

Annex B-2

Environmental Impact Assessment for Proposed Submarine Gas Pipelines from Cheng Tou Jiao Liquefied Natural Gas Receiving Terminal, Shenzhen to Tai Po Gas Production, Hong Kong

Water Quality Modelling Requirements

Modelling software general

1. The modelling software shall be fully 3-dimensional capable of accurately simulating the stratified condition and salinity transport, and effect of wind and tide within the model area.
2. The modelling software shall consist of hydrodynamic, water quality and particle dispersion modules. The hydrodynamic and water quality modules shall have been proven with successful applications locally and overseas.
3. The hydrodynamic and water quality modules shall be strictly mass 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 be properly calibrated and validated before its use in this study in the marine waters in the area including the Tolo Harbour & Channel Water Control Zone and the upper half of Mirs Bay Water Control Zone (as shown in Annex B-1), as defined under the WPCO, with the field data collected by :-
 - Strategic Sewage Disposal Scheme Stage II - Oceanic Outfall, Oceanographic Surveys and Modelling (1992 & 1993)
 - Update on Cumulative Water Quality and Hydrological Effect of Coastal Developments and Upgrading of Assessment Tool (1998)
 - 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:

| <u>Criteria</u> | <u>Level of fitness with field data</u> |
|---|---|
| • 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 suspended solids model for assessing impacts of sediment loss due to marine works shall incorporate the processes of settling, deposition and erosion. Contaminant release and DO depletion during dredging / jetting and dumping shall be simulated by the model.
2. The water quality modeling 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, air-water exchange, contaminant release of dredged / jetted and disposal material, and benthic processes. It shall also be able to simulate salinity and *E. Coli*. Salinity results simulated by hydrodynamic models and water quality models shall be demonstrated to be consistent.
3. The models shall at least cover the Hong Kong waters, the Pearl Estuary and the Lema Channel to incorporate all major influences on hydrodynamic and water quality. A fine grid model can be used for detailed assessment of this study. It shall cover at least the Tolo Harbour & Channel Water Control Zone and the upper half of Mirs Bay Water Control Zone (as shown in Annex B-1) as defined under the WPCO.
4. 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 the Director. 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. Corresponding pollution load generated from dredging / jetting works, bathymetry and coastline shall be adopted in the model set up.

2. Hydrodynamic and water quality models shall be run for (with proper model spin up) at least a real sequence of 15 days spring-neap tidal cycle in both dry season and wet seasons.
3. The results shall be assessed for compliance of Water Quality Objectives. Any changes in hydrodynamic regime shall be assessed. Daily sedimentation rate shall be computed and its ecological impact shall be assessed.
4. The impact on all sensitive receivers including the application of bacterial dispersion module shall be assessed.
5. All modelling input data and results shall be submitted in digital media to the Director.