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

Environmental Impact Assessment Study Brief No. ESB-157/2006

Project Title:
Tuen Mun Area 54 Sewage Pumping Station
(hereinafter known as the "Project")

Name of Applicant :
Civil Engineering and Development Department
(hereinafter known as the "Applicant")

1. BACKGROUND

1.1 An application (No. ESB-157/2006) for an Environmental Impact Assessment (EIA) study brief under section 5(1) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by the Applicant on 9 October 2006 with a project profile (No. PP-301/2006) (the Project Profile).

1.2 The Project is to construct and operate a new sewage pumping station, close to Tsz Tin Road, with a capacity of over 90,000 m^3 per day to collect sewage mainly from Tuen Mun Area 54 to the existing sewers at Ming Kum Road. The key elements of the Project are shown in drawing no. LW 7513 of the Project Profile and are reproduced in Figure 1 of this EIA study brief.

1.3 The Project is a designated project under Item F.3(b) of Part I, Schedule 2 of the EIAO: "*A sewage pumping station with an installed capacity of more than 2000 m^3 per day and a boundary of which is less than 150m from an existing or planned residential area*". According to the EIA report on "Planning and development study of potential housing site in Area 54, Tuen Mun" approved under the EIAO in 1999, a separate EIA study is required for the new sewage pumping station. Therefore, in accordance with section 5(1)(a) of the EIAO, the Applicant has applied to the Director of Environmental Protection (the Director) for an EIA study brief to proceed with an EIA study for the project.

1.4 Pursuant to section 5(7)(a) of the EIAO, 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 nature and extent of

environmental impacts arising from the construction and operation of the Project and related activities that take place concurrently. This information will contribute to decisions by the Director on :

(i) the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project;

(ii) the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and

(iii) the acceptability of residual impacts after the proposed mitigation measures are implemented.

2. OBJECTIVES OF THE EIA STUDY

2.1 The objectives of the EIA study are as follows :

(i) to describe the Project and associated works together with the requirements for carrying out the Project;

(ii) to identify and describe the elements of the community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the Project, including both the natural and man-made environment;

(iii) to present the considerations of alternatives to avoid and minimise the potential adverse environmental impacts on the sensitive uses; to compare the environmental benefits and dis-benefits of the options; to provide reasons for selecting the preferred option(s) and to describe the part of environmental factors played in the selection;

(iv) to identify and quantify emission sources, to determine the significance of impacts on sensitive receivers and potential affected uses and to propose measures to mitigate these impacts;

(v) to identify and quantify any potential impacts from point and non-point pollution sources on the identified water systems and sensitive receivers and to propose measures to mitigate these impacts;

(vi) to identify any potential landscape and visual impacts and to propose measures to mitigate these impacts;

(vii) to identify any potential impacts on any archaeological resources and to propose measures to mitigate these impacts;

(viii) to propose the provision of mitigation measures to minimise pollution, environmental disturbance and nuisance during construction and operation of the Project;

(ix) to investigate the feasibility, practicability, effectiveness and implications of the proposed mitigation measures;

(x) to identify, predict and evaluate the residual environmental impacts (i.e. after practicable mitigation) and the cumulative effects expected to arise during the construction and operation phases of the Project in relation to the sensitive receivers and potential affected uses;

(xi) to identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operation of the Project which are necessary to mitigate these environmental impacts and cumulative effects and reduce them to acceptable levels;

(xii) to investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures and to identify constraints associated with the mitigation measures recommended in the EIA study, as well as the provision of any necessary modification; and

(xiii) to design and specify the environmental monitoring and audit requirements to ensure the effective implementation of the recommended environmental protection and pollution control measures.

3. DETAILED REQUIREMENTS OF THE EIA STUDY

3.1 The Purpose

The purpose of this study brief is to scope the key issues of the EIA study and to specify the environmental issues that are required to be reviewed and assessed in the EIA report. The Applicant has to demonstrate in the EIA report that the criteria in the relevant sections of the Technical Memorandum on the Environmental Impact Assessment Process of the Environmental Impact Assessment Ordinance (hereinafter referred to as "the TM") are fully complied with.

3.2 The Scope

The scope of this EIA study shall cover the project proposed in the Project Profile and the works mentioned in Section 1.2 above. The EIA study shall address the likely key issues described below, together with any other key issues identified during the course of the EIA

study :

(i) the potential noise impacts during construction and operation of the Project;

(ii) the potential air quality impacts during construction and operation of the Project including odour impacts to the sensitive receivers;

(iii) the potential water quality impacts during construction and operation of the Project, including the scenario when there is sewage overflow from the sewage pumping station;

(iv) the potential waste impacts during construction and operation of the Project;

(v) the potential visual and landscape impacts during construction and operation of the Project to the sensitive receivers;

(vi) the potential impacts on any archaeological site during construction of the Project; and

(vii) the potential cumulative environmental impacts of the Project, through interaction or in combination with other existing, committed and planned developments in the vicinity of the Project, and that those impacts may have a bearing on the environmental acceptability of the Project.

3.3 Consideration of Alternatives

3.3.1 Need for the Project

The Applicant shall study and review the need for the Project and provide information to justify the need. The Applicant shall explain clearly the purpose and objectives of the Project and describe the scenarios with and without the Project.

3.3.2 Consideration of Alternative Locations

In addition to the proposed location in the Project Profile, the Applicant shall consider alternative locations of the sewage pumping station, with an aim to avoiding potential environmental impacts to the affected sensitive receivers. A comparison of the environmental benefits and dis-benefits of alternative locations shall be made with a view to recommending the preferred location to maximize environmental benefits and

avoid/minimize adverse environmental effects to the maximum practicable extent.

3.3.3 Consideration of Alternative Construction Methods and Sequences of Works

Taking into consideration the combined effect with respect to the severity and duration of the construction impacts to the affected sensitive receivers, the EIA study shall explore alternative construction methods and sequences of works for the Project, with a view to avoiding prolonged adverse environmental impacts to the maximum practicable extent. A comparison of the environmental benefits and dis-benefits of applying different construction methods and sequences of works shall be made.

3.3.4 Selection of Preferred Scenario

Taking into consideration of the findings in sub-sections 3.3.2 and 3.3.3 above, the Applicant shall recommend with full justifications the adoption of the preferred scenario that will maximize environmental benefits and avoid or minimize adverse environmental effects arising from the Project, and adequately describe the part that environmental factors played in arriving at the final selection.

3.4 Technical Requirements

The Applicant shall conduct the EIA study to address all environmental aspects of the activities as described in Sections 3.2 and 3.3 above. The EIA study shall include the following technical requirements on specific impacts.

3.4.1 Air Quality Impact

3.4.1.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing air quality impact as stated in Annexes 4 and 12 of the TM respectively.

3.4.1.2 The study area for air quality impact assessment shall be defined by a distance of 500 metres from the boundary of the Project shown in Figure 1 and shall be extended to include major emission sources that may have a bearing on the environmental acceptability of the Project. The assessment shall include but not be limited to the existing, planned and committed sensitive receivers within the study area. Such assessment shall be based on the best available information at the time of the assessment.

3.4.1.3 The Applicant shall assess the air pollutant concentrations with reference to the relevant sections of the guidelines in Appendices 1 to 3 attached to this study brief, or other

methodology as agreed by the Director.

3.4.1.4 The air quality impact assessment shall include the following:

(i) Background and Analysis of Activities

(a) Provide background information relating to air quality issues relevant to the Project, e.g. description of the types of activities of the Project that may affect air quality during both construction and operation stages.

(b) Give an account, where appropriate, of the consideration/measures that had been taken into consideration in the planning of the Project to abate the air pollution impact.

(c) Present background air quality levels in the assessment area for the purpose of evaluating cumulative construction and operation air quality impacts.

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

(a) Identify and describe existing and planned/committed ASRs that would likely be affected by the Project, including those earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans and Layout Plans. The Applicant shall select the assessment points of the identified ASRs that represent the worst impact point of these ASRs. A map showing the location and description such as names 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.

(b) Provide a list of air pollutant emission sources, including any nearby emission sources which are likely to have impact related to the Project based on the analysis of construction and operation activities in Sub-section 3.4.1.4(i) above. Examples of construction stage emission sources include stockpiling, material handling and vehicular movements on unpaved haul roads on site, etc.. Examples of operation stage emission sources include odour emissions from the sewage pumping station.. Confirmation of validity of the assumptions and magnitude of the activities (e.g. volume of construction material handled, odour emission strength, etc.) shall be obtained from the relevant government departments/authorities and documented.

(iii) Construction Phase Air Quality Impact

The Applicant shall follow the requirements stipulated under the Air Pollution Control (Construction Dust) Regulation to ensure that construction dust impacts are controlled within the relevant standards as stipulated in Section 1 of Annex 4 of the TM. A monitoring and audit programme for the construction phase shall be devised, if necessary, to verify the effectiveness of the control measures and to ensure that the construction dust levels be brought under proper control. If the Applicant anticipates a significant construction dust impact that will likely cause exceedance of the recommended limits in the TM at the ASRs despite incorporation of the dust control measures above, a quantitative assessment shall be carried out to evaluate the construction dust impact at the identified ASRs based on the emission strength of the emission sources identified in subsection 3.4.1.4 (ii) (b) above. The Applicant shall follow the methodology set out in subsection 3.4.1.4(v) below when carrying out the quantitative assessment.

(iv) Operation Phase Air Quality Impact

The Applicant shall calculate the expected air pollutant concentrations, including odour, at the identified ASRs based on an assumed reasonably worst-case scenario. The evaluation shall be based on the strength of the emission sources identified in Sub-section 3.4.1.4(ii)(b) above. The Applicant shall follow the methodology set out in Sub-section 3.4.1.4(v) below when carrying out the quantitative assessment.

(v) Quantitative Assessment Methodology

(a) The Applicant shall conduct the quantitative assessment with reference to relevant sections of the modelling guidelines in Appendices 1 to 3 or any other methodology as agreed with the Director. The specific methodology must be documented in such level of details (preferably with tables and diagrams) to allow the readers of the assessment report to grasp how the model is set up to simulate the situation at hand without referring to the model input files. Details of the calculation of the emission rates of air pollutants for input to the modelling shall be presented in the EIA report. The Applicant must ensure consistency between the text description and the model files at every stage of submission. In case of doubt, prior agreement between the Applicant and the Director on the specific modelling details should be sought.

(b) The Applicant shall identify the key/representative air pollutant parameters (types of pollutants and the averaging time concentrations) to be evaluated and provide explanations for choosing these parameters for the assessment of the impact of the Project.

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

(vi) Mitigation Measures for Non-compliance

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

(vii) Submission of Model Files

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

3.4.2 Noise Impact

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

3.4.2.2 The noise impact assessment shall include the following :

(i) Determination of Study Area

The study area for the noise impact assessment shall generally include areas within

300m from the Project boundary. Subject to the agreement of the Director, the study area could be reduced accordingly if the first layer of noise sensitive receivers (NSRs), closer than 300m from the outer Project limit, provides acoustic shielding to those receivers at distances further away from the Project. Subject to the agreement of the Director, the study area shall be expanded to include NSRs at distances over 300m from the Project which would be affected by the construction and operation of the Project.

(ii) Provision of Background Information and Existing Noise Levels

The Applicant shall provide background information relevant to the Project, e.g. relevant previous or current studies. Unless required for determining the planning standards, e.g. those for planning of fixed noise sources (such as ventilation systems of the sewage pumping station), no existing noise levels are particularly required.

(iii) Identification of Noise Sensitive Receivers

(a) The Applicant shall refer to Annex 13 of the TM when identifying the NSRs. The NSRs shall include existing NSRs and planned/committed noise sensitive developments and uses earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by Lands Department. Photographs of existing NSRs shall be appended to the EIA report.

(b) The Applicant shall select assessment points to represent identified NSRs for carrying out quantitative noise assessment described below. The assessment points shall be agreed with the Director prior to the quantitative noise assessment. A map showing the location and description such as name of building, use, and floor of each and every selected assessment point shall be given. For planned noise sensitive land uses without committed site layouts, the Applicant should use the relevant planning parameters to work out representative site layouts for operation noise assessment purpose.

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

The Applicant shall provide an inventory of noise sources including representative construction equipment for construction noise assessment, and fixed plant equipment (e.g. ventilation systems of the sewage pumping station), as appropriate, for operation noise assessment. Confirmation of the

validity of the inventory shall be obtained from the relevant government departments/authorities and documented in the EIA report.

(v) Construction Noise Assessment

(a) The assessment shall cover the cumulative noise impacts due to the construction works of the Project and other concurrent projects identified during the course of the EIA study.

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

(c) To minimize the construction noise impact, alternative construction methods to replace percussive piling shall be proposed as far as practicable.

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

(e) 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.

(vi) Operational Noise Assessment

(a) Fixed Noise Sources

If the Project will cause impacts from any fixed noise sources, such as ventilation systems of the sewage pumping station, the following assessment shall be followed.

(b) Assessment of Fixed Source Noise Levels

The Applicant shall calculate expected noise using standard acoustics principles. Calculations for expected noise shall be based on assumed plant inventories and utilization schedule for worst-case scenario. The Applicant shall calculate noise levels taking into account correction of tonality, impulsiveness and intermittency in accordance with Technical Memorandum for Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites issued under NCO.

(c) Presentation of Noise Levels

The Applicant shall present the existing and future noise levels in L_{eq} (30 min) at the NSRs at various representative floor levels (in m P.D.) on tables and plans of suitable scale. A quantitative assessment at the NSRs for the proposed fixed noise source(s) shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM.

(d) Proposals for Noise Mitigation Measures

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

(vii) Assessment of Side Effects and Constraints

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

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

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

3.4.3 Water Quality Impact

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

3.4.3.2 The "Assessment Area" for the purpose of this water quality impact assessment shall cover an area within 300metres of the project site boundary, and all relevant water sensitive receivers downstream of the emergency sewage discharge location at the Tuen Mun River Channel and Castle Peak Bay, including the typhoon shelter and bathing beaches.

3.4.3.3 The Applicant shall identify and analyze in the assessment all physical, chemical and biological disruptions of marine, estuarine, or fresh water system(s) arising from construction and operation of the project (including the impacts arising from emergency discharge of sewage).

3.4.3.4 The Applicant shall include the following in the water quality impact assessment :

(i) collection and review of background information on the existing water system(s) and the respective catchment(s);

(ii) characterization of water and sediment quality based on existing information or site surveys/tests as appropriate;

(iii) identification and analysis of all existing and future activities and beneficial uses related to the water system(s) and identification of all water sensitive receivers;

(iv) identification of pertinent water quality objectives and establishment of other

appropriate water quality criteria or standards for the water system(s) and all the sensitive receivers affected by the project;

(v) identification of any alteration of any water courses, natural streams/ponds, change of water holding/flow regimes, change of catchment types or areas;

(vi) identification, analysis and quantification of all existing and future water pollution sources, including point discharges and non-point sources to surface water runoff. Field investigation and laboratory tests, as appropriate, shall be conducted to fill in any relevant information gaps;

(vii) establishment and provision of an emission inventory on the quantities and characteristics of all existing and future pollution sources in the assessment area shall be provided;

(viii) prediction of impacts on the water system(s) and the sensitive receivers due to those alterations and changes identified in (v) above and the pollution sources identified in (vi) above. Possible impacts include changes in hydrology, flow regime, water quality and the effects on the sensitive receivers due to such changes. The prediction shall include possible different construction stages or sequences, and different operation stages. Cumulative impacts due to other projects, activities or pollution sources within a boundary around the "Assessment Area" to be agreed by the Director shall also be predicted and quantified;

(ix) assessment and evaluation, by technique subject to agreement of the Director, of water quality impacts on the relevant sensitive receivers within the assessment area as described in section 3.4.3.2 due to emergency sewage discharge of the proposed Tuen Mun Area 54 Pumping Station;

(x) development of effective infrastructure, contingency plan, water pollution prevention and mitigation measures to be implemented during the construction, operation stages, including emergency sewage discharge, so as to reduce the water quality impacts to within standards. Appropriate mitigation measures shall be implemented with a view to avoiding emergency sewage discharge to the maximum practicable extent. Requirements to be incorporated in the project contract document shall also be proposed;

(xi) investigation and development of best management practices to reduce storm water and non-point source pollution as appropriate; and

(xii) evaluation and quantification of residual impacts on the water system(s) and the sensitive receivers with regard to the appropriate water and sediment quality objectives, criteria, standards or guidelines.

3.4.4 Waste Management Implications

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

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

(i) Analysis of Activities and Waste Generation

The Applicant shall identify the quantity, quality and timing of the waste arising as a result of the construction activities of the Project, based on the sequence and duration of these activities. The Applicant shall adopt design, general layout, construction methods and programme to minimize the generation of public fill/inert construction and demolition (C&D) materials and maximize the use of public fill/inert C&D materials for other construction works.

(ii) Proposal for Waste Management

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

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

(c) The impact caused by handling (including stockpiling, labelling, packaging & storage), collection, transportation and re-use/disposal of wastes shall be

addressed in detail and appropriate mitigation measures shall be proposed. This assessment shall cover the following areas :

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

3.4.5 Landscape and Visual Impact

3.4.5.1 The Applicant shall follow the criteria and guidelines as stated in Annexes 10 and 18 of the TM on the preparation of Landscape and Visual Impact Assessment under the EIAO. Landscape and visual impacts during both construction and operation phases within the study area and the related works areas shall be assessed.

3.4.5.2 The assessment area for landscape impact assessment shall include areas within a 500m distance from the site boundary of the works areas while the assessment area for the visual impact assessment shall be defined by the visual envelope of the Project.

3.4.5.3 The Applicant shall review relevant plan(s) and/or studies which may identify areas of high landscape value and recommend country park, coastal protection area, green belt and conservation area designations. Any guidelines on landscape and urban design strategies and frameworks 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) and any published land use plans shall be highlighted and appropriate follow-up action shall be recommended.

3.4.5.4 The Applicant shall describe, appraise, analyze and evaluate the existing and planned landscape resources and character of the assessment area. A system shall be derived for judging landscape and visual impact significance as required under the TM. Annotated oblique aerial photographs and plans of suitable scale showing the baseline landscape character areas and landscape resources and mapping of impact assessment shall be extensively used to present the findings of impact assessment. Descriptive text shall provide a concise and reasoned judgement from a landscape and visual point of view. The sensitivity of the landscape framework and its ability to accommodate change shall be particularly focused on. The Applicant shall identify the degree of compatibility of the Project with the existing and planned landscape setting. The landscape impact assessment

shall quantify the potential landscape impact as far as possible so as to illustrate the significance of such impacts arising from the proposed development. Clear mapping of the landscape impact is required. A broad brush tree survey shall be carried out and the impacts on existing mature trees shall be addressed.

3.4.5.5 The Applicant shall assess the visual impacts of the Project. Clear illustration including mapping of visual impact is required. The assessment shall include the following:

(i) Identification and plotting of visual envelope of the Project;

(ii) Identification of the key groups of sensitive receivers within the visual envelope with regard to views from ground level and elevated vantage points;

(iii) Description of the visual compatibility of the Project with the surrounding and the planned setting, and its obstruction and interference with the key views of the adjacent areas; and

(iv) The severity of visual impacts in terms of distance, nature and number of sensitive receivers shall be identified. The visual impacts of the Project with and without mitigation measures shall be included so as to demonstrate the effectiveness of the proposed mitigation measures.

3.4.5.6 The Applicant shall evaluate the merits of preservation in totality, in parts or total destruction of existing landscape and the establishment of a new landscape character area. In addition, alternative site layout, design and construction methods that will avoid or reduce the identified landscape and visual impacts shall be evaluated for comparison before adopting other mitigation or compensatory measures to alleviate the impacts. The mitigation measures proposed shall not only be concerned with damage reduction but shall also include consideration of potential enhancement of existing landscape and visual quality. The Applicant shall recommend mitigation measures to minimize the adverse effects identified above, including provision of a landscape design.

3.4.5.7 The mitigation measures shall also include the preservation of vegetation, transplanting of mature trees, provision of screen planting, re-vegetation of disturbed lands, compensatory planting, woodland restoration, design of structure, provision of finishes to structure, colour scheme and texture of material used and any measures to mitigate the impact on the existing and planned 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 recommendation measures shall be provided.

3.4.5.8 Annotated illustration materials such as colour perspective drawing, plans and section/elevation diagrams, annotated oblique aerial photographs, photographs taken at vantage points, and computer-generated photomontage shall be adopted to illustrate the landscape and visual impacts of the Project. In particular, the landscape and visual impacts of the Project with and without mitigation measures shall also be properly illustrated in existing and planned setting by computer-generated photomontage so as to demonstrate the effectiveness of the proposed mitigation measures. Computer graphics shall be compatible with Microstation DGN file format. The Applicant shall record the technical details in preparing the illustration, which may need to be submitted for verification of the accuracy of the illustration.

3.4.6 Impact on Cultural Heritage

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

3.4.6.2 As the Project falls within the boundary of the Kei Lun Wai Archaeological Site (Figure 2 of this EIA study brief), the Applicant shall carry out an archaeological survey to identify areas with archaeological interest that could possibly be affected by the Project.

3.4.6.3 The scope of archaeological survey is as follows:

(a) Field Walking

The site shall be investigated by systematic field walking to collect and quantify the cultural materials on the surface.

(b) Augering

Systematic auger survey shall be undertaken to collect data to establish the horizontal spread of cultural materials deposits in the site.

(c) Test trenching

Upon the result of augering, at least three 1 x 1 or 1.5 x 1.5 metres test pits shall be excavated to record the archaeological stratigraphy of the site.

3.4.6.4 If the site is inaccessible for survey during the course of the EIA study, the Applicant shall submit a desktop study to include recommendations on necessary field survey (as described

in Section 3.4.6.3 above) to be carried out in later stage of the Project prior to the commencement of the construction works at the site.

3.4.7 Summary of Environmental Outcomes

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

3.4.8 Environmental Monitoring and Audit (EM&A) Requirements

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

3.4.8.2 Subject to the confirmation of the EIA study findings, the Applicant shall comply with the requirements as stipulated in Annex 21 of the TM. The Applicant shall also propose real-time reporting of monitoring data for the Project in the EIA study.

3.4.8.3 The Applicant shall prepare a Project Implementation Schedule (in the form of a checklist as shown in Appendix 4 to this EIA study brief) containing all the EIA study recommendations and mitigation measures with reference to the implementation programme. The Project Implementation Schedule shall include the explicit agreement reached between the Applicant and relevant parties on the responsibility for implementation of mitigation measures together with the relevant legislation and guidelines. Alternatively, the Project Implementation Schedule shall include an undertaking from the Applicant to assume the responsibility of those mitigation measures until an agreement is reached between the Applicant and relevant parties on the implementation of mitigation measures.

4. DURATION OF VALIDITY

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

5. REPORT REQUIREMENTS

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

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

(i) 50 copies of the EIA report in English and 80 copies of the executive summary (each bilingual in both English and Chinese) as required under section 6(2) of the EIAO to be supplied at the time of application for approval of the EIA report.

(ii) when necessary, addendum to the EIA report and the executive summary submitted in (i) above as required under section 7(1) of the EIAO, to be supplied upon advice by the Director for public inspection.

(iii) 20 copies of the EIA report in English and 50 copies of the executive summary (each bilingual in both English and Chinese) with or without Addendum as required under section 7(5) of the EIAO, to be supplied upon advice by the Director for consultation with the Advisory Council on the Environment.

5.3 In addition, to facilitate public inspection of the EIA report via the EIAO Internet Website, the Applicant shall provide electronic copies of both the EIA report and the Executive Summary Report prepared in HyperText Markup Language (HTML) (version 4.0 or later) and in DynaDoc Format (version 3.0 or later) [for Chinese documents] and in Portable Document Format (PDF version 3.0 or later) [for English documents], unless otherwise agreed by the Director. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EIA report and the Executive Summary Report shall be included in the beginning of the document, and all graphics in the report shall be in interlaced GIF format.

5.4 The electronic copies of the EIA report and the executive summary shall be submitted to the Director at the time of application for approval of the EIA report.

5.5 When the EIA report and the executive summary are made available for public inspection under s.7(1) of the EIAO, the content of the electronic copies of the EIA report and the executive summary must be the same as the hard copies and the Director shall be provided

with the most updated electronic copies.

6. OTHER PROCEDURAL REQUIREMENTS

6.1 During the EIA study, if there is any change in the name of the Applicant for this EIA study brief, the Applicant mentioned in this study brief must notify the Director immediately.

6.2 If there is any key change in the scope of the Project mentioned in Section 1.2 of this EIA study brief and in Project Profile (No. PP-301/2006), the Applicant must seek confirmation from the Director in writing on whether or not the scope of issues covered by this EIA study brief can still cover the key changes, and the additional issues, if any, that the EIA study must also address. If the changes to the Project fundamentally alter the key scope of the EIA study brief, the Applicant shall apply to the Director for another EIA study brief afresh.

--- END OF EIA STUDY BRIEF ---

November 2006
Environmental Assessment Division,
Environmental Protection Department

Appendix 1

Guidelines on Choice of Models and Model Parameters

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

1. Introduction

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

2. Choice of Models

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

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

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

2.2 Note that both FDM and CALINE4 have a height limit on elevated sources (20 m and 10m, respectively). Source of elevation above these limits will have to be modelled using the

ISCST3 model or suitable alternative models. In using the latter, reference should be made to the 'Guidelines on the Use of Alternative Computer Models in Air Quality Assessment' in Appendix B-3.

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

3. Model Input Requirements

3.1 Meteorological Data

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

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

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

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

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

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

(i) perform a frequency occurrence analysis of one year of meteorological data to determine the actual wind speed (to the nearest unit of m/s), wind direction (to the nearest 10^{o}) 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 ofσ_Θ range from 12^o for rural areas to 24^o for highly urbanised areas under 'D' class stability. For semi-rural such as new development areas, 18^o is more appropriate under the same stability condition. The following reference can be consulted for typical ranges of standard deviation of wind direction under different stability categories and surface roughness conditions.

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

3.2 Emission Sources

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

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

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

3.3 Urban/Rural Classification

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

3.4 Surface Roughness Height

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

3.5 Receptors

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

3.6 Particle Size Classes

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

3.7 NO_2 to NO_x Ratio

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

NO_2:

(a) Ambient Ratio Method (ARM) - assuming 20% of NO_x to be NO_2; or

(b) Discrete Parcel Method (DPM, available in the CALINE4 model); or

(c) Ozone Limiting Method (OLM) - assuming the tailpipe NO_2 emission to be 7.5% of NO_x and the background ozone concentration to be in the range of 57 to 68 $\mu g/m^3$ depending on the land use type (see also the EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts' in Appendix B-2).

3.8 Odour Impact

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

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

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

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

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

3.9 Plume Rise Options

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

3.10 Portal Emissions

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

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

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

3.11 Background Concentrations

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

3.12 Output

The highest short-term and long-term averages of pollutant concentrations at prescribed receptor locations are output by the model and to be compared against the relevant air quality standards specified for the relevant pollutant. Contours of pollutant concentration are also required for indicating the general impacts of emissions over a study area.

Copies of model files in electronic format should also be provided for EPD's reference.

Schedule 1

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

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

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

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

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

Appendix 2

Guidelines on Assessing the 'TOTAL' Air Quality Impacts

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

1. Total Impacts - 3 Major Contributions

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

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

2. Nature of Emissions

2.1 Primary contributions

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

2.2 Secondary contributions

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

2.3 Background contributions

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

3. Background Air Quality - Estimation Approach

3.1 The approach

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

3.2 Categorisation

The monitored air quality data, by 'district-averaging' are further divided into three categories, viz, Urban, Industrial and Rural/New Development. The background pollutant concentrations to be adopted for a project site would depend on the geographical constituency to which the site belongs. The categorisation of these constituencies is given in

Section 3.4. The monitoring stations suggested for the 'district-averaging'(arithmetic means) to derive averages for the three background air quality categories are listed as follows:

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

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

3.3 Background pollutant values

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

POLLUTANT	**URBAN**	**INDUSTRIAL**	**RURAL / NEW DEVELOPMENT**
NO_2	59	57	39
SO_2	21	26	13
O_3	62	68	57
TSP	98	96	87
RSP	60	58	51

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

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

Indeed, if good quality on-site sampling data which cover at least one year period are

available, these can be used to derive both the long term (annual) and short term (daily / hourly) background values, the latter are usually applied on an hour to hour, day to day basis.

3.4 Site categories

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

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

3.5 Provisions for 'double-counting'

The current approach is, by no means, a rigorous treatment of background air quality but aims to provide an as-realistic-as-possible approximation based on limited field data. 'Double-counting' of 'secondary contributions' may be apparent through the use of such 'monitoring-based' background data as some of the monitoring stations are of close proximity to existing emission sources. 'Primary contributions' due to a proposed project (which is yet to be realized) will not be double-counted by such an approach. In order to

avoid over-estimation of background pollutant concentrations, an adjustment to the values given in Section 3.3 is possible and optional by multiplying the following factor:

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

where E stands for emission.

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

4. Conclusions

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

Appendix 3

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

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

1. Background

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

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

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

(i) the complexity of the situation to be modelled far exceeds the capability of the Schedule 1 models; and

(ii) the performance of an alternative model is comparable or better than the Schedule 1 models.

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

2. Required Demonstration / Submission

2.1 Any model that is proposed for air quality applications and not listed amongst the Schedule 1 models will be considered by EPD on a case-by-case basis. In such cases, the

proponent will have to provide the followings for EPD's review:

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

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

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

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

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

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

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

(i) the highest and second highest concentrations predicted by the proposed model are within 2 percent of the estimates obtained from an applicable Schedule 1 model (with appropriate options chosen) for all receptors for the project under consideration; or

(ii) the proposed model has superior performance against an applicable Schedule 1 model based on the evaluation procedure set out in USEPA Document "Protocol for Determining the Best Performing Model" (Ref. 1).

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

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

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

Schedule 1

Air Quality Models Generally Accepted by

Hong Kong Environmental Protection Department for Regulatory Applications as at 1 July 1998*

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

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

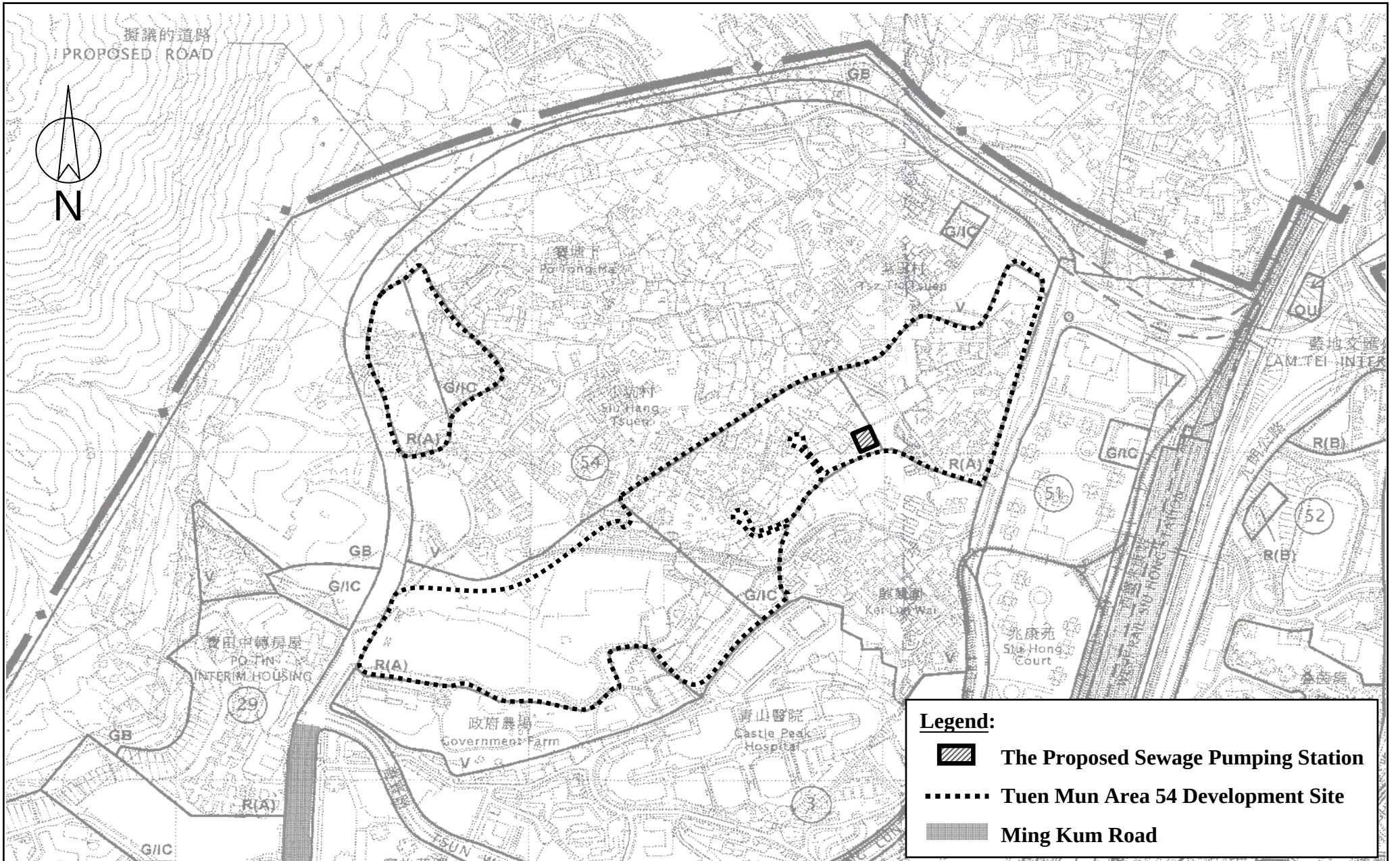
Appendix 4

IMPLEMENTATION SCHEDULE

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Implementation Agent	Relevant Legislation & Guidelines		
				Des	C	O

* 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

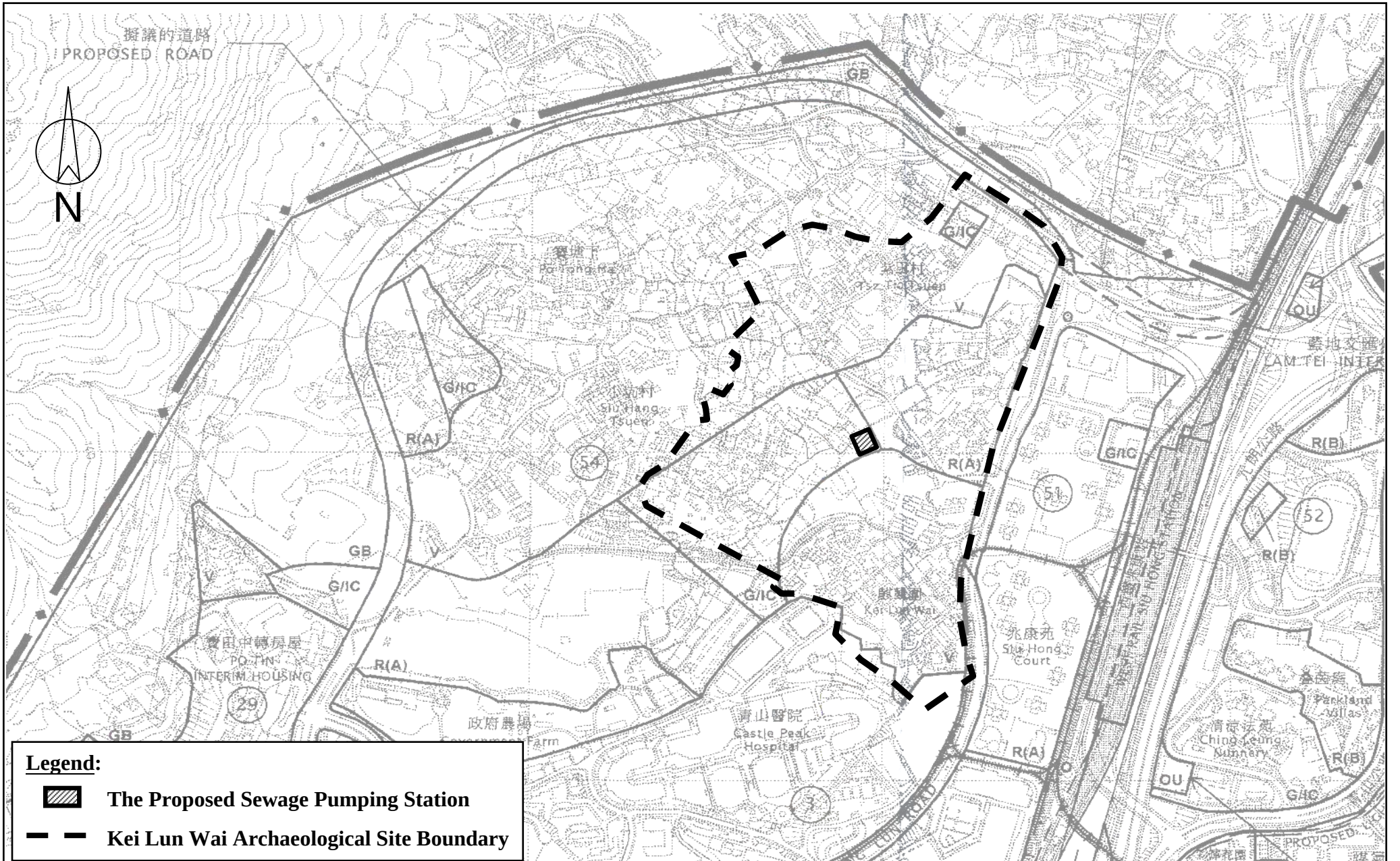


Tuen Mun Area 54 Sewage Pumping Station –

Location of Proposed Sewage Pumping Station

Figure 1

Environmental Study Brief: **ESB-157/2006**



Tuen Mun Area 54 Sewage Pumping Station –

Location of Kei Lun Wai Archaeological Site Boundary

Figure 2

Environmental Study Brief: **ESB-157/2006**