

**ENVIRONMENTAL IMPACT ASSESSMENT ORDINANCE (CAP. 499)
SECTION 5 (7)**

ENVIRONMENTAL IMPACT ASSESSMENT STUDY BRIEF NO. ESB- 214/2010

**PROJECT TITLE : DECOMMISSIONING, REPROVISIONING, CONSTRUCTION
AND OPERATION OF AFFECTED OIL DEPOTS AT SOUTHWEST TSING YI**
(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-214/2010) 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 17 May 2010 with a project profile (No. PP-412/2010) (hereinafter referred as the “Project Profile”).
- 1.2 In the “Study on Hong Kong Port – Master Plan 2020”, Southwest Tsing Yi was identified as one of the potential sites for developing the new Hong Kong’s container terminal facilities, i.e. the Container Terminal 10 (CT10), subject to further studies in determining the feasibility of the Project including, amongst others, the feasibility and site availability of re-provisioning of the affected facilities. Currently, the site of Southwest Tsing Yi comprises mainly industrial facilities and container related and Government facilities such as oil depots, dockyards, cement plant, mid-stream sites, godown sites, bus depot, fire station, service reservoir, open storage areas, vehicles repair area, power plant and tunnel control building. In July 2008, the Applicant submitted a project profile (No. PP-360/2008) applying for an EIA Study Brief for conducting the engineering feasibility study for the CT10 development at Southwest Tsing Yi, but indicated that another application for an EIA Study Brief would be specifically submitted for the decommissioning, reprovisioning, construction and operation of the affected oil depots in due course. The EIA Study Brief (No. ESB-194/2008) for the engineering feasibility study for the CT10 development at Southwest Tsing Yi as shown in [Figure 1](#) of this EIA Study Brief was issued in August 2008.
- 1.3 The Project Profile (No. PP-412/2010) covers only the decommissioning, reprovisioning, construction and operation of the five existing oil depots, namely Shell, Chevron, Exxon-Mobile West, Exxon-Mobile East and Sinopec Oil Depots, at Southwest Tsing Yi. Where necessary, the Project Profile (No. PP-412/2010) and this EIA Study Brief (No. ESB-214/2010) for the oil depots shall be read in conjunction with the project profile (No. PP-360/2008) and the EIA Study Brief (No. ESB-194/2008) for the proposed CT10 development at Southwest Tsing Yi.
- 1.4 The Project is to modify, decommission, reprovision, construct and/or operate the affected oil depots in order to facilitate the implementation of the CT10 Development. Location plan of the five existing oil depots is shown in Figure 2 of the Project Profile and is reproduced in [Figure 2](#) of this EIA Study Brief. The oil depots cover about 62 hectares of land and majority of the land is occupied by fuel tank farms, gas storage facilities and support infrastructures. Product storages include aviation fuel, gasoline, ultra low sulphur diesel, liquefied petroleum gas (LPG), lubes, chemicals, solvents, asphalts, fuel oils and industrial diesel according to the Project Profile. The Project will comprise the following

major works :

- (i) Decommissioning and demolition of affected oil depots and associated jetties;
- (ii) Decontamination works at existing oil depot sites;
- (iii) Re-provisioning of affected oil depots involving:-
 - a) construction/modification of above-ground tanks and associated plant structures;
 - b) construction of filling facilities and associated underground pipelines;
 - c) provision of tank truck loading facilities;
 - d) modification of tanker jetties; and
 - e) construction of underground rock caverns, if found necessary for storage purpose, in proximity of the proposed CT10 Development; and
- (iv) Operation of the modified/re-provisioned oil depots.

1.5 The Project comprises the following designated projects under the EIAO :-

- (i) Part I, Schedule 2 of the EIAO
 - a) Item L.1 - A storage, transfer and trans-shipment of liquefied petroleum gas facility with a storage capacity of not less than 200 tonnes;
 - b) Item L.4 - A storage, transfer and trans-shipment of oil facility with a storage capacity of not less than 1,000 tonnes;
 - c) Item Q.2 - Underground rock caverns;
- (ii) Part II, Schedule 2 of the EIAO – Decommissioning Projects
 - a) Item 12 - A bulk chemical storage facility;
 - b) Item 13 - A store for liquefied petroleum gas with a storage capacity exceeding 200 tonnes;
 - c) Item 16 - A store for oil with a storage capacity exceeding 200 tonnes; and
- (iii) Other designated projects that may be identified during the course of the EIA study.

1.6 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.

1.7 The purpose of this EIA study is to provide information on the nature and extent of environmental impacts arising from the Project and associated works taking place concurrently, taking into consideration of any phased decommissioning of the existing oil

depots and staged development of the re-provisioned facilities. This information will contribute to decisions by the Director on :

- (i) the acceptability of adverse environmental consequences that are likely to arise as a result of the Project and associated works;
- (ii) the conditions and requirements for the design, decommissioning, construction and operation of the Project and associated works, taking into consideration of their co-existence, interaction and development/decommissioning programmes, to mitigate against adverse environmental consequences; and
- (iii) the acceptability of residual impacts of staged development programme of the Project as well as the full implementation of the Project and the related proposed mitigation measures.

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, implementation programme and any phase programme on decommissioning, construction and operation;
- (ii) to identify and describe elements of community and environment likely to be affected by the Project and associated works and/or likely to cause adverse impacts to the Project and associated works, including both the natural and man-made environment and the associated environmental constraints;
- (iii) to provide information on the consideration of alternatives (such as location/siting of the Project; size, layout, configuration, shape and design of the Project; scale, scope, extent, programme, sequence and method of decommissioning and construction of the Project; decontamination method of the contaminated land; and operation programme, mode and measures of the Project) with a view to avoiding or minimizing the potential environmental impacts to (a) the nearby population, (b) the environmentally sensitive areas and other sensitive uses, particularly, those at Tsing Yi, Ma Wan, Kwai Chung and Tsuen Wan, etc., and (c) the Project itself, particularly, the risk to life and health due to any co-existence and interaction of the elements such as the Potentially Hazardous Installations (PHIs) in the Project and the land contamination in the Project site;
- (iv) to compare the environmental benefits and disbenefits of each of the alternative options and to provide reasons for selecting the preferred option(s) by means of describing the part environmental factors played in the selection;
- (v) to identify and quantify the potential risk to human life due to the decommissioning, construction and operation of the Project and to propose measures to mitigate this impact. Information on dangerous goods inventories, site plans and dangerous goods transport routes of the oil depots shall be provided;
- (vi) to identify and quantify the potential risk due to the potential land contamination caused by the decommissioning, construction and operation of the Project and to propose measures to mitigate this impact;

- (vii) to identify and quantify emission sources, including air and gaseous emission, noise emission, sewage and wastewater emission, waste generation, and any dredged mud, and to determine the significance of impacts on sensitive receivers and potential affected uses;
- (viii) to identify any human health impact caused by the decommissioning, construction and operation of the Project and to propose measures to mitigate this impact;
- (ix) to identify and quantify any potential loss or damage and other potential impacts to ecological and fisheries resources, flora, fauna and natural habitats and to propose measures to mitigate these impacts;
- (x) to identify any potential landscape, visual and glare impacts and to propose measures to mitigate these impacts;
- (xi) to identify any negative impact on archaeological resources and to propose measures to mitigate this impact;
- (xii) to propose measures to avoid or the provision of infrastructures or mitigation measures to minimize risk, pollution, environmental disturbance and nuisance during the decommissioning, construction and operation of the Project and associated works;
- (xiii) to investigate the feasibility, practicability, effectiveness and implications of the proposed mitigation measures;
- (xiv) to identify, predict and evaluate the residual environmental impacts (i.e. after practicable mitigation) and the cumulative effects expected to arise during the decommissioning, construction and operation of the Project and associated works, taking into account the relevant programmes and sequences on decommissioning and/or construction of the affected facilities, in relation to the sensitive receivers and potentially affected uses;
- (xv) to identify, assess and specify methods, measures and standards to be included in the detailed design, decommissioning, construction and operation of the Project and associated works which are necessary to mitigate these environmental impacts and cumulative effects, and reduce them to acceptable levels;
- (xvi) 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;
- (xvii) to design and specify environmental monitoring and audit requirements to check the effective implementation of the recommended environmental protection and pollution control measures for the decommissioning, construction and operation of the Project and associated works; and
- (xviii) to identify individual project(s) and associated works of the Project that fall under Schedule 2 of the EIAO.

3. DETAILED REQUIREMENTS OF THE EIA STUDY

3.1 The Purpose

3.1.1 The purpose of this Study Brief is to scope the key issues of the EIA study and to specify the environmental issues that are required to be reviewed and assessed in the EIA report for the Project. The Applicant has to demonstrate in the EIA report whether the criteria in the relevant sections of the Technical Memorandum on the Environmental Impact Assessment Process of the EIAO (hereinafter referred to as the “TM”) are met.

3.2 The Scope

3.2.1 The scope of this EIA study shall cover the Project proposed in the Project Profile (No. PP-412/2010) and mentioned in sections 1.3 and 1.4 of this EIA Study Brief. The co-existence, interaction and programme, etc. of decommissioning, construction and operation of the affected oil depots and other nearby industrial facilities will have impacts on the Project. The EIA study shall cover the combined and staged impacts of the Project and associated works and the cumulative impacts of the existing, committed and planned developments in the vicinity of the Project based on relevant decommissioning, construction and operation programmes and sequences of the Project and the concurrent developments.

3.2.2 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) Objective consideration of the environmental benefits and dis-benefits of alternative options for carrying out the Project with a view to deriving a preferred option(s) to avoid any unacceptable risk and to avoid or minimise any adverse environmental impacts. Particular consideration shall be given to the followings :
 - a) alternative location/siting of the Project;
 - b) alternative size, layout, configuration, shape and design of the Project, including use of underground rock cavern for storage, etc.;
 - c) alternative scale, scope, extent, programme, sequence and method of decommissioning and construction of the Project, including :
 - ♦ for decommissioning the oil depots, the options of full and part scale, concurrent and staged decommissioning, and the operation status of the unaffected facilities;
 - ♦ for constructing the underground rock cavern (if necessary), both explosive and non-explosive methods; and
 - ♦ for any marine works such as construction/modification of jetties of the oil depots, both dredging and non-dredging methods, selection of fill material and dredging/filling equipment, etc.;
 - d) alternative methods to decontaminate any contaminated lands associated with the Project; and

- e) alternative programme and mode of operation of the Project, including technology, equipment, method, process, system, practice and facility, etc.;
- (ii) The potential risk to human life due to the staged implementation, co-existence and interaction of the oil depots and the storage, use and transportation of dangerous goods (DG) (such as fuel gas DG, non-fuel gas DG and explosives) during decommissioning, construction and/or operation of the Project;
- (iii) The potential hazard and environmental impacts associated with the potential land contamination caused by the Project, and the secondary hazard and environmental impacts that may arise from the remediation of contaminated land;
- (iv) The potential human health impact arising from the Project, particularly, emissions of odour and volatile organic compounds (VOCs) from the oil depots and the handling of contaminated soil and toxic materials (if any);
- (v) The potential water quality impact caused by the Project, particularly :
 - a) the water quality impact caused by construction dredging, piling, fill extraction, filling and any other marine works activities (such as reclamation and maintenance dredging (if any)) during decommissioning, construction and operation of the Project. Particular attention shall be given to the potential release of toxic contaminants and the potential increase of suspended solids affecting the water sensitive receivers and uses such as beaches, seawater intakes/salt water pumping stations and fish culture zone(s) at Tsing Yi, Ma Wan, Tsuen Wan and Ting Kau;
 - b) the water quality impact caused by the discharges of industrial effluent, domestic sewage, marine vessels, maintenance dredging, contaminated surface run-off and stormwater drainage system during operation of the Project;
 - c) the water quality impact associated with significant fuel spillages including different probably accident types such as grounding and collision of marine vessels and fuel transfer in ports. Preferred option shall be studied to avoid or minimize any adverse environmental impacts with reference to the results of an assessment of the risk of accidental fuel spillage associated with the operation of the Project;
 - d) the water quality impact associated with decommissioning, construction and operation of the oil depots; and
 - e) the hydrodynamic and water quality impacts as a result of the changes in coastline, flow regime, flushing capacity, and water quality in Hong Kong waters during decommissioning, construction and operation of the Project on the relevant water system(s). Particular attention shall be given to the hydrodynamic, dispersion and dilution effects on the Ma Wan Channel and the sewage effluent discharged from the Harbour Area Treatment Scheme's (HATS) sewage submarine outfall at the Stonecutters Island;

- (vi) The potential air quality impact caused by decommissioning, construction and operation of the Project, particularly, the emissions of odour and volatile organic compounds (VOCs) from the oil depots and the emissions from the marine vessels. Attention shall also be given to the air quality impact on the sensitive receivers including the residential uses at Tsing Yi and Ma Wan;
- (vii) The potential noise impact caused by decommissioning, construction and operation of the Project, particularly, the construction noise due to blasting and piling, and operational noise due to fixed noise sources. Attention shall also be given to the likely traffic noise impact on the sensitive receivers in Tsing Yi arising from the traffic to and from the oil depots;
- (viii) The potential impact on waste management and caused by waste generation during decommissioning, construction and operation of the Project, particularly, the disposal of dredged sediment during demolition of jetties of the oil depots;
- (ix) The potential impact on capture and culture fisheries during decommissioning, construction and operation of the Project, such as loss or disturbance of sites of fisheries importance, effect on fish culture zone, particularly the Ma Wan Fish Culture Zone, and disruption of fisheries operations;
- (x) The potential impact on ecology during decommissioning, construction and operation of the Project, such as (a) marine ecological impact due to loss or disturbance of benthic habitats and foraging grounds, and effect on habitats for marine mammals like Chinese White Dolphin, Finless Porpoise, corals, marine benthic communities; and (b) terrestrial ecological impact due to loss or disturbance of flora, fauna, natural habitats and other ecological sensitive areas;
- (xi) The potential landscape and visual impacts during decommissioning, construction and operation of the Project, particularly, the potential visual and glare impacts on the nearby residents in Tsing Yi and Ma Wan, the effect on landscape character of the Tsing Yi and Ma Wan areas, and the effect on scenic or tourist spots such as Tsing Ma Bridge;
- (xii) The potential impact on archaeological deposits likely to be affected during decommissioning and construction of the Project;
- (xiii) Any potential vibration impact caused by decommissioning and construction of the Project, particularly, the vibration impact due to blasting activities (if any) on any nearby buildings and structures of historical or architectural value; and
- (xiv) The potential cumulative environmental impacts of the Project, through co-existence, interaction and staged implementation with other existing, committed and planned projects in their vicinity, and that those impacts may have a bearing on the environmental acceptability of the Project. Consideration shall be given to account for impacts from likely concurrent projects, including the proposed CT10, the existing container terminals numbered 1 to 9, the existing and planned major roads such as Tsing Ma Bridge, Route 3, Route 8 and Tsing Yi Lantau Link, the existing industrial, chemical and special facilities such as Chemical Waste Treatment Centre, Dow Chemical Plant and cement plant at Tsing Yi, and the marine borrow and dumping areas at South of Tsing Yi, etc.

3.3 **Consideration of Alternatives**

3.3.1 Need of the Project

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

3.3.2 Consideration of Alternative Development Options

3.3.2.1 The Applicant shall present in the EIA report the consideration of alternative options, including location/siting, size, layout, configuration, shape, design, scale, scope, extent, programme, sequence, construction method, decontamination method and operation mode, etc., of decommissioning, constructing and operating the oil depots, with a view to recommending a preferred option(s) to avoid or minimize any hazard and adverse environmental impacts during decommissioning, construction and operation of the Project. The combined effects with respect to the severity and duration of the environmental impacts to the affected sensitive receivers shall be taken into consideration. Comparison of the environmental benefits and dis-benefits of applying different development options shall be studied. Other factors or constraints affecting the development options of the Project shall be stated in the EIA report.

3.3.2.2 The EIA report shall include the consideration of the following alternatives :-

- (i) alternative location/siting of the Project with a view to avoiding or minimising risk to human life and any adverse environmental impacts;
- (ii) alternative size, layout (both land-use and internal layouts), configuration, shape and design of the Project with a view to avoiding or minimising risk to human life and any adverse land contamination, air quality, noise, water quality, visual and glare, etc. impacts;
- (iii) alternative scale, scope, extent, programme and sequence of decommissioning and construction of the Project with a view to avoiding or minimising risk to human life and any adverse land contamination, air quality, noise and water quality, etc. impacts;
- (iv) alternative decontamination and remediation methods for any contaminated land with a view to avoiding or minimising hazard and any adverse environmental impacts;
- (v) alternative construction methods for any caverning, dredging and marine works with a view to avoiding or minimising risk to human life and any adverse noise, water quality, waste management and disposal, fisheries and ecological, etc. impacts; and
- (vi) alternative programme, measures and mode of operation, such as technology, equipment, method, process, system, practice and facility to be used in the Project, with a view to avoiding or minimising risk to human life and any adverse land contamination, air quality, noise, water quality, waste, visual and glare, etc. impacts during operation of the Project.

3.3.3 Selection of Preferred Option(s)

3.3.3.1 The Applicant shall, taking into consideration of the findings in sections 3.3.2 of this Study Brief, recommend and justify the adoption of the preferred decommissioning, construction and operation option(s) in terms of location, size, scale, scope, extent, layout, configuration, shape, design, programme and sequence, etc. that will avoid and/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 3.1, 3.2 and 3.3 of the Study Brief. The assessment shall be based on the best and latest information available during the course of the EIA study. The Applicant shall include in the EIA report details of the decommissioning, re-provisioning, construction and operation programme and sequence of the oil depots. The Applicant shall clearly state in the EIA report the time frame, works programmes and works sequences of the Project and other concurrent projects, and assess the cumulative environmental impacts from the Project and interacting projects as identified in the EIA study. 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.

3.4.1.2 The study area for air quality impact assessment shall be defined by a distance of 500 metres from the Project boundary shown in [Figure 2](#) of this Study Brief or other project locations as identified in the EIA study, which shall be extended to include major existing, planned and committed air pollutant emission sources within Tsing Yi area such as proposed CT10, existing container terminals numbered 9, major roads in the areas, industrial and special uses in the areas, Chemical Waste Treatment Plant at Tsing Yi and marine traffic in the Ma Wan Channel, and any others that may have a bearing on the environmental acceptability of the Project. The assessment shall include the existing, planned and committed sensitive receivers within the study area as well as areas where air quality may be potentially affected by the Project. The assessment shall cover the air sensitive receivers at Tsing Yi and Ma Wan. Such assessment shall be based on the best available information at the time of the assessment.

3.4.1.3 The assessment of the air quality impact arising from the decommissioning, construction and operation of the Project shall follow the detailed technical requirements given in [Appendix A](#) of this EIA Study Brief.

3.4.1.4 The Applicant shall assess the air pollutant concentrations with reference to the relevant sections of the guidelines in [Appendices A-1](#) to [A-3](#) attached to this Study Brief, or other methodology as agreed by the Director. The Applicant shall also note that the PATH model may be used for estimating the cumulative background concentrations by taking into account the major air pollutant emission sources in Hong Kong and nearby regions.

3.4.2 Hazard to Life

3.4.2.1 The Applicant shall follow the criteria for evaluating hazard to life from dangerous goods (DG) as stated in Annex 4 of the TM.

3.4.2.2 The Applicant shall carry out hazard assessment for the potential risk to the nearby population during all stages of decommissioning, construction and operation of the Project. The Applicant shall identify and provide DG inventories relating to hazard to life issue and relevant to decommissioning, construction and operation of the Project. The hazard assessment shall include :

- i) hazard assessment for fuel gas DG such as liquefied petroleum gas (LPG);
- ii) hazard assessment for other non-fuel gas DG such as aviation fuel, gasoline, ultra low sulphur diesel, lubes, chemicals, solvents, asphalts, fuel oils and industrial diesel; and
- iii) hazard assessment for explosives (if use of explosives is required during decommissioning and/or construction of the Project and the location of overnight storage of explosives is in close vicinity to populated areas and/or PHI site(s))

3.4.2.3 The hazard assessment for the decommissioning, construction and operation of the Project shall follow the detailed technical requirements given in [Appendix B](#) of this EIA Study Brief.

3.4.3 Noise Impact

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

3.4.3.2 The study area for the noise impact assessment shall generally include areas within a distance of 300m from the Project boundary as shown in [Figure 2](#) of this Study Brief or other Project locations as identified in the EIA study. Subject to the agreement of the Director, the assessment area can 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. The assessment area shall be expanded to include NSRs at distances over 300m from the Project, if those NSRs are affected by the decommissioning, construction and operation of the Project, particularly, area close to the road networks affected by the vehicular traffic generated from the operation of the Project. The assessment shall cover NSRs at Tsing Yi and Ma Wan.

3.4.3.3 The noise impact assessment for the decommissioning, construction and operation of the Project shall follow the detailed technical requirements given in [Appendix C](#) of this EIA Study Brief.

3.4.4 Water Quality Impact

3.4.4.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing water pollution as stated in Annexes 6 and 14 of the TM. For evaluation and assessment of impacts on the public sewerage, sewage treatment and disposal facilities, the Applicant shall follow the criteria and guidelines stated in section 6.5 in Annex 14 of the TM.

3.4.4.2 The study area for this water quality impact assessment shall cover the North Western Water Control Zone, North Western Supplementary Water Control Zone, Western Buffer Water Control Zone, Victoria Harbour Water Control Zone and Southern Water Control Zone as designated under the Water Pollution Control Ordinance (WPCO).

3.4.4.3 Sensitive receivers including, but not limiting to, beaches, secondary contact recreational zones, recreation and tourism related uses, seawater intakes, cooling water intakes, salt water pumping stations (SWPSs) of the Water Supplies Department (WSD), marine parks, Chinese White Dolphin and Finless Porpoise habitats, fish culture zones, Sites of Special Scientific Interest (SSSIs), artificial reefs, corals, fishing, spawning and nursery grounds of commercially important species in the above areas shall be addressed in the water quality assessment. The assessment shall cover the sensitive receivers at Ma Wan, Tsing Yi, Kwai Chung, Tsuen Wan and Ting Kau and along Castle Peak Road. The study area can be extended to include other areas if they are found also being impacted during the course of the EIA study and have a bearing on the environmental acceptability of the Project.

3.4.4.4 The assessment of the water quality impact arising from the decommissioning, construction and operation of the Project shall follow the detailed technical requirements given in [Appendix D](#) of this EIA Study Brief.

3.4.5 **Waste Management**

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

3.4.5.2 The assessment of the waste management implications arising from the decommissioning, construction and operation of the Project shall follow the detailed technical requirements given in [Appendix E-1](#) of this EIA Study Brief.

3.4.6 **Land Contamination**

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

3.4.6.2 The "Assessment Area" for the land contamination impact shall include any potential land contamination site(s) within the Project area as shown in [Figure 2](#) and any other potential land contaminated site(s) within the boundaries of all associated areas (e.g. works areas) of the Project.

3.4.6.3 The land contamination assessment arising from the decommissioning, construction and operation of the Project shall follow the detailed technical requirements given in [Appendix E-2](#) of this EIA Study Brief.

3.4.7 **Ecological Impact**

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

3.4.7.2 The assessment area for marine ecological impact shall be same as the assessment area for water quality impact assessment and shall also include any other areas likely to be impacted by the Project. The assessment area for terrestrial ecological impact including freshwater habitats shall include areas within 500m distance from the site boundary of the Project and also any other areas likely to be impacted by the Project.

3.4.7.3 The assessment of the ecological impact arising from the decommissioning, construction and operation of the Project shall follow the detailed technical requirements given in [Appendix F](#) of this EIA Study Brief.

3.4.8 Fisheries Impact

- 3.4.8.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing fisheries impact as stated in Annexes 9 and 17 of the TM.
- 3.4.8.2 The assessment area for fisheries impact assessment shall be same as the assessment area for water quality impact assessment and shall also include any other areas likely to be impacted by the Project. Special attention shall be given to the fishing activities and fishing spawning and nursery grounds within the assessment area and the Ma Wan Fish Culture Zone.
- 3.4.8.3 The assessment of the fisheries impact arising from the decommissioning, construction and operation of the Project shall follow the detailed technical requirements given in [Appendix G](#) of this EIA Study Brief.

3.4.9 Landscape, Visual and Glare Impact

- 3.4.9.1 The Applicant shall follow the criteria and guidelines as stated in Annexes 10 and 18 of the TM and the EIAO Guidance Note No. 8/2002 on the preparation of Landscape and Visual Impact Assessment under the EIAO. Landscape, visual and glare impacts during decommissioning, construction and operation phases within the study area and the related works areas shall be assessed.
- 3.4.9.2 The assessment area for the landscape impact assessment shall include areas within a 500m distance from the site boundary of the Project, while the assessment area for the visual impact assessment shall be defined by the visual envelop of the Project. The assessment area for the visual impact assessment shall cover the areas of Ma Wan and Tsing Yi. The assessment area for the glare impact assessment shall cover the areas of Ma Wan, Tsing Yi and those areas affected by glare or any uncomfortable eye feeling caused by light interference from direct man-made light sources generated from the Project. The defined visual envelope shall be shown on a plan and documented in the EIA report.
- 3.4.9.3 The assessment of the landscape, visual and glare impacts arising from the decommissioning, construction and operation of the Project shall follow the detailed technical requirements given in [Appendix H](#) of this EIA Study Brief.

3.4.10 Cultural Heritage Impact

- 3.4.10.1 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.
- 3.4.10.2 The cultural heritage impact assessment shall include a Marine Archaeological Investigation (MAI) for the Project.
- 3.4.10.3 The assessment of the cultural heritage impact arising from the decommissioning, construction and operation of the Project shall follow the detailed technical requirements given in [Appendix I](#) of this EIA Study Brief.

3.4.11 Summary of Environmental Outcomes

- 3.4.11.1 The EIA report shall contain a summary of the 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 the environmental protection measures recommended.

3.4.12 Environmental Monitoring and Audit (EM&A) Requirements

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

3.4.12.2 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 through a dedicated internet website.

3.4.12.3 The Applicant shall prepare a project implementation schedule (in the form of a checklist as shown in [Appendix J](#) to this EIA Study Brief) containing all the EIA study recommendations and mitigation measures with reference to the implementation programme and, if any, staged implementation programme of the Project.

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 the issuance 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. REPORTING 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 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.

5.3 To facilitate public involvement in the EIA process, the applicant shall produce 3-dimensional electronic visualizations of the major findings and elements of the EIA report, including baseline environmental information, the environmental situations with or without the Project, key mitigated and unmitigated environmental impacts, and key recommended environmental mitigation measures so that the public can understand the Project and the associated environmental issues. The visualizations shall be based on the EIA report and released to the public. The 3-dimensional visualizations shall be developed and constructed such that they can be accessed and viewed by the public through an internet browser at a reasonable speed and without the need for software

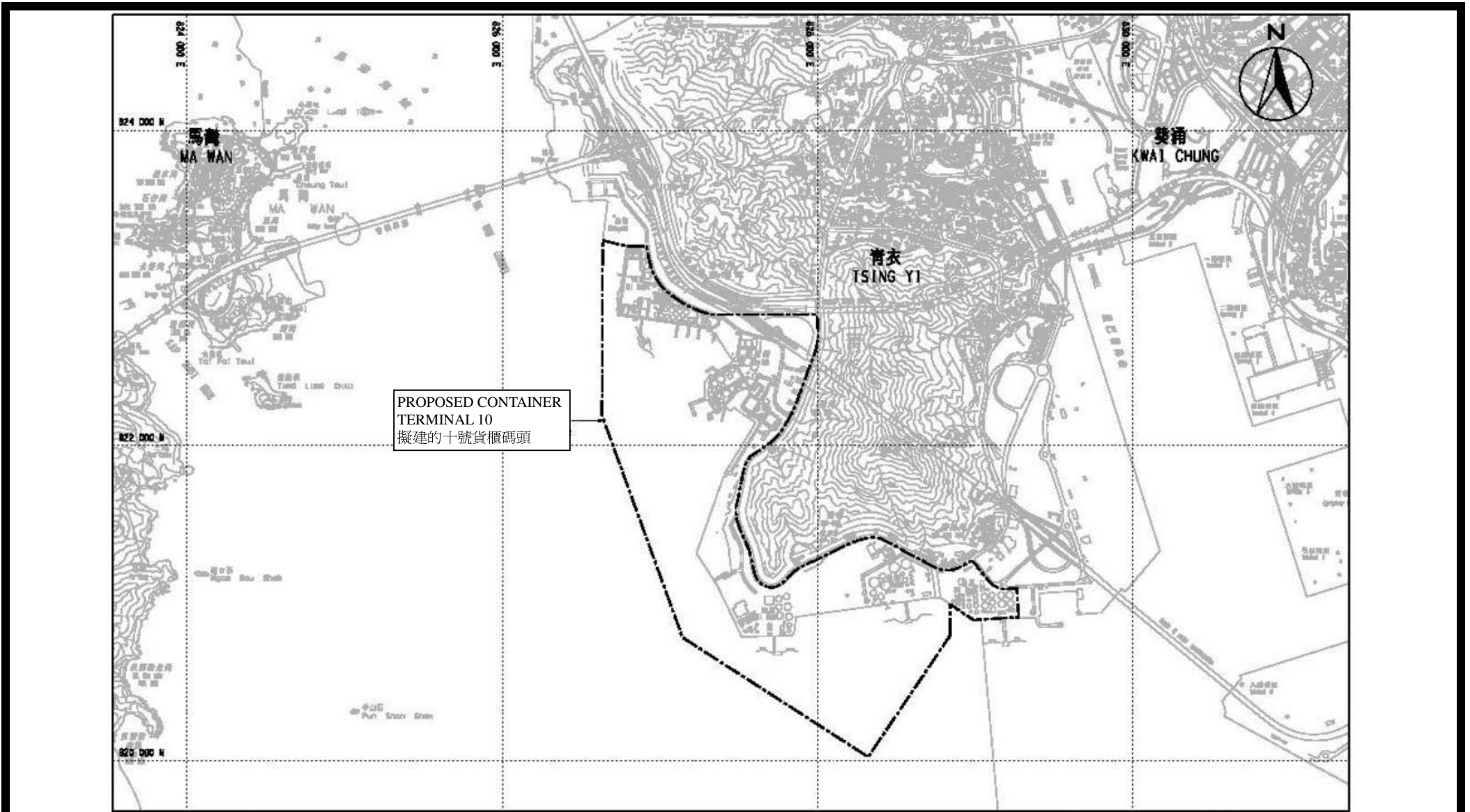
license requirement at the client's end. The visualizations shall be submitted in 10 copies of CD-ROM, DVD_R or other suitable means as agreed with the Director.

6. OTHER PROCEDURAL REQUIREMENTS

- 6.1 If there is any change in the name of Applicant for this EIA Study Brief during the course of the EIA study, the Applicant must notify the Director immediately.
- 6.2 If there is any key change in the scope of the Project mentioned in sections 1.3 and 1.4 of this EIA Study Brief and in Project Profile (No. PP-412/2010), 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 this EIA Study Brief, the Applicant shall apply to the Director for a fresh EIA study brief.

--- END OF EIA STUDY BRIEF ---

June 2010
Environmental Assessment Division,
Environmental Protection Department



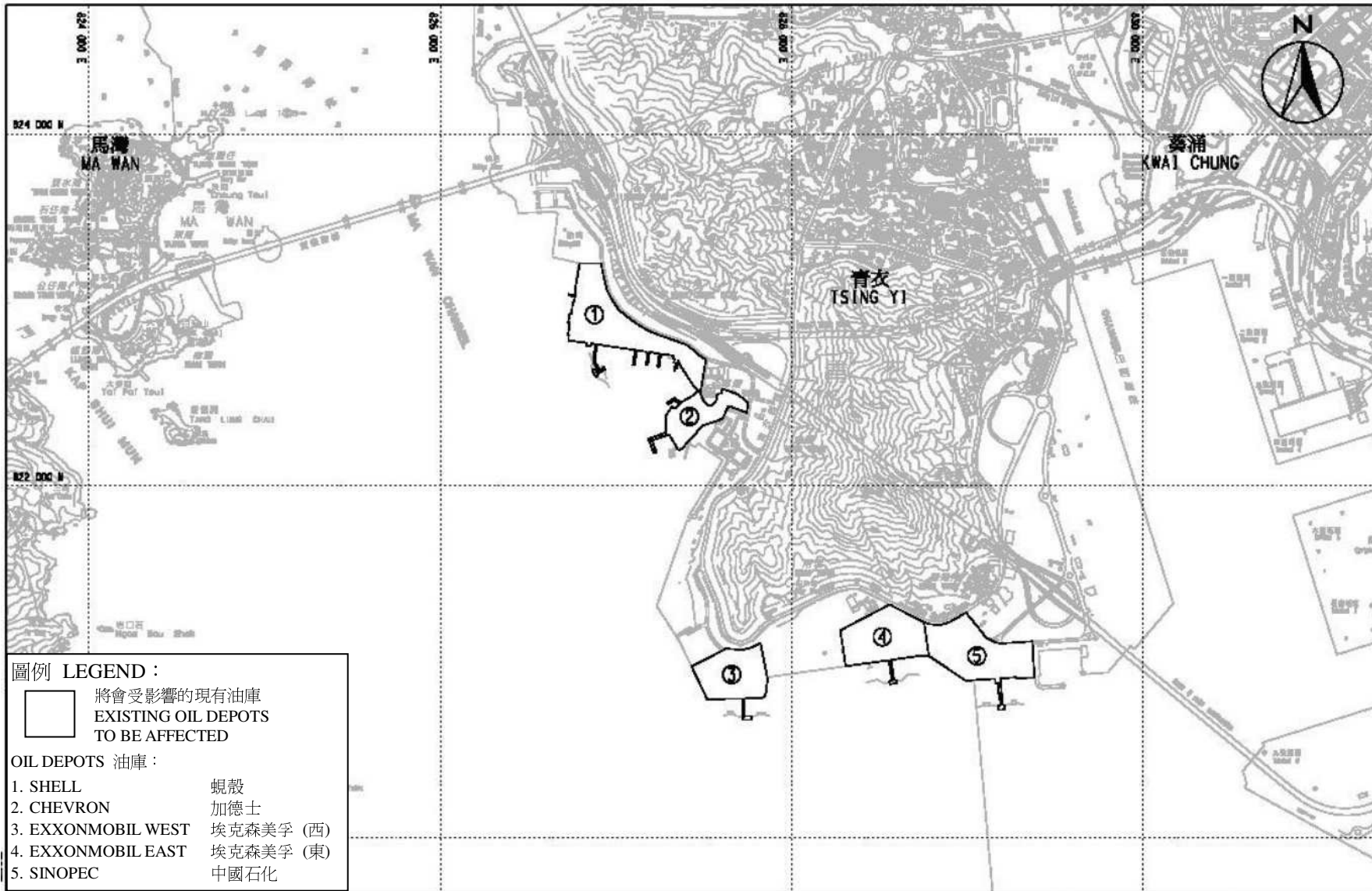
Project Title: Decommissioning, Re provisioning, Construction and Operation of Affected Oil Depots at Southwest Tsing Yi

Location Plan of Proposed Container Terminal 10 (Originated from the Figure 1 of Project Profile No. PP-412/2010)


EIA Study Brief No.: ESB-214/2010

Figure 1





圖例 LEGEND :

 將會受影響的現有油庫
 EXISTING OIL DEPOTS
 TO BE AFFECTED

OIL DEPOTS 油庫 :

1. SHELL	蜆殼
2. CHEVRON	加德士
3. EXXONMOBIL WEST	埃克森美孚 (西)
4. EXXONMOBIL EAST	埃克森美孚 (東)
5. SINOPEC	中國石化

Project Title: Decommissioning, Re provisioning, Construction and Operation of Affected Oil Depots at Southwest Tsing Yi

Locations of Affected Oil Depots (Originated from the Figure 2 of Project Profile No. PP-412/2010)

EIA Study Brief No.: ESB-214/2010

Figure 2



Appendix A

Requirements for Air Quality Impact Assessment

The air quality impact assessment shall include the following:

1. **Background and Analysis of Activities**
 - (i) Provision of 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 decommissioning, construction and operation stages of the Project.
 - (ii) Giving 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 (a) alternative decommissioning methods and programmes, (b) alternative construction methods and phasing programmes, (c) alternative designs in terms of location, position, layout, treatment/ventilation process and enclosure/undergrounding/caverning, etc., and (d) alternative operation modes to minimize the air quality impact during decommissioning, construction and operation stages of the Project.
 - (iii) Presentation of background air quality levels in the assessment area for the purpose of evaluating cumulative air quality impacts during decommissioning, construction and operation stages of the Project.
2. **Identification of Air Sensitive Receivers (ASRs) and Examination of Emission/Dispersion Characteristics**
 - (i) Identification and description of existing, planned and committed ASRs that would likely be affected by the Project, including those earmarked on the relevant Outline Zoning Plans, Outline Development Plans and Layout Plans and other relevant published land use plans, including plans and drawings published by Lands Department and any land use and development applications approved by the Town Planning Board. The Applicant shall select the assessment points of the identified ASRs that represent the worst impact point of these ASRs. A map clearly showing the location and 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) Provision of a list of air pollution emission sources, including any nearby emission sources which are likely to have impact related to the Project based on the analysis of the decommissioning, construction and operation activities in Section 1 above. Confirmation regarding the validity of the assumptions adopted and the magnitude of the activities (e.g. volume of construction material handled, odour and volatile organic compounds (VOCs) emission strength, traffic mix and volume of the land-based vehicles and marine-based vessels, etc.) shall be obtained from the relevant government departments/authorities and documented.

- (iii) Identification of chimneys and obtainment of relevant chimney emission data in the study area by carrying out a survey for assessing the cumulative air quality impact of air pollutants through chimneys. The Applicant shall ensure and confirm that the chimney emission data used in their assessment have been validated and updated by their own survey. If there are any errors subsequently found in their chimney emission data used, the Applicant shall be fully responsible and the submission may be invalidated.
- (iv) The emissions from any concurrent projects identified as relevant during the course of the EIA study shall be taken into account as contributing towards the overall cumulative air quality impact. The impact as affecting the existing, committed and planned ASRs within the assessment area shall be assessed, based on the best information available at the time of assessment.

3. Decommissioning Phase and 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. A monitoring and audit programme for the construction phase shall be devised to verify the effectiveness of the control measures proposed so as to ensure proper construction dust control.
- (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 the ASRs despite the incorporation of the dust control measures proposed, a quantitative assessment should be carried out to evaluate the construction dust impact at the identified ASRs. The Applicant shall follow the methodology set out in Section 5 below when carrying out the quantitative assessment.
- (iii) The Applicant shall calculate the expected air pollutant concentrations from the Project, including possible impacts of odour, soil gas and VOCs, etc., at the identified ASRs based on an assumed reasonably worst case scenario. The Applicant shall follow the methodology as described in Section 5 below when carrying out the quantitative assessment.

4. Operational Phase Air Quality Impact

- (i) The Applicant shall calculate the expected air pollutant concentrations at the identified ASRs based on an assumed reasonably worst-case scenario under normal operating conditions. The evaluation shall be based on the strength of the emission sources identified in Section 2 above. The Applicant shall follow Section 5 below when carrying out the quantitative assessment.
- (ii) The Applicant shall calculate the expected air pollutant concentrations from the Project due to odour and VOCs.
- (iii) The air pollution impacts of future road traffic shall be calculated based on the highest emission strength from the road within the next 15 years upon

commencement of operation of the proposed road or full commissioning of the Project, whichever is later. The Applicant shall demonstrate that the selected year of assessment represents the highest emission scenario given the combination of vehicular emission factors and traffic flow for the selected year. The Applicant shall propose any Fleet Average Emission Factors used in the assessment. If necessary, the Fleet Average Emission Factors shall be determined by a motor vehicle emission model such as EMFAC-HK model and documented in the EIA report. All the traffic flow data and assumptions that are used in the assessment shall be clearly and properly documented in the EIA report.

- (iv) The Applicant shall assess the air quality impact due to the emissions from the marine-based vessels and study the option to provide on-shore power supply to the berthed marine vessels in order to reducing the air emissions.
- (v) If vehicular tunnels and/or full enclosures (e.g. cavern, etc.) are proposed in the Project, it is the responsibility of the Applicant to ensure that the air quality inside these proposed structures shall comply with EPD's "*Practice Note on Control of Air Pollution in Vehicle Tunnels*". When assessing air quality impact due to emissions from tunnels/full enclosures, the Applicant shall ensure prior agreement with the relevant ventilation design engineer over the amount and the types/kinds of pollutants emitted from these full enclosures; and such assumptions shall be clearly and properly documented in the EIA report.

5. Quantitative Assessment Methodology

- (i) The Applicant shall apply the general principles enunciated in the modeling guidelines in Appendices A-1 to A-3 while making allowance for the specific characteristic of the Project. This specific methodology must be documented in such level of details, preferably assisted with tables and diagrams, to allow the readers of the EIA report to grasp how the model has been set up to simulate the situation under study without referring to the model input files. Detailed calculations of air pollutants emission rates for input to the model shall be presented in the EIA report. The Applicant must ensure consistency between the text description and the model files at every stage of submissions for review. In case of doubt, prior agreement between the Applicant and the Director on the specific modelling details should be sought.
- (ii) The Applicant shall identify the key/representative air pollutant parameters (types of pollutants and the averaging time concentrations) to be evaluated and provide explanation for selecting such parameters for assessing the impact from the Project. Ozone Limiting Method (OLM) or Discrete Parcel Method (DPM) or other method to be agreed with the Director shall be used to estimate the conversion ratio of NO_x to NO_2 if NO_2 has been identified as a key air pollutant.
- (iii) 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 should be used to present pollution contours to allow buffer distance requirements to be determined properly.

6. Mitigation Measures for Non-compliance

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

7. Submission of Model Files

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

Appendix A-1

Guidelines on Choice of Models and Model Parameters

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

1. Introduction

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

2. Choice of Models

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

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

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

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

3 Model Input Requirements

3.1 Meteorological Data

- 3.1.1 At least 1 year of recent meteorological data (including wind speed, wind direction, stability class, ambient temperature and mixing height) from a weather station either closest to or having similar characteristics as the study site should be used to determine the highest

short-term (hourly, daily) and long-term (annual) impacts at identified air sensitive receivers in that period. The amount of valid data for the period should be no less than 90 percent.

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

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

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

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

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

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

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

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

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

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

3.2 Emission Sources

All the identified sources relevant to a process plant or a study site should be entered in the model and the emission estimated based on emission factors compiled in the AP-42 (Ref. 2) or other suitable references. The relevant sections of AP-42 and any parameters or

assumptions used in deriving the emission rates (in units g/s, g/s/m or g/s/m²) as required by the model should be clearly stated for verification. The physical dimensions, location, release height and any other emission characteristics such as efflux conditions and emission pattern of the sources input to the model should also correspond to site data.

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

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

3.3 Urban/Rural Classification

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

3.4 Surface Roughness Height

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

3.5 Receptors

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

3.6 Particle Size Classes

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

3.7 NO₂ to NO_x Ratio

The conversion of NO_x to NO₂ is a result of a series of complex photochemical reactions and has implications on the prediction of near field impacts of traffic emissions. Until further data are available, three approaches are currently acceptable in the determination of NO₂:

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

3.8 Odour Impact

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

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

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

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

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

3.9 Plume Rise Options

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

3.10 Portal Emissions

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

Schedule 1

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

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

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

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

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

Appendix A-2

Guidelines on Assessing the 'TOTAL' Air Quality Impacts

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

1. Total Impacts - 3 Major Contributions

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

Primary contributions:	project induced
Secondary contributions:	pollutant-emitting activities in the immediate neighbourhood
Other contributions: (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 categorization 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 meter. 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 A-3

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

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

1. Background

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

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

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

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

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

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

2. Required Demonstration / Submission

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

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

Based on the above information, the Director 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 the Director 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 the Director 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 the Director 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

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

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

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

Appendix B

Requirements for Hazard Assessment

The hazard to human life assessment shall include the following:

Background and Analysis of Activities

1. The Applicant shall identify and provide dangerous goods (DG) inventories relating to hazard to human life issue and relevant to the decommissioning, construction and operation of the Project. The DG inventories shall include, but not limited to, aviation fuel, gasoline, ultra low sulphur diesel, liquefied petroleum gas (LPG), lubes, chemicals, solvents, asphalts, fuel oil and industrial diesel currently present in the existing oil depots. If explosives and other DG will be used for decommissioning, construction or operation of the Project, the relevant DG inventories shall also be provided.

Hazard Assessment for Fuel Gas DG including LPG

2. The Applicant shall carry out hazard assessment to evaluate the risk associated with decommissioning, construction and operation of the Project due to storage, use and transport of fuel gas DG including LPG, etc. The hazard assessment shall include:
 - i) Identification of hazardous scenarios associated with decommissioning, construction and operation of the Project with a view to determining a set of relevant hazard scenarios to be included in a Quantitative Risk Assessment (QRA);
 - ii) Execution of a QRA of the set of hazardous scenarios determined in item (i) above, expressing population risks in both individual and societal terms;
 - iii) Comparison of individual and societal risks with the Criteria for Evaluating Hazard to Life stipulated in Annex 4 of the TM; and
 - iv) Identification and assessment of practicable and cost-effective risk mitigation measures (e.g. practicality and cost effectiveness of undergrounding/caverning for DG storage facilities).

Hazard Assessment for other non-Fuel Gas DG (including aviation fuel, gasoline, ultra low sulphur diesel, lubes, chemicals, solvents, asphalts, fuel oil and industrial diesel)

3. The Applicant shall carry out hazard assessment to evaluate the risk associated with decommissioning, construction and operation of the Project due to storage, use and transport of the other non-fuel gas DG including aviation fuel, gasoline, ultra low sulphur diesel, lubes, chemicals, solvents, asphalts, fuel oil and industrial diesel. The hazard assessment shall include:
 - i) Identification of hazardous scenarios associated with decommissioning, construction and operation of the Project with a view to determining a set of relevant hazard scenarios to be included in a QRA;

- ii) Execution of a QRA of the set of hazardous scenarios determined in item (i) above, expressing population risks in both individual and societal terms;
- iii) Comparison of individual and societal risks with the Criteria for Evaluating Hazard to Life stipulated in Annex 4 of the TM; and
- iv) Identification and assessment of practicable and cost-effective risk mitigation measures (e.g. practicality and cost effectiveness of undergrounding/caverning for DG storage facilities, remote jetty and subsea pipelines).

Hazard Assessment for Explosives

- 4. If use of explosives is required during decommissioning and/or construction of the Project and the location of overnight storage of explosives (magazine) is in close vicinity to populated areas and/or Potentially Hazardous Installation site(s), the Applicant shall carry out hazard assessment to evaluate the risk associated with the storage, use and transport of the explosives. The hazard assessment shall include:
 - i) Identification of hazardous scenarios associated with decommissioning and/or construction of the Project with a view to determining a set of relevant hazard scenarios to be included in a QRA;
 - ii) Execution of a QRA of the set of hazardous scenarios determined in item (i) above, expressing population risks in both individual and societal terms;
 - iii) Comparison of individual and societal risks with the Criteria for Evaluating Hazard to Life stipulated in Annex 4 of the TM; and
 - iv) Identification and assessment of practicable and cost-effective risk mitigation measures (e.g. selection of the shortest practicable road transport routes to and from the explosive magazine).

Cumulative Risk Assessment

- 5. The Applicant shall conduct cumulative risk assessment of DG (fuel gas, non-fuel gas and explosives) during all stages of decommissioning, construction and operation of the Project.

Methodology

- 6. The methodology to be used in the hazard assessment shall be consistent with previous studies having similar issues (e.g. EIA studies for the Permanent Aviation Fuel Facility for Hong Kong International Airport; Development of a Biodiesel Plant at Tseung Kwan O Industrial Estate; Hong Kong Section of Guangzhou - Shenzhen - Hong Kong Express Rail Link; and Kai Tak Development, etc.).

Appendix C

Requirements for Noise Impact Assessment

The noise impact assessment shall include the following:

1. Provision of Background Information and Existing Noise Levels

- (i) The Applicant shall provide background information relevant to the Project, including relevant previous or current studies. Unless required for determining the planning standards, such as those for planning of fixed noise sources, no existing noise levels are particularly required.
- (ii) For ground-borne noise impact, the background information and existing noise levels shall be measured and described in a way sufficient for identification and prediction of noise impacts, and for formulation of noise criteria. Where necessary, baseline noise surveys shall be carried out to determine the existing noise conditions inside NSRs likely to be affected during the decommissioning, construction and operation of the Project. The type and duration of baseline surveys shall be such that there will be adequate information taking account of natural variation to define the existing conditions. Where appropriate, results from relevant past studies should be used.
- (iii) The Applicant shall note the existing background noise due to aircraft on Ma Wan residents and provide information in view of considering the noise impacts from the Project and its mitigations.

2. Identification of Noise Sensitive Receivers

- (i) The Applicant shall refer to Annex 13 of the TM when identifying the NSRs. The NSRs shall include existing NSRs and planned/committed noise sensitive developments and uses earmarked on the relevant Outline Zoning Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by Lands Department and any land use and development applications approved by the Town Planning Board. Photographs of existing NSRs shall be appended to the EIA report.
- (ii) The Applicant shall select assessment points to represent the identified NSRs for carrying out quantitative noise assessment described below. A map showing the location and description such as name of building, use, and number of floors of each and every selected assessment point shall be given. For planned noise sensitive land uses without committed site layouts, the Applicant shall use the relevant planning parameters to work out representative site layouts for noise assessment purpose.

3. Provision of an Emission Inventory of the Noise Sources

- (i) The Applicant shall provide an inventory of noise sources including representative construction equipment, such as those used for tunneling/caverning and other construction works, for the purpose of carrying out the construction noise assessment, and including vehicular and marine traffic flow

and fixed plant equipment, as appropriate, for operational noise assessment. Confirmation of the validity of the inventory shall be obtained from the relevant government departments/authorities and documented in the EIA report. For each selected assessment point, the Applicant shall separate the noise sources into two groups (one having unblocked line of sight to the assessment point and one with blocked line of sight to the assessment point) in the noise impact assessment. For such purpose, the Applicant shall produce plans showing the screened portion of the site and the unscreened portion of the site for each selected assessment point at the beginning of the noise impact assessment.

4. Decommissioning and Construction Noise Assessment

- (i) The assessment shall cover the cumulative noise impacts due to the decommissioning and construction works of the Project and other concurrent projects identified during the course of the EIA study.
- (ii) 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. In case blasting works is involved, it shall be carried out, as far as practicable, outside the sensitive hours of 7 p.m. to 7 a.m. on Monday to Saturday and any time on a general holiday, including Sunday. For blasting that must be carried out during the above-mentioned sensitive hours, the noise impact from the removal of debris and rocks shall be fully assessed and adequate mitigation measures shall be recommended to reduce the noise impact.
- (iii) To minimize the construction noise impact, alternative construction methods to replace percussive piling and blasting shall be proposed as far as practicable.
- (iv) For tunneling/caverning, noise impact (including air-borne noise and ground-borne noise) associated with the operation of powered mechanical equipment, in particular, tunnel boring machines or equivalent, shall be assessed. If the equipment, such as a tunnel boring machine, are used and it is likely that ground-borne noise will affect NSRs, the assessment methodology/model for ground-borne noise shall be consistent with previous studies having similar issues or agreed with the Director prior to the assessment. Methodology and the empirical parameters required in the ground-borne noise model shall be documented in the EIA report.
- (v) 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, rescheduling and restricting hours of operation of noisy tasks) to minimize the impact. If the mitigated noise levels still exceed the relevant criteria, the duration of the noise exceedance at the affected NSR shall be given.
- (vi) 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. In case the Applicant considers that there is an unavoidable need to conduct certain type of construction works during the restricted hours, detailed justifications shall be provided with the assessment of the degree and duration of the noise impact. 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 shall be explicitly stated in the noise chapter and the conclusions and recommendations chapter in EIA report.

5. Operation Noise Assessment

(a) Fixed Noise Sources

(i) Except those of public roads under the Road Traffic Ordinance, the assessment for the passageways within the development site with movements of vehicles (e.g. container trucks, lorries and light vehicles) shall be made as fixed noise sources.

(ii) Assessment of Fixed Source Noise Levels

- ♦ The Applicant shall calculate the expected noise using standard acoustics principles. Calculations for the expected noise shall be based on assumed plant inventories and utilization schedule for the worst-case scenario. The Applicant shall calculate noise levels taking into account correction of tonality, impulsiveness and intermittency in accordance with Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites issued under the NCO.
- ♦ The Applicant shall provide justification for the sound power level of each type of fixed noise sources. For some equipment having more than one notional sources, the Applicant shall separately assess the noise contribution from each notional source. For equipment having notional source at a very high level, the notional source shall be assumed at a representative height above the ground level.
- ♦ The passageways within the development site with movements of vehicles shall be considered as fixed noise sources. Before the assessment of this part of the noise impacts, the Applicant shall propose the methodology for assessing the noise contribution from these internal roads for agreement with the Director.

(iii) 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 fixed noise sources shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM.

- (iv) 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.

(b) Road Traffic Noise

(i) Calculation of Noise Levels

- ♦ The Applicant shall analyse the scope of the proposed road alignment(s) to identify road sections for the purpose of traffic noise impact assessment. In determining whether the traffic noise impact due to a road improvement project/work is considered significant, detailed information with respect to factors including at least change of nature of road, change of alignment and change of traffic capacity or traffic composition shall be assessed. The traffic noise impact shall be considered significant if the traffic noise level with the road project is greater than that without the road project at the design year by 1.0 dB(A) or more. Figures showing extents of the road sections (both existing and new/ altered road sections) shall be provided in the EIA report.
- ♦ For public roads under the Road Traffic Ordinance, the Applicant shall calculate expected road traffic noise using methods described in the U.K. Department of Transport's "Calculation of Road Traffic Noise" (1988). Calculations of future road traffic noise shall be based on peak hour traffic flow at the design year, i.e. the maximum traffic projection within a 15 years period upon commencement of operation of the Project. The Applicant shall calculate traffic noise levels in respect of each road section and the overall noise levels from combined road sections (road sections within the meaning of Item A.1 of Schedule 2 of EIAO and other road sections) at NSRs. The EIA report shall contain sample calculations and input parameters for at least 10 assessment points as requested by the Director.
- ♦ The Applicant shall provide the input data set of the traffic noise model in the format of electronic files in the EIA. The Applicant shall prepare and provide drawings (i.e., road-plots of the traffic noise model) of appropriate scale to show the road segments, topographic barriers, and assessment points of sensitive receivers input into the traffic noise model.
- ♦ The Applicant shall provide input data sets of traffic noise prediction model adopted in the EIA study as requested by the Director for the following scenarios:

1. The scenario without the road projects at the design year;
2. the unmitigated scenario at assessment year;
3. mitigated scenario at assessment year; and
4. prevailing scenario for indirect technical remedies eligibility assessment.

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

(ii) Presentation of Noise Levels

- ♦ The Applicant shall present the prevailing and future noise levels in L10 (1 hour) at the NSRs at various representative floor levels (in m P.D.) on tables and plans of suitable scale.
- ♦ A quantitative assessment at the NSRs for the road alignments shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM. The potential noise impact of the road alignments shall be quantified by estimating the total number of dwellings, classrooms and other noise sensitive elements that will be exposed to noise levels exceeding the criteria set in Table 1A of Annex 5 in the TM.

(iii) Proposals for Noise Mitigation Measures

- ♦ After rounding of the predicted noise levels according to the U.K. Department of Transport's "*Calculation of Road Traffic Noise*" (1988), the Applicant shall propose direct mitigation measures in all situations where the predicted traffic noise level due to the road sections within the meaning of Item A.1 of Schedule 2 of EIAO, exceeds the criteria in Table 1A of Annex 5 in the TM by 1 dB(A) or more; or, for situations where the overall traffic noise level at the NSRs with the road project exceeds the criteria in Table 1A of Annex 5 in the TM by 1 dB(A) or more and at the same time is greater than that without the road project at the design year by 1.0 dB(A) or more. The direct mitigation measures listed under Section 6.1, Annex 13 of the TM, including the option of alternative land use arrangement, shall be thoroughly explored and evaluated with a view to reducing the noise level at the NSRs concerned to the level meeting the relevant noise criteria. Also, the feasibility, practicability, programming and effectiveness of the recommended mitigation measures should be assessed in accordance with section 4.4.2(k) of the TM. Specific reasons for not adopting certain direct mitigation measures in the design to reduce the traffic noise to a level meeting the criteria in the TM or to maximize the protection for NSRs as far as possible shall be clearly and specifically quantified and laid down in the EIA report. Sections of barriers proposed to protect existing NSRs shall be differentiated clearly

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

- ♦ The total number of dwellings, classrooms and other noise sensitive elements that will be benefited from, and be protected by the provision of direct mitigation measures shall be provided. In order to clearly present the extents/locations of recommended noise mitigation measures, plans prepared from 1:1000 or 1:2000 survey maps showing the mitigation measures (e.g. enclosures/barriers, low noise road surfacing) shall be included in the EIA report.
- ♦ The total number of dwellings, classrooms and other noise sensitive elements that will still be exposed to noise levels above the criteria with the implementation of recommended direct mitigation measures shall be quantified. The Applicant shall provide in the EIA report information of recommended noise mitigation measures (including at least barrier types, nominal dimensions at different cross-sections, extents/locations, lengths, mPD levels of barriers) in the format as agreed by the Director (including electronic format).
- ♦ In case where a number of NSRs cannot be protected by the recommended direct mitigation measures, the Applicant shall identify and estimate the total number of existing dwellings, classrooms and other noise sensitive elements which may qualify for indirect technical remedies, the associated costs and any implications for such implementation. For the purpose of determining eligibility of the affected premises for indirect technical remedies, reference shall be made to the following set of three criteria:
 1. the predicted overall noise level at the NSR from the road sections and other traffic noise in the vicinity must be above a specified noise level (e.g. 70 dB(A) for domestic premises and 65 dB(A) for education institutions and places of public worship, all in L10(1hr));
 2. the predicted overall noise level at the NSR is at least 1.0 dB(A) more than the prevailing traffic noise level, i.e. the total traffic noise level existing before the commencement of works to construct the road; and
 3. the contribution from the road sections to the increase in predicted overall noise level from the new road at the NSR must be at least 1.0dB(A).

6. Assessment of Side Effects and Constraints

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

7. Evaluation of Constraints on Planned Noise Sensitive Developments/Land Uses

- (i) 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 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.
- (ii) 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.

Appendix D

Requirements for Water Quality Impact Assessment

1. The Applicant shall identify and analyse in the assessment the physical, chemical and biological disruptions of marine, coastal, estuarine, fresh water or ground water system(s) arising from decommissioning, construction and operation of the Project.
2. The Applicant shall predict, quantify and assess any water quality impacts arising from the Project on the water system(s) and the sensitive receivers by appropriate mathematical modelling and/or other techniques proposed by the Applicant and approved by the Director. The mathematical modelling requirements are set out in Appendix D-1. Possible impacts due to the dredging, piling, fill extraction, filling, transportation and disposal of dredged materials and other marine works activities shall include but not be limited to changes in hydrology, flow regime, silting, sediment erosion and deposition patterns, morphological change of seabed profile, water and sediment quality, fisheries, marine and freshwater organisms/community. The prediction shall include possible different decommissioning stages or sequences, different construction stages or sequences, different construction methods, and different operational stages for the preferred development option identified in the EIA study. Affected sensitive receivers shall be identified by the assessment tool with indications of degree of severity.
3. The Applicant shall take into account and include the likely different decommissioning, construction and operational stages or sequences of the Project in the assessment. The assessment shall have regard to the phasing, frequency, duration and rate of dredging, filling and its sediment loading. Essentially the assessment shall address the following in the water quality impact assessment :

General

- (i) Collection and review of background information on the existing water system(s) and their respective catchments, and sensitive receivers which might be affected by the Project during decommissioning, construction and operation;
- (ii) Characterization of water and sediment quality of the related water system(s) and sensitive receivers, which might be affected by the Project during decommissioning, construction and operation, based on existing information or appropriate site survey/tests as appropriate;
- (iii) Identification and analysis of existing and future activities and beneficial uses related to the water system(s) and identification of water sensitive receivers. The Applicant shall refer to *inter alia* those developments and uses earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans and Layout Plans;
- (iv) Identification of pertinent water and sediment quality objectives, criteria and standards for the water system(s) and the sensitive receivers;

- (v) Review of the decommissioning sequences and methods, construction sequences and methods, and operation of the Project to identify any alteration of water courses, natural streams/ponds, wetland, change of shoreline or bathymetry, change of flow regimes, change of ground water levels, change of catchment types or areas. The selected method shall take into consideration the need to protect relevant water sensitive receivers and let the marine sediments be left in place and not be disturbed as far as possible;
- (vi) Identification, analysis and quantification of existing and future water and sediment pollution sources, including site runoff and groundwater from contaminated area, decontaminated water and wastewater from decontamination processes, point and non-point discharges to surface water runoff and discharges from marine vessels, and analysis of the provision and adequacy of future facilities to reduce such pollution. An emission inventory on the quantities and characteristics of these existing and future pollution sources in the assessment area shall also be provided. Field investigation and laboratory tests, as appropriate, shall be conducted to fill in any relevant information gaps;

Impact Prediction

- (vii) Prediction and quantification, by mathematical modelling or other technique approved by the Director, 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. The mathematical modelling requirements are set out in Appendix D-1. Possible impacts include changes in hydrology, flow regime, silting, sediment erosion or deposition, water and sediment quality and the effects on the aquatic organism due to such changes. The prediction shall include possible different decommissioning stages or sequences, different construction stages or sequences, and different operation stages for the preferred development option including *inter alia* location, position, scale, size, layout, configuration and construction method identified in the EIA Study;
- (viii) Identification and quantification of dredging, piling, fill extraction, filling, sediment/mud transportation and disposal activities and requirements. Potential dumping ground(s) and sand borrowing ground(s) to be involved shall also be identified and cumulative environmental impacts during their operation shall be evaluated. Field investigation, sampling and chemical and biological laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. The potential for the release of contaminants during dredging shall be addressed using the chemical testing results derived from sediment samples collected on site and relevant historic data. Appropriate laboratory tests such as elutriate tests shall be performed on the sediment samples to simulate and quantify the degree of mobilization of various contaminants such as metals, ammonia, trace organic contaminants into the water column during dredging. The ranges of parameters to be analyzed; the

number, location, depth of sediment, type and methods of sampling; sample preservation; and chemical and biological laboratory test methods to be used shall be subject to the approval of the Director. The Applicant shall also assess the pattern of the sediment deposition and the potential increase in turbidity and suspended solid levels in the water column and at the sensitive receivers due to the disturbance of sediments during dredging and filling;

- (ix) Assessment of cumulative decommissioning, construction and operational water quality impacts due to other projects, activities or pollution sources in the vicinity of the identified water system(s) and sensitive receivers that may have a bearing on the environmental acceptability of the Project through mathematical modelling or other technique approved by the Director;
- (x) Recommendation of appropriate mitigation measures to avoid or minimize the impacts identified above, in particular suitable methods and arrangement for dredging, filling and mud disposal, shall be recommended to mitigate any adverse impact. 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 shall be assessed using appropriate mathematical models as set out in Appendix D-1;

Waste Water and Non-point Sources Pollution

- (xi) Proposal for upgrading or providing any effective infrastructure, water pollution prevention and mitigation measures to be implemented during the decommissioning, construction and operation stages so as to handle any wastewater generated including *inter alia* wastewater discharge from marine vessels 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;
- (xii) Investigation of and proposal for, as appropriate, best management practices to reduce storm water and non-point source pollution;
- (xiii) 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;

Fuel Spillage

- (xiv) 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 D-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; and

Sewerage and Sewage Treatment Implication

- (xv) The Applicant shall study and assess the impacts of the sewage discharge from the Project on the sewerage system connecting to the Stonecutters Island Sewage Treatment Works. The assessment shall include the following :
 - a) Investigation and review of the existing, committed and planned sewerage networks and sewage treatment and disposal facilities;
 - b) Assessment of the sewerage system of the Project, including sewage treatment and disposal facilities, taking into account the projected flows from the Project;
 - c) Assessment of the impact of the Project on the existing, committed and planned sewerage system and sewage treatment and disposal facilities;
 - d) Preparation of a sewerage master plan for the Project using the latest version of the computerised analysis technique “INFOWORKS” or equivalent computer software agreed by the Director;
 - e) Identification of sewerage upgrading works required for the sewerage networks and sewage treatment and disposal facilities; and
 - f) Recommendation of upgrading of sewage treatment and disposal facilities and sewerage networks as appropriate, development of the implementation programme and preparation of the cost estimates.
- 4. The Applicant shall compare the environmental benefits and dis-benefits of different possible location, position, scale, size, shape, configuration, layout, design, construction method and operation mode/measures of the Project with a view to avoiding or minimising the adverse environmental effect on Ma Wan Channel, Ma Wan Fish Culture Zone, coral sites, bathing beaches and recreational and tourism related uses at Ma Wan, Tsing Yi, Kwai Chung, Tsuen Wan and Ting Kau and along Castle Peak Road, seawater intakes at Ma Wan and Tsing Yi, WSD’s SWPSs at Tsing Yi, Tsuen Wan, Cheung Sha Wan, Kennedy Town, Sheung Wan, Wan Chai and Yau Ma Tei, and HATS’ submarine sewage outfall at the Stonecutters Island, and

morphological change of the seabed during decommissioning, construction and operation stages. The Applicant shall describe clearly the potential impact on the benthic organisms at the related seabed areas, frequency and rate of dredging and recurrent water quality impacts of the maintenance dredging activities due to different development options of the Project alone and the cumulative impact with concurrent projects.

5. The Applicant shall evaluate the need of maintenance dredging at different operation stages of the Project. The cumulative water quality impacts arising from maintenance dredging and other interfacing projects within the study area shall be assessed with reference to the frequency and rate of maintenance dredging required for the preferred option identified in the EIA Study.

Appendix D-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.

Model details – Calibration & Validation

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

<u>Criteria</u>	<u>Level of fitness with field data</u>
• tidal elevation (@)	< 8 %
• maximum phase error at high water and low water	< 20 minutes
• maximum current speed deviation	< 30 %
• maximum phase error at peak speed	< 20 minutes
• maximum direction error at peak speed	< 15 degrees
• maximum salinity deviation	< 2.5 ppt
@ 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 Applicant shall be responsible for acquiring/developing and calibration of the models for use in this study themselves. They might make reference to the models developed under the Update on Cumulative Water Quality and Hydrological Effect of

Coastal Developments and Upgrading of Assessment Tool (Agreement No. CE 42/97). They might also propose to use other models subject to agreement with the Director.

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 the Director. Contaminants release and DO depletion during dredging and dumping shall be simulated by the model.
3. The thermal model shall be based on the flow field produced by the hydrodynamic model. It shall incorporate the physical processes of thermal / cooled water discharge and abstraction flow, buoyancy effect of the thermal plume, and surface heat exchange. Dispersion of biocides in the discharge shall also be simulated with appropriate decay rates.
4. The models shall at least cover the Hong Kong waters, the Pearl Estuary and the Dangan Channel to incorporate all major influences on hydrodynamic and water quality. A fine grid model may be used for detailed assessment of this study. It shall either be linked to a far field model or form part of a larger model by gradual grid refinement. The coverage of the fine grid model shall be properly designed such that it is remote enough so that the boundary conditions would not be affected by the project. The model coverage area shall be agreed with the Director.
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 the Director.

Modelling assessment

1. The assessment shall include the construction and operation phases of the project. Where appropriate, the assessment shall also include maintenance dredging. Scenarios to be assessed shall cover the baseline condition and scenarios with various different options proposed by the Applicant in order to quantify the environmental impacts and improvements that will be brought about by these options. Corresponding pollution load, bathymetry and coastline shall be adopted in the model set up.

2. 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 the Director.
3. Hydrodynamic, sediment transport, oil spill 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 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. 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.
6. The impact on all sensitive receivers shall be assessed.
7. Cumulative impacts due to other projects, activities or pollution sources within a boundary to the agreement of the Director shall also be predicted and quantified.

Appendix E-1

Requirements for Assessment of Waste Management Implication

The assessment of waste management implication shall cover the following:

1. Analysis of Activities and Waste Generation

- (i) The Applicant shall identify the quantity, quality and timing of the wastes arising as a result of the decommissioning, construction and operation activities of the Project, based on the sequence and duration of these activities, e.g. contaminated soil, dredged/excavated sediment/mud, construction and demolition materials, floating refuse and other wastes which will be generated during decommissioning, construction and operation stages. The Applicant shall adopt design, general layout, decommissioning/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, e.g. reclamation work.

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 that can be taken in the planning and design stages e.g. by modifying the design approach and in the decommissioning and 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 waste shall be described in detail. The disposal methods/options recommended for each type of wastes shall take into account the result of the assessment in item (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 wastes identified; and
- (v) 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. Dredging/Excavation, Filling and Dumping

- (i) Identification and quantification as far as practicable of dredging/excavation, fill extraction, filling, reclamation, sediment/mud transportation and disposal activities and requirements shall be conducted. Potential fill source and dumping ground to be involved shall also be identified. Field investigation, sampling and chemical and biological laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. The ranges of parameters to be analyzed; the number, type and methods of sampling; sample preservation; chemical and biological laboratory test methods to be used shall be agreed with the Director (with reference to Section 4.4.2(c) of the TM) prior to the commencement of the tests. The categories of sediment/mud which are to be disposed of in accordance with a permit granted under the Dumping at Sea Ordinance (DASO) shall be identified by both chemical and biological tests and their quantities shall be estimated. If the presence of any serious contamination of sediment/mud which requires special treatment/disposal is confirmed, the Applicant shall identify the most appropriate treatment and/or disposal arrangement and demonstrate its feasibility; and
- (ii) The Applicant shall identify and evaluate the best practical dredging/excavation methods to minimize dredging/excavation and dumping requirements and demand for fill sources based on the criterion that existing sediment/mud shall be left in place and not to be disturbed as far as possible.

Appendix E-2

Requirements for Land Contamination Assessment

The land contamination assessment shall cover the following:

1. Land Use Review - The Applicant shall provide a clear and detailed account of the present land use (including description of the activities, chemicals and hazardous substances handled, with clear indication of their storage and location, by reference to a site map) and a complete past land use history in relation to possible land contamination (including accident records and change of land use(s) and the like).
2. Contamination Assessment Plan - During the course of the EIA study, the Applicant shall submit a Contamination Assessment Plan (CAP) to the Director for agreement prior to conducting the contamination impact assessment of the relevant land or site(s). The CAP shall include proposal with details on representative sampling and analysis required to determine the nature and the extent of the contamination of the relevant land or site(s). Alternatively, the Applicant may refer to other previously agreed and still relevant and valid CAP(s) for the concerned site(s).
3. Contamination Assessment Report and Remedial Action Plan - Based on the agreed CAP, the Applicant shall conduct a land contamination impact assessment and submit a Contamination Assessment Report (CAR). If land contamination is confirmed, a Remedial Action Plan (RAP) shall also be prepared and submitted to formulate viable remedial measures with supporting documents, such as agreement by the relevant facilities management authorities. The Applicant shall clean up the contaminated land or site(s) according to the RAP, and a Remediation Report (RR) to demonstrate adequate clean-up shall be prepared and submitted prior to the commencement of any development works within the site. The CAP, CAR and RAP shall be documented in the EIA report.
4. If there is/are potential contaminated site(s) inaccessible for preparing sampling and analysis during the course of the EIA study, e.g. due to site access problem, the Applicant's CAP shall include :
 - (i) a review of the available information;
 - (ii) an initial contamination evaluation of this/these site(s) and possible remediation methods;
 - (iii) a confirmation of whether the contamination problem at this/these site(s) will be surmountable;
 - (iv) a sampling and analysis proposal which shall aim at determining the nature and the extent of the contamination of this/these site(s); and
 - (v) a schedule of submission of revised CAP (if necessary), CAR and RAP upon this/these site(s) is/are accessible.
5. Prevention of Potential Land Contamination during Operation - To prevent potential contamination problems during operational phase of the Project, the Applicant shall (i) identify the possible sources of contamination associated with the operation of the Project; and (ii) formulate appropriate operational practices, waste management strategies and precautionary measures for prevention of contamination problems.

Appendix F

Requirements for Ecological Impact Assessment

The ecological impact assessment shall cover both terrestrial and marine ecology and shall include the following :

1. Examination the flora, fauna and other components of the ecological habitats within the assessment area. The aim shall be to protect, maintain or rehabilitate the natural environment. In particular, the Project shall avoid or minimise impacts on recognised sites of conservation importance such as SSSIs and wildlife groups or habitats/species of conservation important such as *Croton hancei*, important habitats of wildlife and marine mammals such as Finless Porpoise and Chinese White Dolphin, marine benthic communities, intertidal habitats and coral communities. The assessment shall identify and quantify as far as possible the potential ecological impacts to the natural environment and the associated wildlife groups and habitats/species arising from the Project including their decommissioning, construction and operation phases as well as the subsequent management and maintenance of the proposals.
2. Review of the findings of relevant studies/surveys and collation of the available information regarding the ecological characters of the assessment area.
3. Evaluation of information collected and identification of any information gap relating to the assessment of potential ecological impact.
4. Carrying out of necessary ecological field surveys and investigation of at least 6 months covering both wet and dry seasons to verify the information gaps identified in (3) above and to fulfil the objectives of the EIA study. The field surveys shall include but not limited to corals, marine benthic communities and intertidal habitats.
5. Establishment of the general ecological profile of the Study Area based on data of relevant previous studies/surveys and results of the ecological field surveys, and taking into consideration the seasonal variations, and description of the characteristics of each habitat found; major information to be provided shall include :
 - (a) description of the physical environment, including recognized sites/ habitats of conservation importance, and assessment of whether these sites/habitats will be affected by the Project;
 - (b) habitat maps of suitable scale showing the types and locations of habitats/species in the Study Area with special attention to those with conservation interests, including the followings :
 - South Tsing YI SSSI ;
 - coral communities (including all hard corals, octocorals and black corals);
 - marine benthic communities and intertidal habitats (including rocky shores and sandy shores);
 - marine mammals, in particular Finless Porpoises and Chinese White

- Dolphin, and
- any other habitats/species identified as having special conservation interest by this EIA study.
- (c) ecological characteristics of each habitat type such as extent, substrate, size, type, species present, dominant species found, species diversity and abundance, community structure, ecological value and 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.
6. Investigation and description of the existing wildlife uses of the various habitats with special attention to those wildlife groups and habitats with conservation interests, including South Tsing Yi SSSIs, endemic shrub *Croton hancei*, coral communities, important benthic communities and intertidal habitats, and marine mammals (e.g. Finless Porpoises and Chinese White Dolphin), in the context of the Project;
7. Using suitable methodology and considering also other works activities from other projects reasonably likely to occur at the same time, identification and quantification as far as possible of any direct (e.g. loss of habitats due to reclamation, dredging, marine works, site formation and other associated works, etc), indirect (e.g. changes in water qualities, hydrodynamics properties, sedimentation rates and pattern, hydrology, noise and other disturbance generated by the decommissioning, construction and operation activities, etc), on-site, off-site marine habitats at Ma Wan, primary, secondary and cumulative ecological impacts from other projects (e.g. CT10 Development at Southwest Tsing Yi, Tsing Yi Lantau Link, and Harbour Area Treatment Scheme) such as destruction of habitats, reduction of species abundance/diversity, loss of feeding grounds, reduction of ecological carrying capacity, habitat fragmentation, and in particular the followings :
- (a) Potential destruction or disturbance to natural habitats at Tsing Yi (including habitats of endemic shrub *Croton hancei*);
 - (b) Potential impacts to marine benthic communities and intertidal habitats (including rocky shores and sandy shores);
 - (c) Potential deterioration or disturbance to corals (including hard corals, octocorals and black corals);
 - (d) Potential impacts on marine ecology due to dredging and disposal of contaminated mud; and

- (e) Potential impacts to marine habitats/species of conservation value, including Finless Porpoises, Chinese White Dolphin and any others discovered during the course of the EIA study.
- 8. Evaluation of 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 decommissioning, construction and operation phases as well as the subsequent management and maintenance requirement of the Project.
- 9. Evaluation of potential cumulative impact on habitats/species of conservation interest arising from this Project.
- 10. Recommendations for possible alternatives, such as modification/change of construction methods, location, position, scale, size, layout and configuration of the Project, and practicable mitigation measures to avoid, minimize and/or compensate for the adverse ecological impacts identified during decommissioning, construction and operation of the Project.
- 11. Evaluation of the feasibility and effectiveness of the recommended mitigation measures and definition of the scope, type, location, implementation arrangement, resources requirement, subsequent management and maintenance of such measures.
- 12. Determination and quantification as far as possible of the residual ecological impacts after implementation of the proposed mitigation measures.
- 13. Evaluation of the significance and acceptability of the residual ecological impacts by making reference to the criteria in Annex 8 of the TM.
- 14. Review of the need for and recommendation on any ecological monitoring programme required.

Appendix G

Requirements for Fisheries Impact Assessment

1. The assessment shall cover any potential short and long-term impacts on both capture and culture fisheries, during the decommissioning, construction and operation phases. Existing information available from relevant studies/surveys regarding the assessment 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. If field surveys are considered necessary, the assessment shall recommend appropriate methodology, duration and timing for the field surveys.
2. The fisheries impact assessment shall include the following tasks:
 - (i) Description of the physical environmental background;
 - (ii) Description and quantification of the existing capture and culture fisheries activities;
 - (iii) Description and quantification of the existing fisheries resources (e.g. major fisheries products and stocks);
 - (iv) Identification of parameters e.g. water quality parameters and areas that will be affected;
 - (v) Identification and evaluation of any direct and indirect, onsite and offsite impacts on capture fisheries such as loss or disturbance of fishing grounds, spawning and nursery grounds and disruption of fishing activities;
 - (vi) Identification and evaluation of any direct and indirect, onsite and offsite impacts on culture fisheries such as water quality deterioration in fish culture zone;
 - (vii) Recommendations on any environmental mitigation measures with justification, description of scope and programme, feasibility as well as staff and financial implications including those related to subsequent management and maintenance requirements of such recommendations; and
 - (viii) Review of the need for monitoring and, if necessary, recommendation of monitoring and auditing programme.

Appendix H

Requirements for Landscape, Visual and Glare Impact Assessments

1. 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 the statutory town plan(s) and any published land use plans shall be highlighted and appropriate follow-up action shall be recommended.
2. The Applicant shall describe, appraise, analyse 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. 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, recreation and tourism related uses, and scenic spot such as Tsing Ma Bridge. 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. Tree survey shall be carried out and the impacts on existing trees shall be addressed.
3. The Applicant shall assess the visual and glare 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 existing and planned sensitive receivers within the visual envelope with regard to views from ground level, sea level and elevated vantage points;
 - (iii) description of the visual compatibility of the Project with the surrounding and the planned setting, and its obstruction and interference with the key views of the study areas;
 - (iv) identification of the severity of visual impacts in terms of distance, nature and number of sensitive receivers. The visual impacts of the Project with and without mitigation measures shall be included so as to demonstrate the effectiveness of the proposed mitigation measures;
 - (v) identification and evaluation of the glare impact due to decommissioning,

construction and operation of the Project. The glare impact assessment shall include the following tasks :

- (a) identification and description of any glare or uncomfortable eye feeling caused by light interference from direct man-made light sources generated from the Project;
 - (b) derivation of numerical criteria and lighting engineering approach for credible glare impact assessment;
 - (c) carrying out of computer lighting calculation/analysis by persons with appropriate training in lighting engineering; and
 - (d) recommendations for possible alternatives, such as design, orientation, spotting angle, intensity and operation mode, and practicable mitigation measures to avoid or minimise the adverse glare impact identified during decommissioning, construction and operation of the Project.
- (vi) clear evaluations and explanations of the factors considered in arriving the significance thresholds of visual impacts, and the factors/constraints in recommending the mitigation measures for visual and/or glare impact.
4. 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 location, position, configuration, site layout, design, built-form, operation mode and construction method 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 adverse effects identified above, including provision of a master landscape plan.
 5. The mitigation measures shall also include the preservation of vegetation, transplanting of mature trees when tree removal is inevitable, 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 and visually sensitive receivers. Parties shall be identified for the on going management and maintenance of the proposed mitigation works to ensure their effectiveness throughout the decommissioning phase, construction phase and operation phase of the Project. A practical programme and funding proposal for the implementation of the recommendation measures shall be provided.
 6. Annotated illustration materials such as colour perspective drawings, plans and section/elevation diagrams, annotated oblique aerial photographs, photographs taken at vantage points, and computer-generated photomontage shall be adopted to fully illustrate the landscape and visual impacts of the Project. In particular, the landscape and visual impacts of the Project with and without mitigation measures from

representative viewpoints, particularly from views of the most severely affected visually sensitive receivers (i.e. worst case scenario), shall be properly illustrated in existing and planned setting at four stages (existing condition, Day 1 with no mitigation measures, Day 1 with mitigation measures and Year 10 with mitigation measures) by computer-generated photomontage so as to demonstrate the effectiveness of the proposed mitigation measures. 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.

7. The Applicant shall assess the cumulative landscape and visual impacts of the Project with other committed and planned developments.

Appendix I

Requirements for Marine Archaeological Investigation under Cultural Heritage Impact Assessment

1. The assessment area for the potential archaeological impact shall include all areas affected by the marine and dredging works of the Project.
2. 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.
3. If marine archaeological potential is identified and the need for further investigation is confirmed, a marine archaeological investigation (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
4. 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 AMO.

Appendix I-1

Guidelines for Marine Archaeological Investigation (MAI)

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

1. Baseline Review

- 1.1 A baseline review should be conducted to collate the existing information in order to identify the potential for archaeological resources and, if identified, their likely character, extent, quality and value.
- 1.2 The baseline review will focus on known sources of archive data. It will include:
 - a. Geotechnical Engineering Office (GEO) – the Department holds extensive seabed survey data collected from previous geological research.
 - b. Marine Department, Hydrographic Office - the Department holds a substantial archive of hydrographic data and charts.
 - c. The Royal Naval Hydrographic Department in the UK - the Department maintains an archive of all survey data collected by naval hydrographers.
 - 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 1:500 scale and show each survey contact. Its dimensions and exact location should also be shown.

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

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

5. Report

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

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 bilingual (in both English and Chinese) executive summary as required under section 6(2) of the EIAO to be supplied at the time of application for approval of the EIA report.
 - (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 bilingual (in both English and Chinese) executive summary with or without Addendum as required under section 7(5) of the EIAO, to be supplied upon advice by the Director for consultation with the Advisory Council on the Environment.
2. 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 4.0 or later), unless otherwise agreed by the Director. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EIA report and 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.