APPENDIX 3D   COMPARISON OF OBSERVED WATER QUALITY AGAINST TIME SERIES PLOTS OF PREDICTED WATER QUALITY AT EPD WATER QUALITY MONITORING STATIONS NEAR PROJECT SITE

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Source:

Observed Data

EPD Marine Water Quality Monitoring Stations SM1, SM19, MM8, EM3 2011 to 2020.

Modelled Data
Time series prediction of Delft3D WAQ model (TTDD) at the same locations for 2016.

Approach

Average of observed data for each month of the 10 most recent years were used for comparison to smooth out inter-annual variation of meteorological and hydrological conditions which has not been taken into account in the Delft3D modelling scenario.

Discussion

Model prediction for key water quality parameters for this Project, namely, dissolved oxygen, 5-day biochemical oxygen demand, total inorganic nitrogen, orthophosphate phosphorus, suspended solids and chlorophyll-a, would be discussed in turn in the subsequent sections.

(a) Dissolved Oxygen

Predicted dissolved oxygen levels were in similar order. Some levels of stratification were predicted but the levels were underestimated.

(b) Biochemical Oxygen Demand

Predicted biochemical oxygen demand were similar to the observed level at the nearby EPD monitoring stations with small underestimation. Such small underestimation is not considered to be of particular concern that could affect the conclusion of the modelling exercise given both the observed and predicted levels were significantly below that of the corresponding assessment criterion of 10 mg/L.

(c) Total Inorganic Nitrogen

The predicted level of total inorganic nitrogen were generally higher than that of the observed levels at the nearby EPD monitoring stations as a results of conservative assumptions adopted for estimation of pollution loading. Note that given the more average dry and wet hydrodynamic conditions modelled (in terms of varying river flow rate of the Pearl River Delta), the simulated levels lack the seasonal peak of total inorganic nitrogen in wet season, while slightly more overestimation were observed in the rest of wet season.

(d) Orthophosphate Phosphorus

The model prediction for orthophosphate phosphorus matched quite well with the observed data with slight overestimation (because of conservative pollution load estimation) and was able to reproduce stratification and slightly elevated levels in the wet season.

(e) Suspended Solids

The predicted levels of suspended solids were in similar order as the observed data, with a small overall underestimation.

(f) Chlorophyll-a

The predicted levels of chlorophyll-a were generally higher than the observed data as a result of conservative overestimation of nitrogenous and phosphorus nutrients discussed above. Nevertheless, the elevated levels during wet season as well as the stratification were both reproduced in the model. Noted that as a result of simulating the average dry and wet hydrodynamic conditions

(explained in prior section), there were a slight underestimation of nitrogenous nutrients, and accordingly an underestimation of chlorophyll-a in part of the wet season.

Conclusion

The water quality model was able to reproduce key water quality characteristics including seasonal changes and stratification, as well as suitably accurate prediction of certain key water quality parameters. Note that the effect of conservative overestimation of pollution load, particularly for nitrogenous and phosphorus nutrients have been reflected in as the overestimated levels in the model. Such overestimation is deemed conservative in term of assessment and be suitable for the purpose of an environmental impact assessment study. It is therefore concluded this water quality model of TTDD suitable for this Study.

Parameters	Location	Plot
Dissolved Oxygen	SM1	
	SM19	
	MM8	

	EM3	
Biochemical Oxygen Demand	SM1	
	SM19	
	MM8	

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	EM3	
Total Inorganic Nitrogen	SM1	
	SM19	
	MM8	

	EM3	
Orthophosphate Phosphorus	SM1	
	SM19	
	MM8	

	EM3	
Suspended Solids	SM1	
	SM19	
	MM8	

	EM3	
Chlorophyll-a	SM1	
	SM19	
	MM8	

EM3	