Appendix B

Modelling requirements for thermal discharges North Hong Kong Island Line

Modelling software general

1. The modelling software shall be fully 3-dimensional capable of accurately simulating the stratified condition and salinity transport within the model area.

2. The modelling software shall consist of hydrodynamic & thermal modules. The hydrodynamic and thermal modules shall have been proven with successful applications locally and overseas.

3. The hydrodynamic and thermal modules shall be strictly mass and energy conserved at all levels.

Model details – Calibration & Validation

1. No field data collection is required for model calibration for this study. However, the models shall have been properly calibrated and validated before commencement of this study in the Victoria Harbour with the field data collected by:

    - Hydraulic and Water Quality Studies in Victoria Harbour (1987)
    - Port and Airport Development Strategy - Enhancement of WAHMO Mathematical Models (1990)
    - Strategic Sewage Disposal Scheme Stage II - Oceanic Outfall, Oceanographic Surveys and Modelling (1992)
    - EPD's routine monitoring data
    - Tidal data from HK Observatory, Macau and relevant Mainland Authorities.

2. Tidal data shall be calibrated and validated in both frequency and time domain manner.

3. For the purpose of calibration and validation, the model shall run for not less than 15 days of real sequence of tide (excluding model spin up) in both dry and wet seasons with due consideration of the time required to establish initial conditions.

4. In general the hydrodynamic models shall be calibrated to the following criteria:

Criteria	Level of fitness with field data
• tidal elevation (root mean square)	< 8 %
• maxi. phase error at HW and LW	< 20 minutes
• maxi. 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

Model details – Simulation

1. The thermal model shall be based on the flow field produced by the hydrodynamic model. It shall incorporate the physical processes of thermal water discharge and abstraction flow, buoyancy effect of the thermal plume, and surface heat loss. Dispersion of biocide in the discharge shall also be simulated with an appropriate decay rate.

2. The models shall at least cover the whole of Victoria Harbour Water Control Zone as defined under the Water Pollution Control Ordinance. Particularly in the wet season, the hydrodynamic model shall be able to reproduce stratification in Victoria Harbour due to the fresh water discharge from the Pearl Estuary.

3. Model grid across major flow channels including the Lei Yue Mun shall be less than 75 m. 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 schematisation shall be agreed with EPD. All models shall either be dynamically linked to a far field model or form part of a larger model by gradual grid refinement.

Modelling assessment

1. Scenarios to be assessed shall cover all phases of development being considered. All thermal heat and biocide discharges from sources in the Central and Wanchai area shall be identified and quantified with the cumulative impacts assessed. Corresponding bathymetry and coastline shall be adopted in the model set up.
2. Model results should be presented in format assessable for compliance of Water Quality Objectives.
3. Hydrodynamic and thermal models shall be run for 15 days (excluding model spin up) of real sequence of tide. In general, both the wet season and dry season shall be simulated.
4. The impact on all identified sensitive receivers shall be assessed.
5. All modelling input data and results shall be submitted in digital media to EPD.