construction and operation phases which may restrict fisheries activities e.g. Marine Exclusion Zone designation, artificial reef deployment, marine park designation, etc.);
 - (vi) evaluation of cumulative impacts on fisheries;
 - (vii) proposals of feasible, practical and effective alternatives and / or mitigation measures with details on justification, description of and programme feasibility as well as staff and financial implications including those related to subsequent management and maintenance requirements of the measures, special attention shall be paid to the potential secondary impacts of the proposed measures on fisheries; and
 - (viii) review for the need of monitoring during the construction and operation phases of the Project and, if necessary, proposal for a monitoring and audit programme.

Appendix H**Requirements for Landscape and Visual Impact Assessments**

1. The Applicant shall review relevant outline development plan(s), outline zoning plan(s), layout plan(s) or planning briefs and studies which may identify areas of high landscape value, e.g. green belt and woodland areas with sensitive landscape designations and visually sensitive areas/receivers. Any guidelines on landscape strategy, landscape framework, urban design concept, building height profiles, designated view corridors, open space network and landscape link that may affect the appreciation of the Project shall also be reviewed. The aim is to gain an insight to the future outlook of the area affected so as to assess whether the Project can fit into the surrounding setting. Any conflict with statutory town plan(s) shall be highlighted and appropriate follow-up action shall be recommended.
2. The Applicant shall describe, appraise, analyze and evaluate the existing and planned landscape resources and character of the study area. e.g. vegetation, woodland, streams and topography, etc. A system shall be derived for judging landscape impact significance as required under the TM and EIAO Guidance Note No. 8/2010. Annotated oblique aerial photographs and plans of suitable scale showing the baseline landscape resources and landscape character areas and mapping of impact assessment shall be extensively used to present the findings of impact assessment. Descriptive text shall provide a concise and reasoned judgment from a landscape and visual point of view. The assessment shall be particularly focused on the sensitivity and magnitude of change of the landscape framework and its ability to accommodate change. The Applicant shall identify the degree of compatibility of the Project with the existing and planned landscape settings. The landscape impact assessment shall quantify potential landscape impact during the construction phase and operation phase as far as possible, so as to illustrate the significance of such impact arising from the Project. Clear mapping of the landscape impact is required. A broad brush tree survey to identify dominant tree species, maturity, rarity and any plant species of conservation interest, etc. should be conducted within the study area to provide baseline information on the landscape resources and landscape character areas and the impacts on existing trees shall be summarized. Cumulative landscape and visual impacts of the Project with other existing, committed and planned developments in the study area shall be assessed.
3. The Applicant shall assess the visual impacts of the proposed Project. Clear illustration including mapping of visual impact is required. The assessment shall adopt a systematic methodology and include the following:
 - (i) identification and plotting of visual envelope of the Project;
 - (ii) identification of the key groups of existing and planned sensitive receivers within the visual envelope and their views at both ground level and elevated vantage points. Among other receivers, sensitive receivers shall include, but not limited to, nearby residents and villagers. Both long distance view and short distance view shall be covered in the assessment;
 - (iii) assessment for evaluating visual impacts, by taking into account the factors affecting the sensitivity of receivers (including value and quality of existing views, availability and amenity alternative views, type and estimated number of receiver population, duration or frequency of view and degree of visibility) and the magnitude of change of view (including compatibility of the project with the surrounding landscape and

planned setting, duration of impacts under construction and operation phases, scale of development, reversibility of change, viewing distance and potential blockage of view). The visual impacts of the Project with and without mitigation measures shall also be included so as to demonstrate the effectiveness of the proposed mitigation measures; and

- (iv) clear evaluations and explanation with supportive arguments of all relevant factors considered in arriving the significance thresholds of visual impacts.
4. The Applicant shall evaluate the merit and demerit of preservation in totality, in parts or total destruction of existing landscape and the establishment of a new landscape character area. Alternative location, site layout, development options, design and construction method that would avoid or reduce the identified landscape and visuals impacts shall first be considered and be evaluated for comparison before adopting other mitigation or compensatory measures to alleviate the impacts. The mitigation measures proposed shall not only be concerned with damage reduction but shall also include consideration of potential enhancement of the existing landscape and visual quality. The Applicant shall recommend mitigation measures to minimize the adverse effects identified above, including provision of a master landscape design.
 5. The mitigation measures shall also include the preservation of vegetation, transplanting of trees of good amenity value, provision of screen planting, re-vegetation of disturbed lands, compensatory planting, re-provisioning of amenity areas and open spaces, design of structure, provision of finishes to structure, colour scheme and texture of material used and any measures to mitigate the disturbance of the existing land use. Parties shall be identified for the on-going management and maintenance of the proposed mitigation works to ensure their effectiveness throughout the operation phase of the Project. A practical programme and funding proposal for the implementation of the recommended measures shall be provided.
 6. Annotated illustration such as coloured perspective drawings, plans and section/elevation diagrams, oblique aerial photographs, photographs taken at vantage points and computer-generated photomontage, particularly from but not limited to the most severely affected vantage points shall be adopted to illustrate the significance of the landscape and visual impacts of the Project in four stages i.e. existing conditions, unmitigated impacts at Day 1, mitigated impacts at Day 1 and residual impact at Year 10. Options of design schemes should be illustrated with photomontages to show the visual impact on the surrounding areas. True colour samples may be requested if found necessary and appropriate. Technical details in preparing the illustration, which may need to be submitted for verification of accuracy of the illustration shall be recorded. Computer graphics shall be compatible with Microstation DGN file format.

Appendix I**Requirements for Marine Archaeological Investigation**

1. The Applicant shall demonstrate that the disturbances to those sites of cultural heritage are avoided to the maximum practicable extent by modification of the design of the Project. For those identified sites of cultural heritage that may still be directly and indirectly affected by the Project, the Applicant shall recommend practicable mitigation measures and monitoring to avoid or minimise the adverse impacts on the sites of cultural heritage. A checklist including the affected sites of cultural heritage, identified impacts, recommended mitigation measures as well as the implementation agent and period shall be given in the EIA report.
2. The Applicant shall draw necessary reference to relevant sections of the “Guidelines for Marine Archaeological Investigation” at Appendix I-1 for detailed requirement.
3. Marine Archaeological Investigation (MAI)
 - (i) The assessment area shall include all areas affected by the marine and dredging works of the Project.
 - (ii) The Applicant shall engage a qualified marine archaeologist to conduct a marine archaeological review based on the best available information to identify whether there is any potential existence of sites or objects of cultural heritage within the seabed that will be affected by the marine works of the Project, whether the identified issues can be mitigated and whether there is a need for more detail investigation. The review shall take into account the scope and nature of proposed marine works, the results of previous marine archaeological investigations, the dredging history and other diving records, etc.
 - (iii) If marine archaeological potential is identified and the need for further investigation is confirmed, a MAI shall be carried out to ascertain the archaeological value of the affected seabed area. The guidelines for MAI are set out in Appendix I-1.
 - (iv) The Applicant shall propose a programme of investigation, including the scope of works, methodology and time schedule, etc. for agreement with the Director. The MAI shall be carried out by a qualified marine archaeologist who shall obtain a licence from the Antiquities Authority under the provision of the Antiquities and Monuments Ordinance, Cap. 53. If significant archaeological remains are discovered, mitigation measures shall be designed and implemented in consultation with the Antiquities and Monuments Office.

Appendix I-1**Guidelines for Marine Archaeological Investigation (MAI)**

I. The standard practice for MAI should consist of four separate tasks, i.e. (1) Baseline Review, (2) Geophysical Survey, (3) Establishing Archaeological Potential and (4) Remote Operated Vehicle (ROV)/Visual Diver Survey/Watching Brief. Marine archaeologists should make reference to the standard and guidance of the Institute for Archaeologists and English Heritage to carry out MAI.

(1) Baseline Review

- 1.1 A baseline review should be conducted to collate the existing information in order to identify the potential for archaeological resources and, if identified, their likely character, extent, quality and value.
- 1.2 The baseline review will focus on known sources of archive data. It will include:
 - a. Geotechnical Engineering Office (GEO) – the Department holds extensive seabed survey data collected from previous geological research.
 - b. Marine Department, Hydrographic Office - the Department holds a substantial archive of hydrographic data and charts.
 - c. The Royal Naval Hydrographic Department in the UK - the Department maintains an archive of all survey data collected by naval hydrographers.
 - d. Relevant government departments should be consulted in order to obtain the information of dredging history (if any) on the proposed project area. Area for sand dredging, mud disposal and allocated marine borrow area within Hong Kong should also be considered during the review.
- 1.3 The above data sources will provide historical records and more detailed geological analysis of submarine features which may have been subsequently masked by more recent sediment deposits and accumulated debris.

(2) Geophysical Survey

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

- c. Detailed examination of the boomer and side scan sonar records to map anomalies in and on the seabed which may be archaeological material.
- d. Detailed examination of the multi beam sonar data to assess the archaeological potential of the sonar contacts.

(3) Establishing Archaeological Potential

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

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

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

II Report

- 1. Five copies of the final report should be submitted to the AMO for record.

Appendix J**Implementation Schedule**

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location/Duration of measures/ Timing of completion of measures	Implementation Agent	Implementation Stage **				Relevant Legislation & Guidelines
					Des	C	O	Dec	

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.

** Des=Design; C=Construction; O=Operation; Dec=Decommissioning

Appendix K**Requirements for EIA Report Documents**

1. The Applicant shall supply the Director with the following number of copies of the EIA report and the executive summary:
 - (i) 50 copies of the EIA report and 80 copies of the executive summary (each bilingual in both English and Chinese) as required under section 6(2) of the EIAO to be supplied at the time of application for approval of the EIA report.
 - (ii) When necessary, addendum to the EIA report and the executive summary submitted in item (i) above as required under section 7(1) of the EIAO, to be supplied upon advice by the Director for public inspection.
 - (iii) 20 copies of the EIA report and 50 copies of the executive summary (each bilingual in both English and Chinese) with or without Addendum as required under section 7(5) of the EIAO, to be supplied upon advice by the Director for consultation with the Advisory Council on the Environment.
2. In addition, to facilitate public inspection of EIA report via EIAO Internet Website, the Applicant shall provide electronic copies of both the EIA report and executive summary prepared in HyperText Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 1.3 or later), unless otherwise agreed by the Director. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EIA report and executive summary shall be included in the beginning of the document. Hyperlinks to figures, drawings and tables in the EIA report and executive summary shall be provided in the main text from where respective references are made. Graphics in the report shall be in interlaced GIF format unless otherwise agreed by the Director.
3. 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.
4. When the EIA report and the executive summary are made available for public inspection under section 7(1) of the EIAO, the content of the electronic copies of the EIA report and the executive summary must be the same as the hard copies and the Director shall be provided with the most updated electronic copies.
5. 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.