Annex 5C

Technical Note on Delft3D Water Quality Model

CONTENTS

1 INTRODUCTION

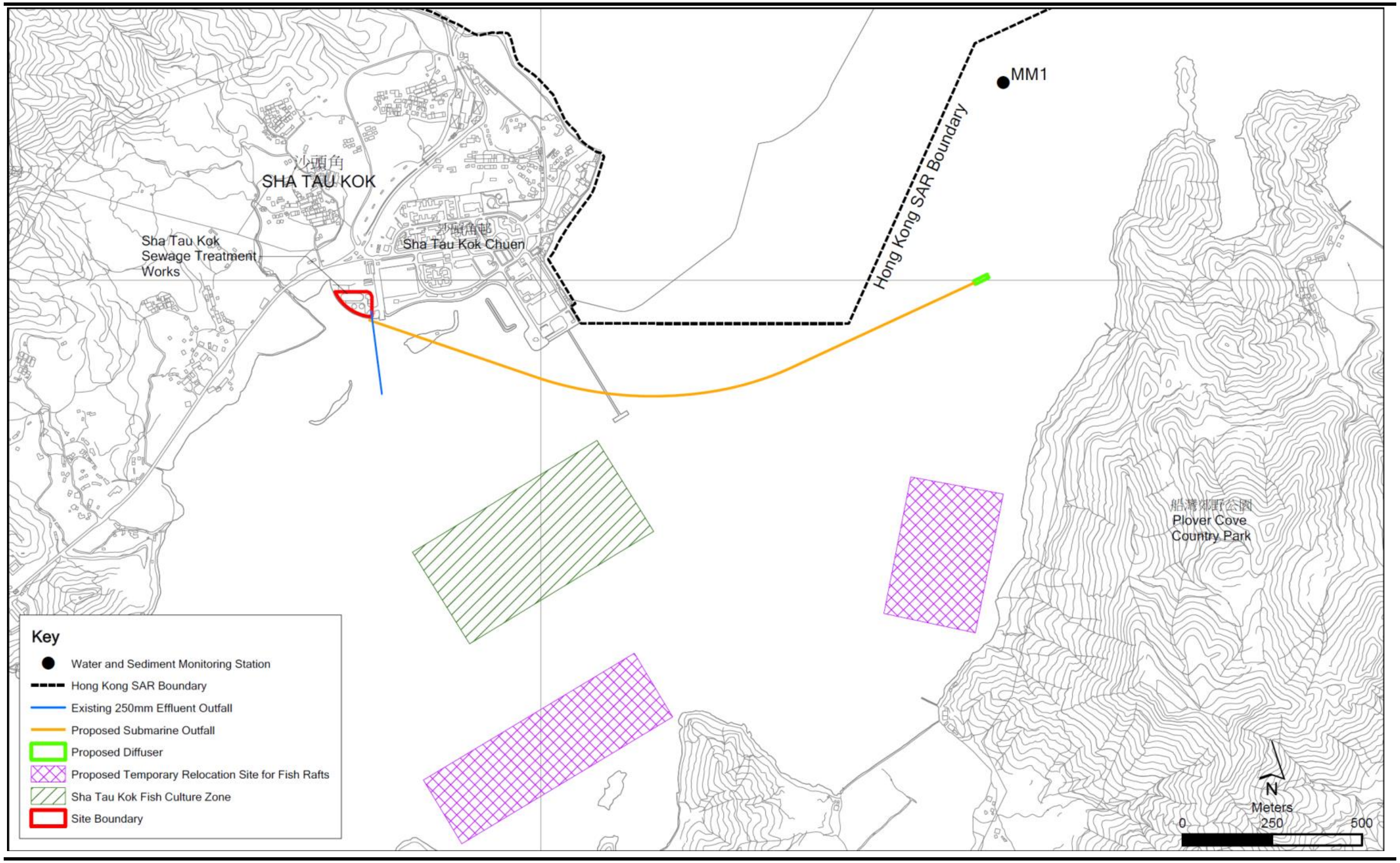
1.1 PURPOSE

The Sha Tau Kok Delft3D fine grid model (STK Model) has been developed based on the Tolo Harbour and Mirs Bay Model (THMB Model) under the *"Expansion of Sha Tau Kok Sewage Treatment Works, Phase 1"* (hereinafter referred to as the "Project") for water quality modelling prediction of potential change in water quality due to the operation of the expanded Sha Tau Kok Sewage Treatment Works (STKSTW).

The hydrodynamic model verification of the STK Model has been conducted by comparison with the performance of the THMB Model and the results are documented in the water quality modelling methodology paper for the EIA of the Project. This document will discuss the settings and performance of the STK water quality modelling exercise for the purpose of performance verification.

The water quality modelling assessment of the operation of the expanded STKSTW is beyond the scope of this document and would be addressed under the main text and corresponding annexes of the EIA.

Figure 1.1 Location of the Sha Tau Kok Sewage Treatment Works



2 OVERVIEW OF MODEL INPUTS

2.1 FLOW AGGREGATION

The water quality model of the STK Model makes use of the flow field generated from the corresponding Delft3D FLOW simulation, which was calibrated and verified against the THMB Model. No horizontal aggregation was conducted when coupling the flow field for Delft3D WAQ simulation. Vertical aggregation with 1-2-2-3-2 ratio of hydrodynamic layers (each constitutes 10% of the water column) was applied for the water quality layers.

2.2 SUBSTANCES INVOLVED

The transport of substances and associated water quality processes are incorporated in the Delft3D-WAQ module. The framework contains suspended sediment, nutrients phytoplankton growth and bacteria. The applied state variables of the water quality model are adopted from the *Update Model* and are listed below:

Table 2.1 List of State Variables in STK Water Quality Model

State Variables (Model Name)	Description	Unit
Salinity	Salinity (from)	g/kg
ModTemp	Water temperature	˚C
IM1	Inorganic matter (originate from HK)	gDM/m^3
IM1S1	Inorganic matter (originate from HK) in the bottom	gDM
IM2	Inorganic matter (originate from Pearl River Delta)	gDM/m^3
IM2S1	Inorganic matter (originate from Pearl River Delta) in the bottom	gDM
IM3	Inorganic matter (originate from ocean)	gDM/m^3
IM3S1	Inorganic matter (originate from ocean) in the bottom	gDM
EColi	E. coli bacteria	MPN/m^3
OXY	Dissolved oxygen	$gO2/m^3$
CBOD5	Carbonaceous BOD (first pool) at 5 days, excluding algae and detritus	$gO2/m^3$
NO3	Dissolved nitrate-N and nitrite-N	gN/m^3
NH4	Dissolved ammonium-N	gN/m^3
DetN	Detritus nitrogen (dead algae)	gN/m^3
DetNS1	Detritus nitrogen (dead algae) in the bottom	gN
PO4	Dissolved ortho-phosphate phosphorus	gP/m^3
AAP	Adsorbed inorganic phosphate	gP/m^3
AAPS1	Adsorbed inorganic phosphate in the bottom	gP
DetP	Detritus phosphorus (dead algae)	gP/m^3
DetPS1	Detritus phosphorus (dead algae) in the bottom	gP
Si	Dissolved silica	gSi/m^3
DetSi	Detritus silica (dead algae)	gSi/m^3
DetSiS1	Detritus silica (dead algae) in the bottom	gSi
Diat	Algae, diatoms	gC/m^3
DiatS1	Algae, diatoms in the bottom	gC
Green	Algae, non-diatoms	gC/m^3
GreenS1	Algae, non-diatoms in the bottom	gC
DetC	Detritus carbon (dead algae)	gC/m^3
DetCS1	Detritus carbon (dead algae) in the bottom	gC

State Variables (Model Name)	Description	Unit
Cu	Copper	g/m^3
CuS1	Copper in the bottom	g

2.3 *INITIAL CONDITIONS AND BOUNDARY CONDITIONS*

Uniform initial conditions for various state variables are defined in the water quality model based on long-term average water quality monitoring results of EPD monitoring stations MM1 from 1986-2013. The model is then subjected to model spin-up run for two years to eliminate the effect of selected initial conditions.

Water quality model boundary conditions were constructed based on long-term average water quality monitoring results of the 2 nearest EPD monitoring stations MM15 and PM11 from 1986-2013. Temporally constant, depth-varying boundary conditions, based on the surface, middle, bottom results of the marine water quality monitoring results from MM15 and PM11, were constructed for wet season and dry season respectively. It is noted that the Study area (the Starling Inlet and northern Mirs Bay) is over 20 km away from the model boundary and the selection of water quality model boundary does not seems to exert any notable effect on the WSRs under this Study.

2.4 *METEOROLOGICAL FORCING*

Environmental conditions imposed on the wet and dry season water quality model is provided below:

Table 2.2 Meteorological Forcing adopted for Water Quality Model – Dry and Wet Season

Forcing (Unit)	Dry Season	Wet Season
Ambient water temperature (˚C)	17	25
Solar surface radiation (W/m^2)	171	238
Wind Speed (m/s)	7.2	6.1

Daily forcing in 2011 from the Hong Kong Observatory has been adopted for the 2011 scenario for model verification. The sources of information are listed below:

Table 2.3 Meteorological Forcing adopted for Water Quality Model – 2011 Scenario for Model Verification

Forcing (Unit)	Weather Station	Remarks
Ambient water temperature (˚C)	North Point Tidal Station	Dataset more complete than that of the Waglan Island Station

Forcing (Unit)	Weather Station	Remarks
Solar surface radiation (W/m^2)	Kau Sai Chau Weather Station	Closer to the Study area than that of Kings Park Weather Station
Wind Speed (m/s)	Ta Kwu Ling Weather Station	Supplemented with dataset of East Ping Chau Weather Station when there is missing data

2.5 *POLLUTION LOADING*

Loading from Storm Outfall

Background pollution loading from storm outfall for 2011, 2020 and 2030 within the coverage of the model domain has been compiled based on the population data of the 2016-, 2021-, 2026- and 2031-based TPEDM following the methods adopted in the *Update Study*. Detailed approach for compilation of pollution loading is provided in the main text of the EIA and is not provided again in this document.

Rainfall-Related Loading

Rainfall-related loading of typical wet and dry seasons within the Study area is calculated based on developed area within the sewage catchment, long-term rainfall pattern in Hong Kong as well as the mean event concentration of pollutants in rainfall runoff. The compiled typical rainfall loading for both seasons was then applied accordingly in the modelling scenarios in wet and dry seasons. Detailed approach on compilation of rainfall-related loading is provided in the main text of the EIA and is not provided again in this document.

For the 2011 scenario for model verification, the rainfall-related loading was generated from rainfall data of the Sha Tau Kok Rain Gauge Station (supplemented with rainfall data from the Kat O Weather Station when there is missing data). Time varying pollution loading was generated for the whole year of 2011 using the developed area within the sewage catchment, actual daily rainfall as well as the mean event concentration of pollutants in rainfall runoff, assuming all loading from rainfall received be discharged evenly within the same day.

Other Sources Pollution Loading

Pollution loading from other sources, such as point source discharge from marine culture zones, leaching from Shuen Wan landfill as well as pollution loading from the Mainland, are compiled and implemented in the water quality model as stipulated in the main text of the EIA and is not provided again in this document.

3 WATER QUALITY MODEL VERIFICATION

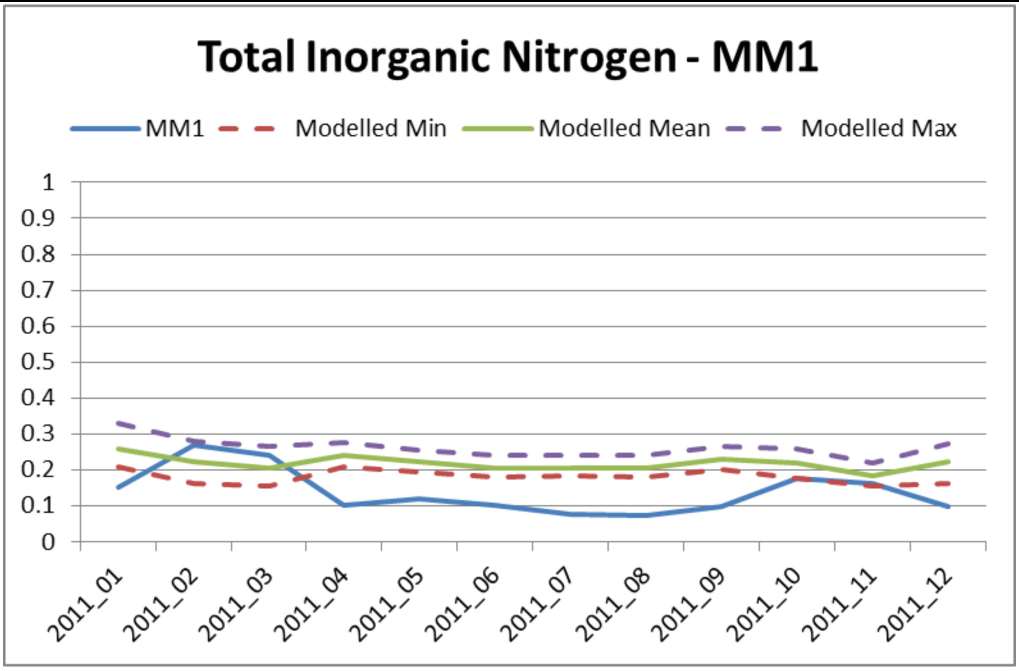
3.1 GENERAL

For the purpose of performance verification of the water quality model, hydrodynamic simulation was conducted for the whole year 2011 to generate flow field for water quality simulation (divided into twelve 30-day runs due to file size limitation of Delft3D). Twelve Delft3D water quality model runs were conducted for these periods and the results are compiled below for comparison with the marine water quality monitoring data at station MM1 in 2011. Contour plots showing the comparison for modelled parameters against EPD field measurements in 2011 January and June for are provided at the back of this document.

3.2 TOTAL INORGANIC NITROGEN

The water quality model generally overestimates the level of TIN when compared with the field data. It is considered a result of conservative assumptions in compiling the pollution loading and is considered acceptable for the purpose of EIA assessment. As shown in *Figure 3.1* below, the predicted mean TIN level at EPD marine water quality monitoring station MM1 is generally higher than the corresponding field measurements. Discrepancies are generally on the conservative side and modelling performance on this parameter is considered acceptable.

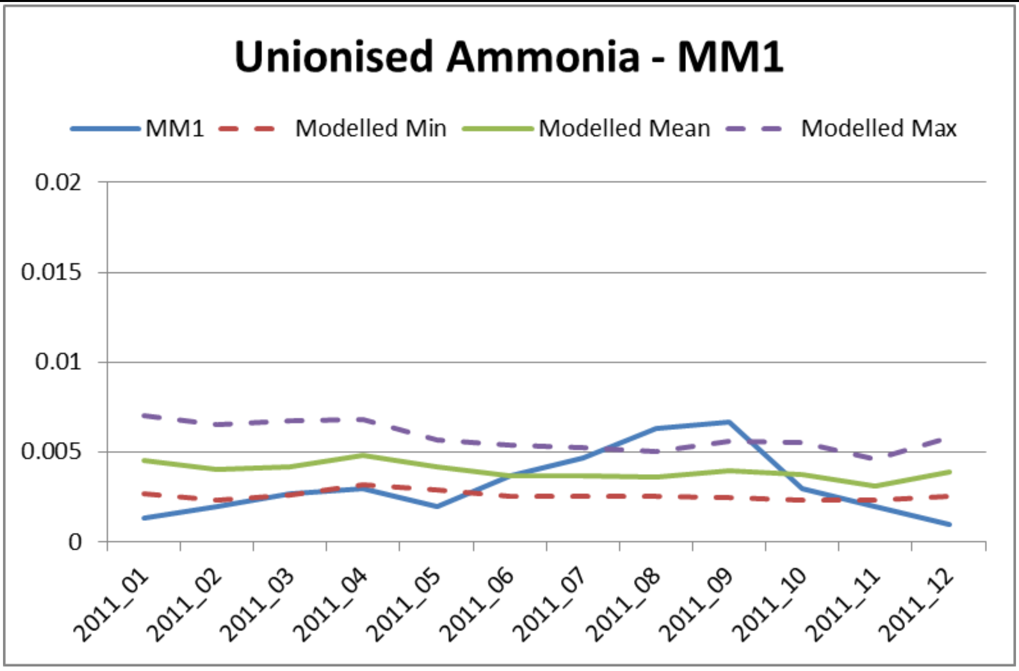
Figure 3.1 Total Inorganic Nitrogen at MM1 - Modelled vs. Measured



3.3 *UNIONIZED AMMONIA*

Comparison of modelled level and EPD regular monitoring data at MM1 are provided in *Figure 3.2* below. Overestimation of the level of UIA is observed throughout the year except two incidents of underestimation in August and September. The discrepancy is generally small and less than 0.002 mg/L. The discrepancy is considered minor and acceptable.

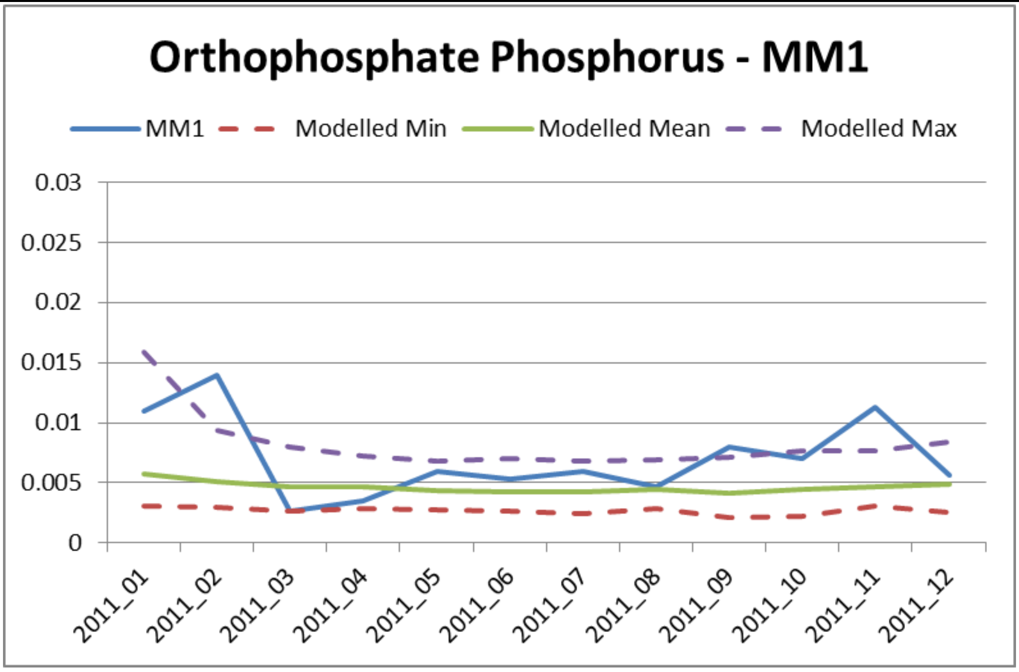
Figure 3.2 ***Unionized Ammonia at MM1 - Modelled vs. Measured***



3.4 *ORTHO-PHOSPHATE PHOSPHORUS*

Field measurements from EPD monitoring stations MM1 show quite significant variation of level of OP at the Starling Inlet As shown in *Figure 3.3* below, the variation of level of OP at MM1 is mostly captured within the modelled range by the water quality model in 2011 (with a minor underestimation in February and November 2011). The discrepancy is considered minor and acceptable.

Figure 3.3 Ortho-phosphate Phosphorus at MM1 - Modelled vs. Measured



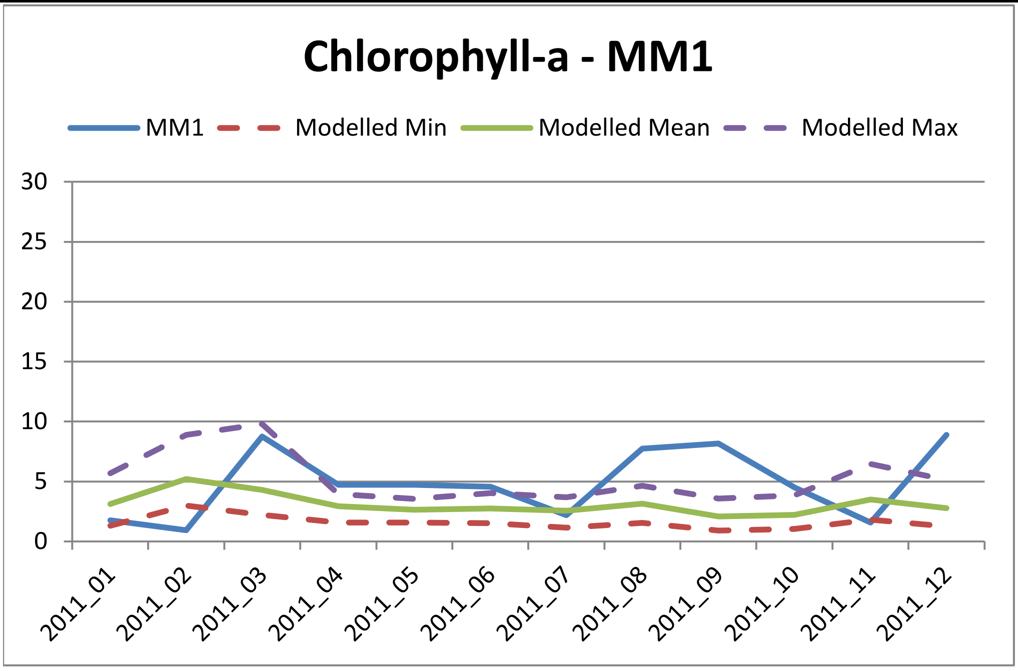
3.5 CHLOROPHYLL-A

Initially, the settling velocity of diatoms was assumed to be 1 m/day in the preliminary simulations. Results of the preliminary simulation indicate that modelled level of chlorophyll-*a* way above the field measurements at MM1 (> 30 µg/L modelled, < 10 µg/L field measurement). Algal growth is primarily controlled by the interaction of three physical mechanisms: settling of algae, vertical turbulence between surface and subsurface layers and the light limitation in the subsurface layers. In the relatively shadow water in the Starling Inlet, the light limitation is small and result in very high level of modelled chlorophyll-*a*. The model results within the Starling Inlet could be greatly improved by increasing the settling velocity of diatom from 1 m/day to 3 m/day. The adopted settling velocity of diatom is chosen such that the level of chlorophyll-*a* at MM1 could be modelled at lower and more reasonable range while without significantly altering the predicted level of chlorophyll-*a* at area beyond the Starling Inlet. U. Passow (1990) [1] studied the settling velocity of various species of diatom by radioactive tracer and suggests settling velocity of diatom could be up to over 70 m/day. The proposed adoption of higher sedimentation velocity of diatom is therefore considered within appropriate range.

Based on the adjusted model settings, the predicted range of chlorophyll-*a* is similar to the field measurement at MM1, with small underestimation in August and September 2011.

[1] U. Passow (1990). Species-specific sedimentation and sinking velocities of diatoms

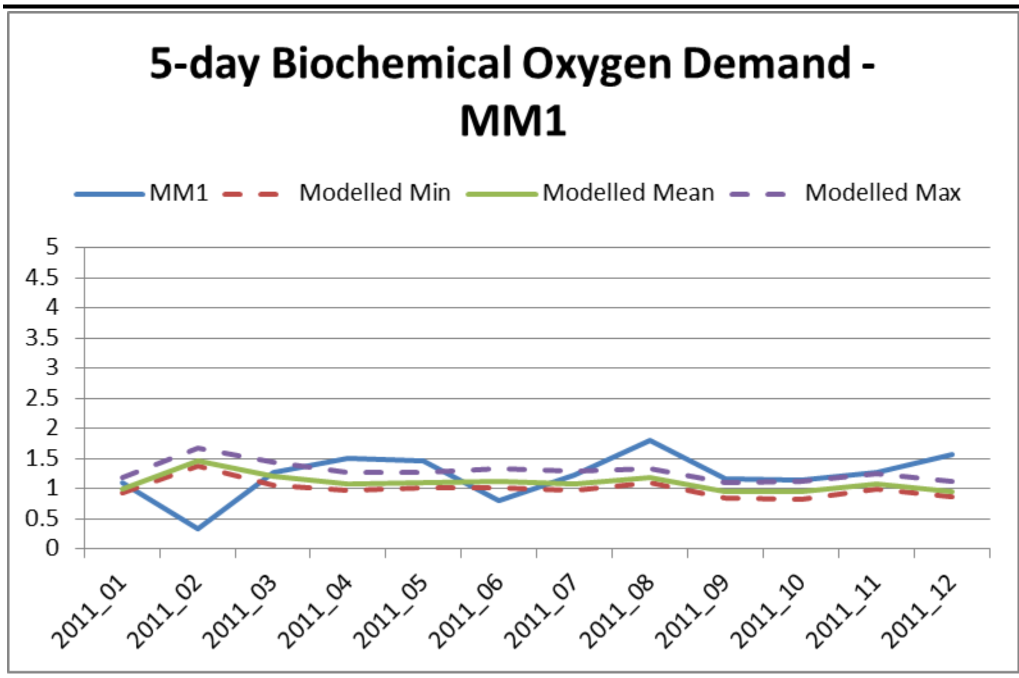
Figure 3.4 *Chlorophyll-a at MM1 - Modelled vs. Measured*



3.6 *5-Day Biochemical Oxygen Demand*

As shown in *Figure 3.5*, the predicted range of SS is generally consistent with the field measurements at the EPD monitoring stations MM1 throughout year 2011, with slightly higher underestimation in August and December. The deviation is considered minor and acceptable.

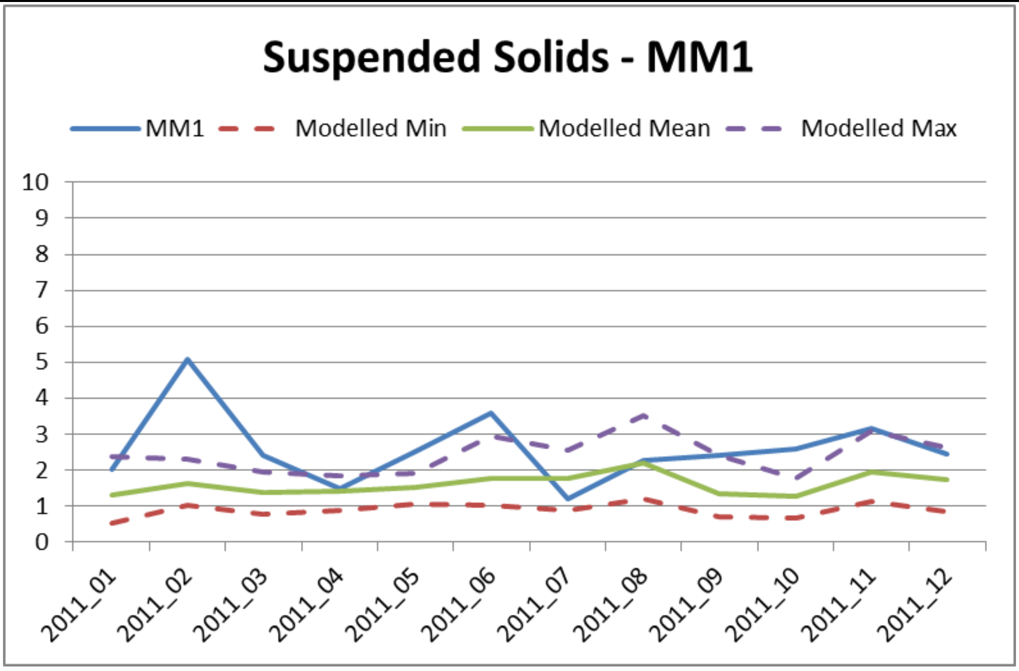
Figure 3.5 *5-Day Biochemical Oxygen Demand at MM1 - Modelled vs. Measured*



3.7 SUSPENDED SOLIDS

The predicted range of SS is shown below in Figure 3.6. The field measurements are of similar range with the modelled level at the EPD monitoring stations MM1 throughout year 2011. High level of SS is observed in February and that is not well captured in the model. The overall model performance is considered acceptable despite of this.

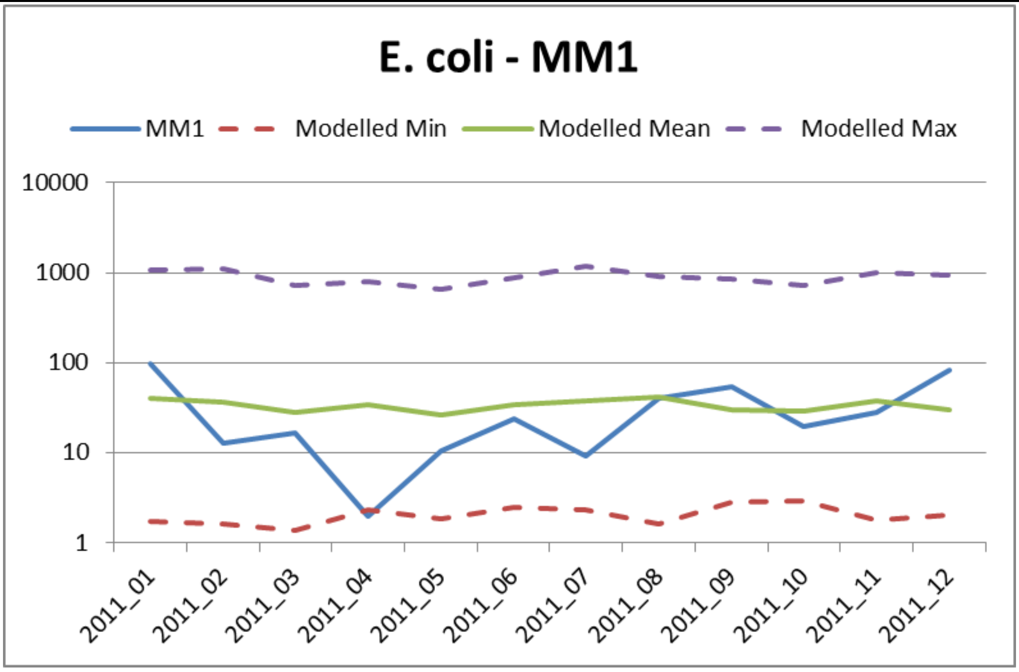
Figure 3.6 Suspended Solids at MM1 - Modelled vs. Measured



3.8 E.COLI

The predicted level of *E.coli* at MM1 in 2011 is provided in *Figure 3.7*. As shown, the model prediction generally of the same range as the field measurements with overall overestimation. It is considered the level of *E.coli* be appropriately presented in the water quality model.

Figure 3.7 *E.coli at MM1 - Modelled vs. Measured*

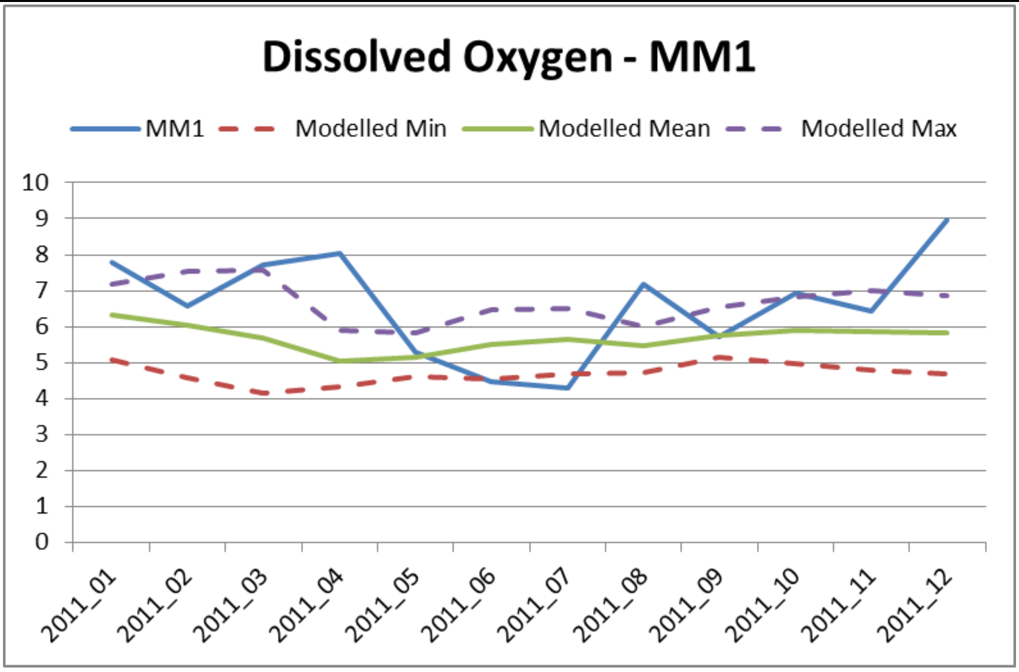


Note: "Modelled Mean" refers to the monthly geometric mean.

3.9 *DISSOLVED OXYGEN*

The modelled levels of DO are presented below in *Figure 3.8*. As shown, the level of DO in field measurements varies quite significantly throughout the year. The predicted level of DO generally covers the same range of the field measurements, with some underestimation of DO in April, August and December of 2011, possibly due to the conservative assumption in pollution loading. It is considered the modelled DO level a reasonably conservative presentation of the field condition.

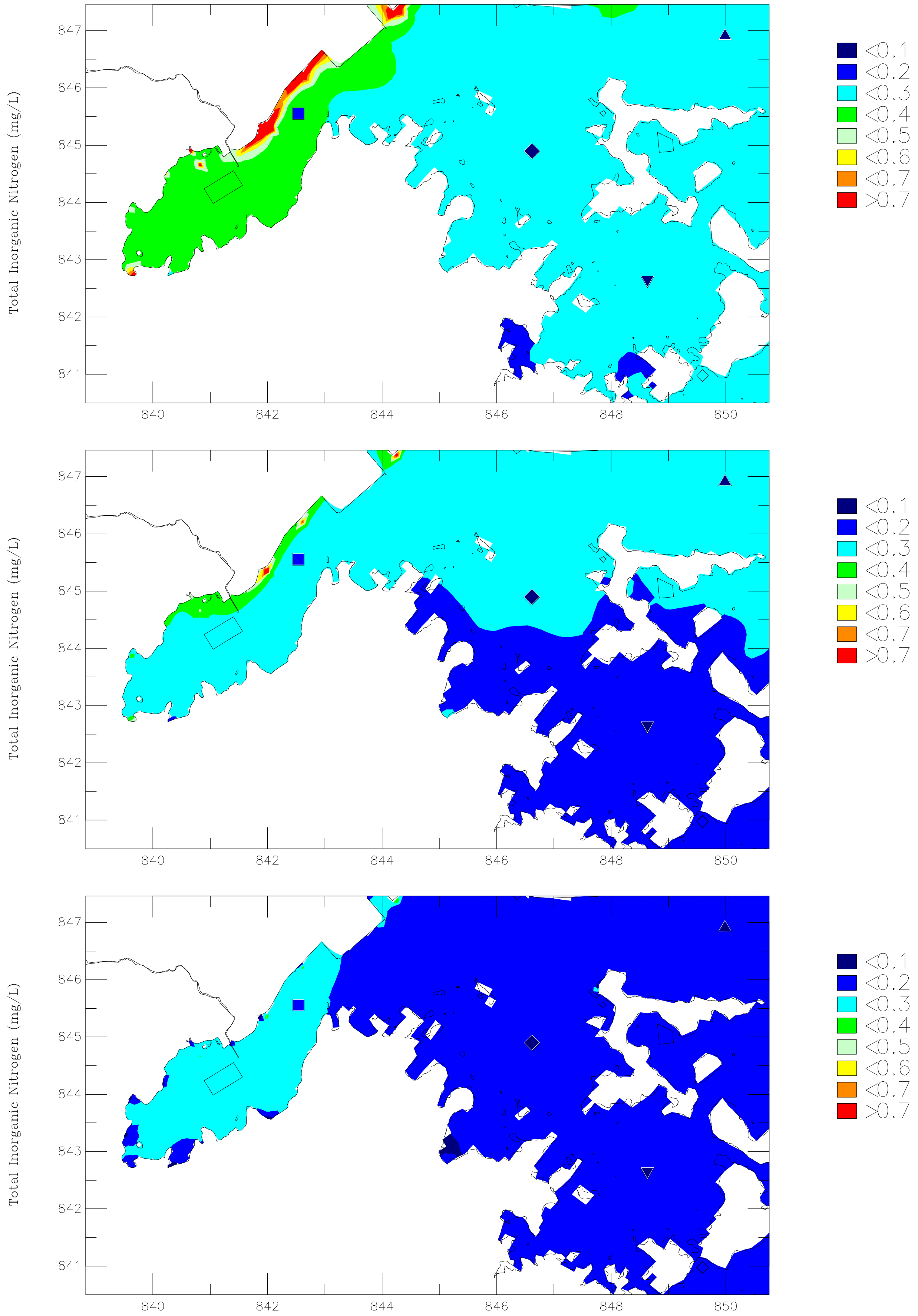
Figure 3.8 Dissolved Oxygen at MM1 - Modelled vs. Measured



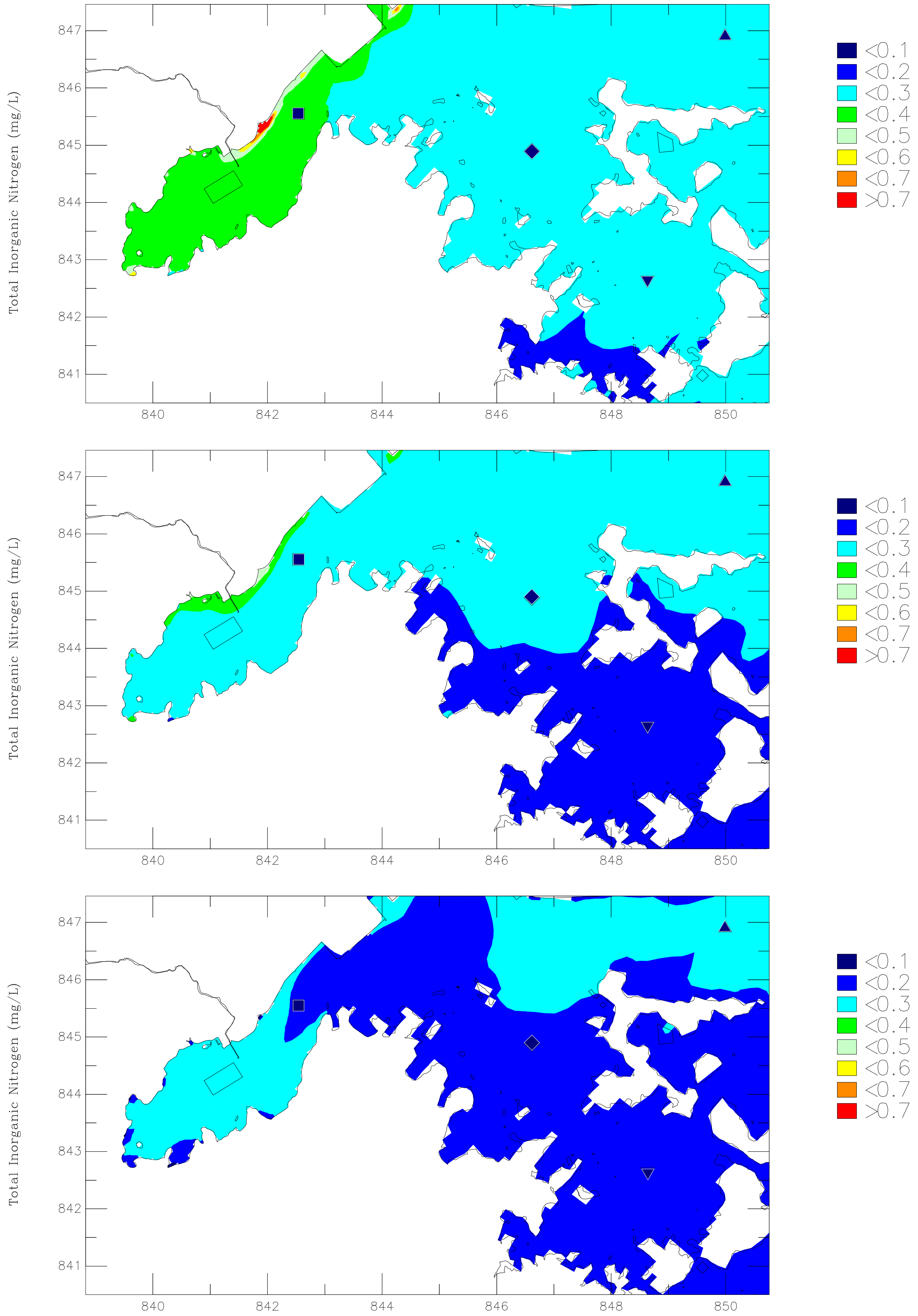
4 CONCLUSION

The first part of this document provided details on settings of the water quality model. These included coupling to Delft3D FLOW, substances modelled, initial conditions, boundary conditions, meteorology forcing and pollution loading.

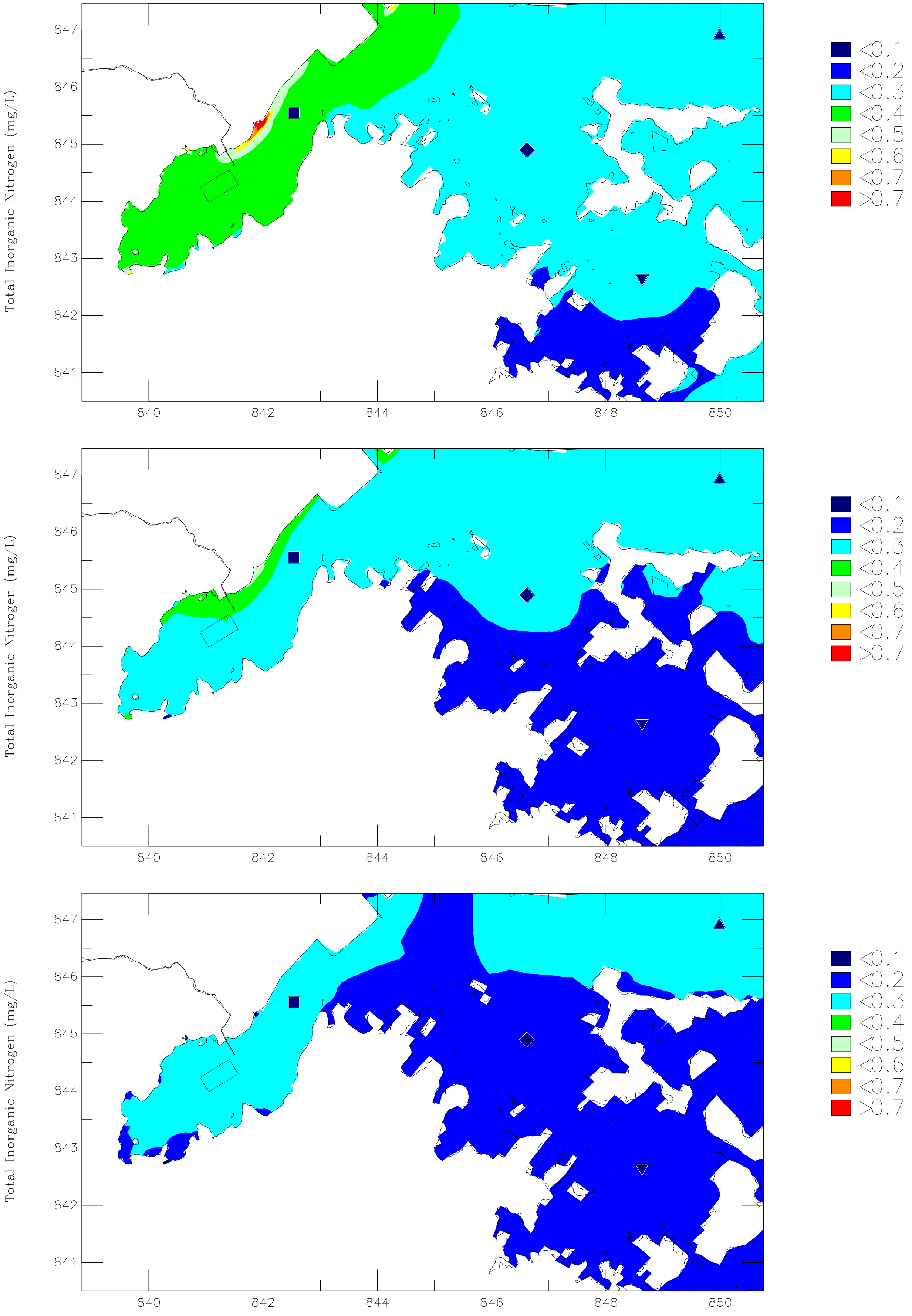
The second part of this document compared the modelled water quality against actual marine water quality monitoring results from EPD monitoring stations within the Study area. Limitations on the water quality model were acknowledged and appropriate adjustments on modelling parameters were made to ensure the water quality model be reasonably conservative for use in the EIA water quality impact assessment. It is considered the current settings of the Delft3D STK water quality model suitable for the purpose of water quality impacts prediction for the operation of the expanded STKSTW.



Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan – Total Inorganic Nitrogen Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jan
	Annex 5C–01	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan – Total Inorganic Nitrogen Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jan
	Annex 5C–02	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



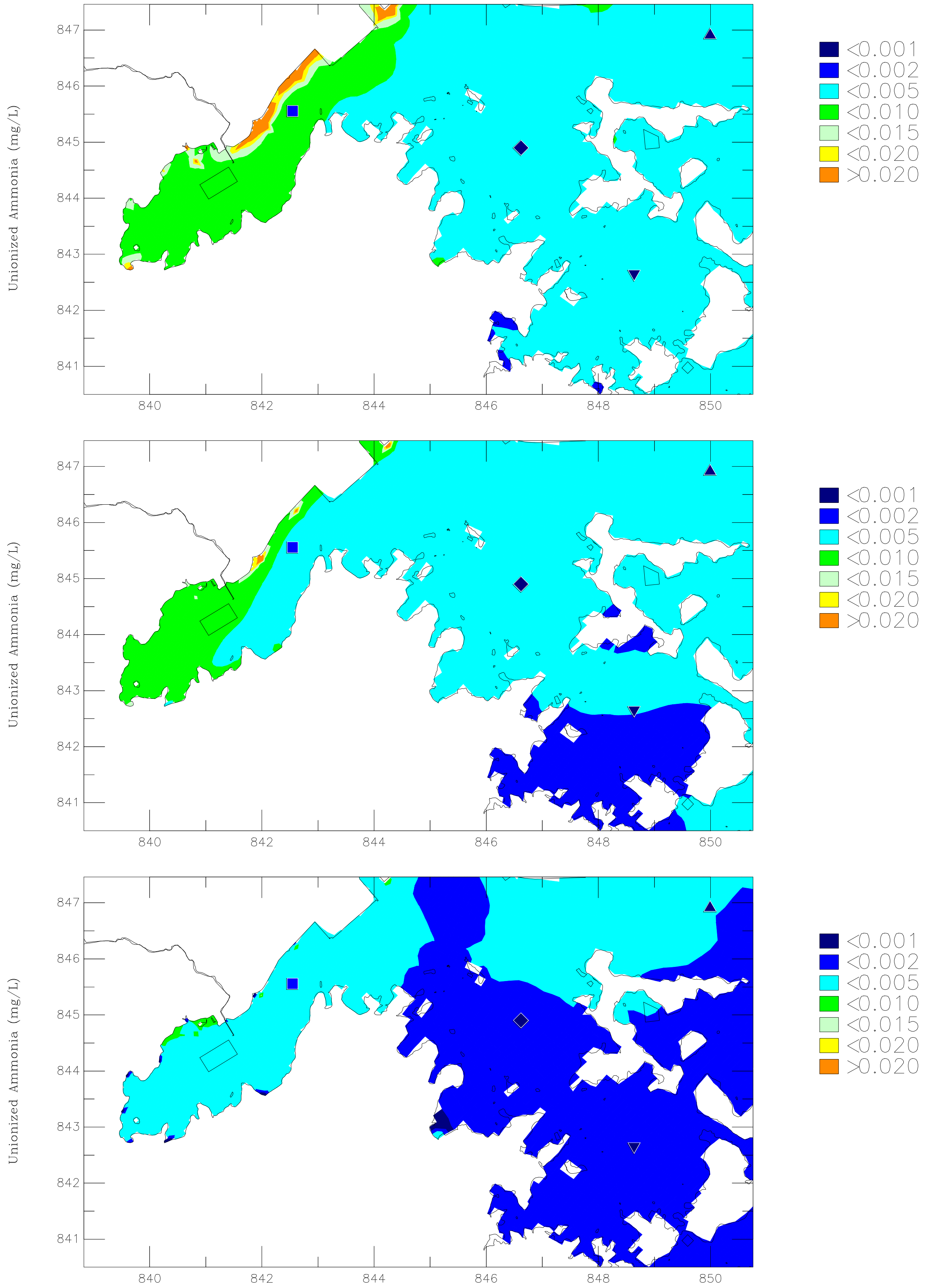
Expansion of Sha Tau Kok Sewage Treatment Works

Water Quality Prediction 2011 Jan – Total Inorganic Nitrogen

Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jan
Annex 5C–03	
0211731/GPP	WQ·Cal.ssn

ERM HK Limited



Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan – Unionized Ammonia Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jan
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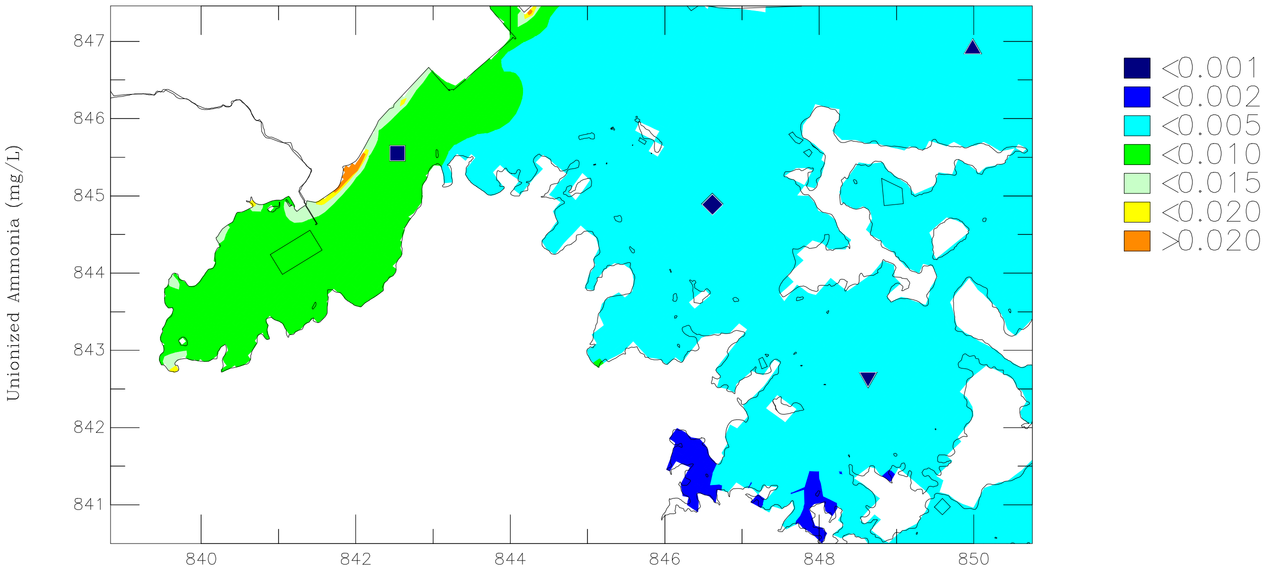
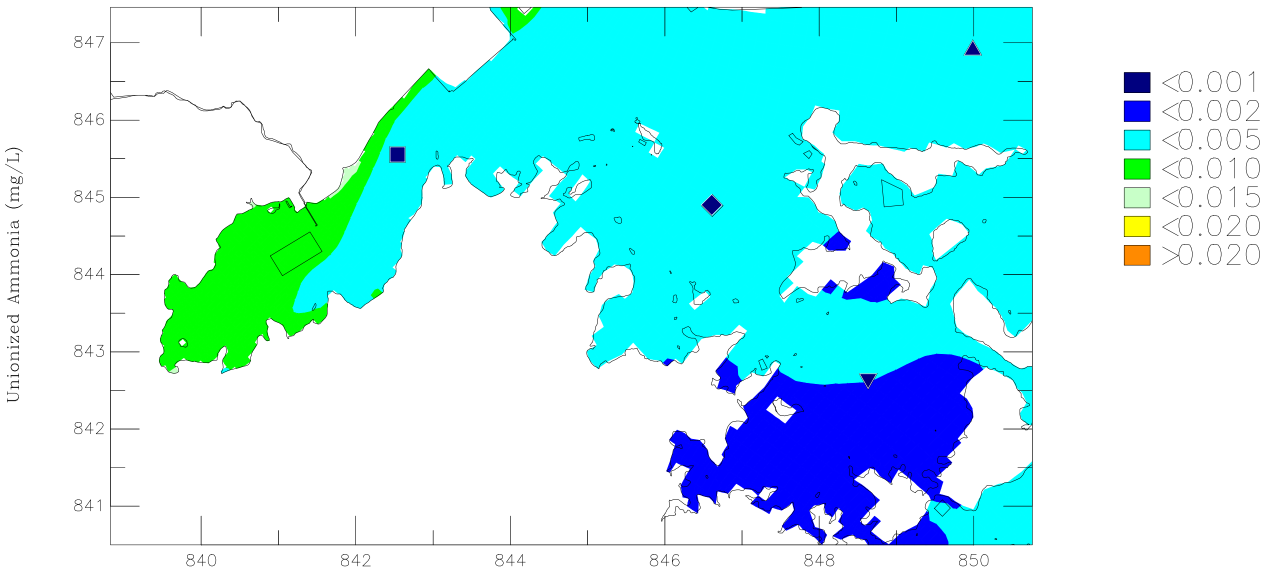
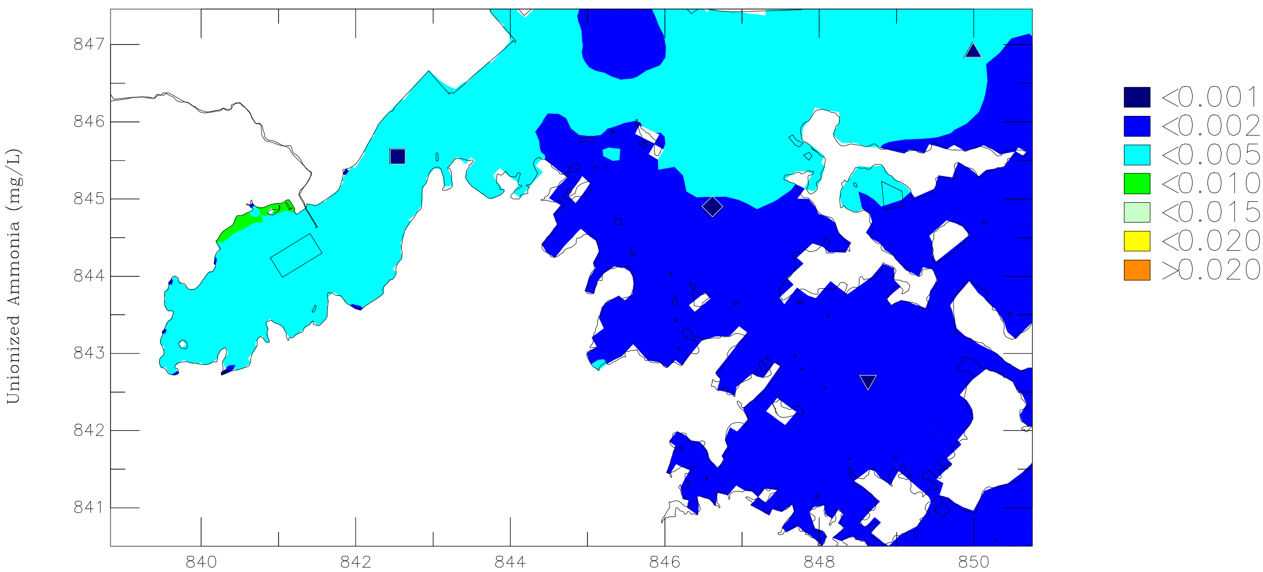
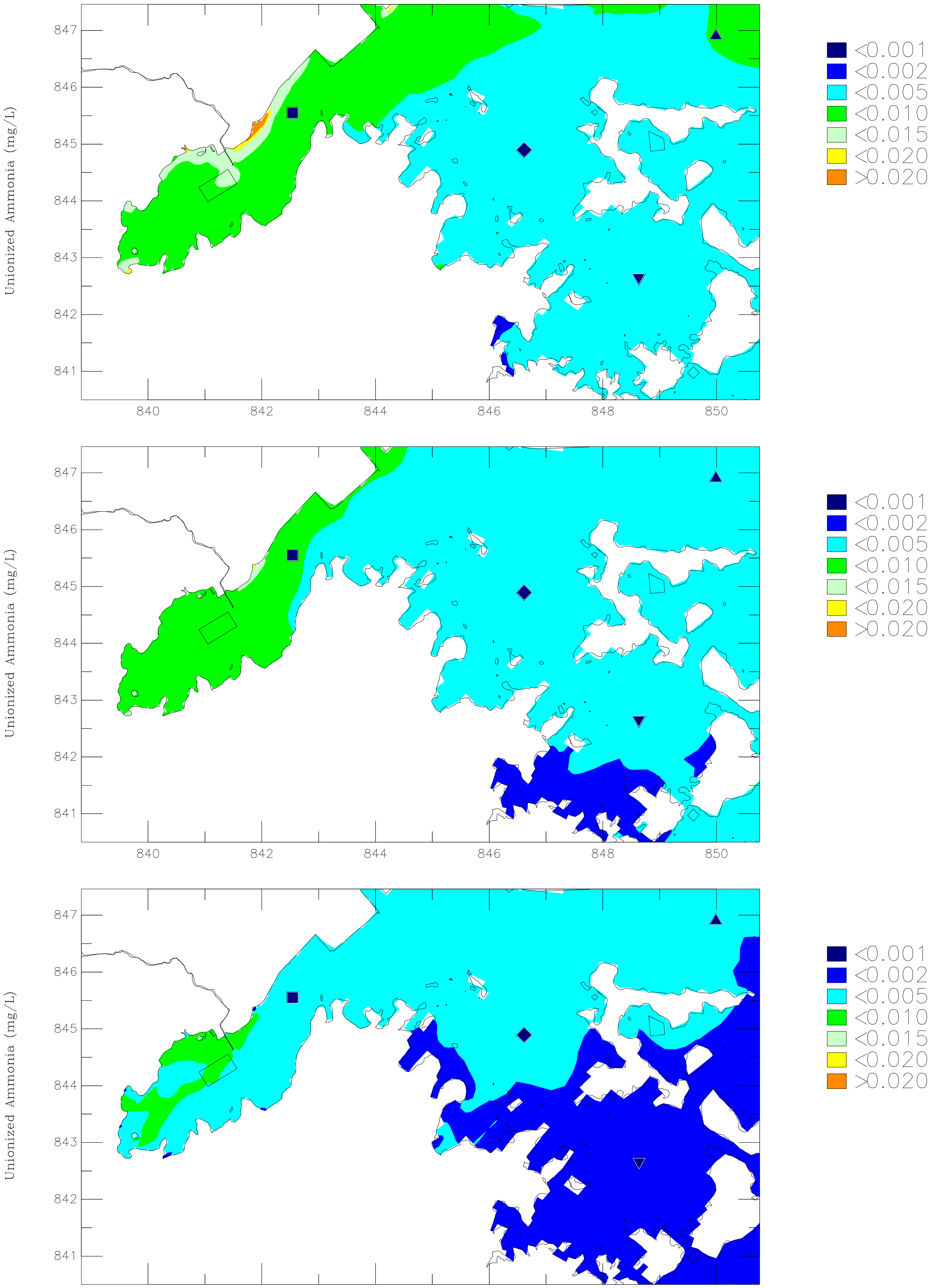






Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan – Unionized Ammonia Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jan
	Annex 5C–05	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

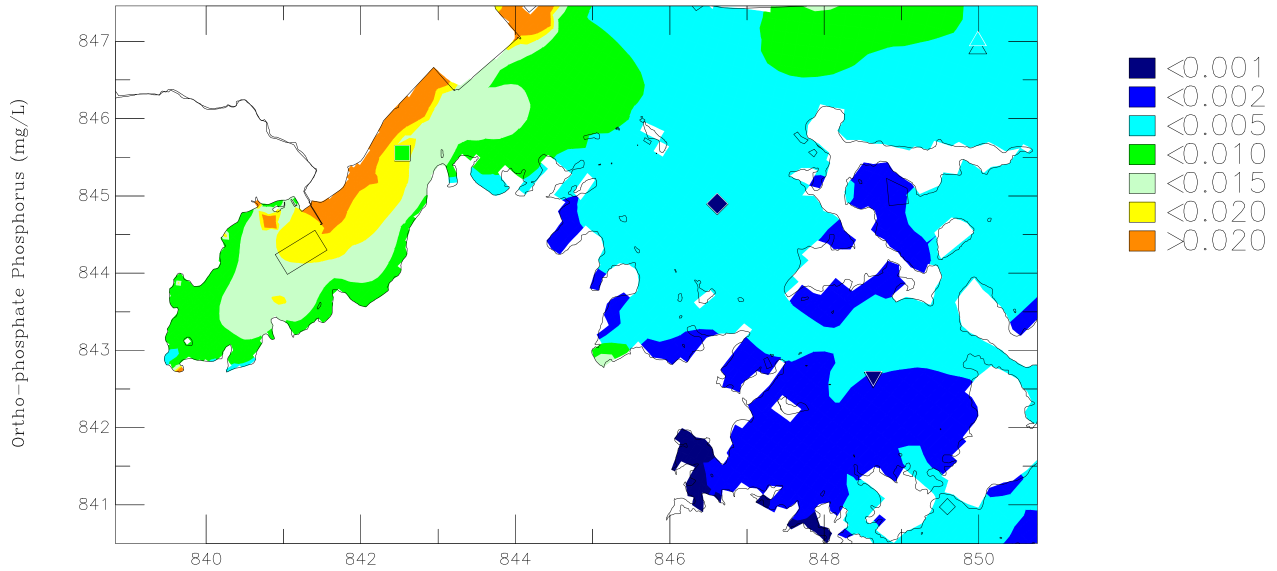
Water Quality Prediction 2011 Jan – Unionized Ammonia

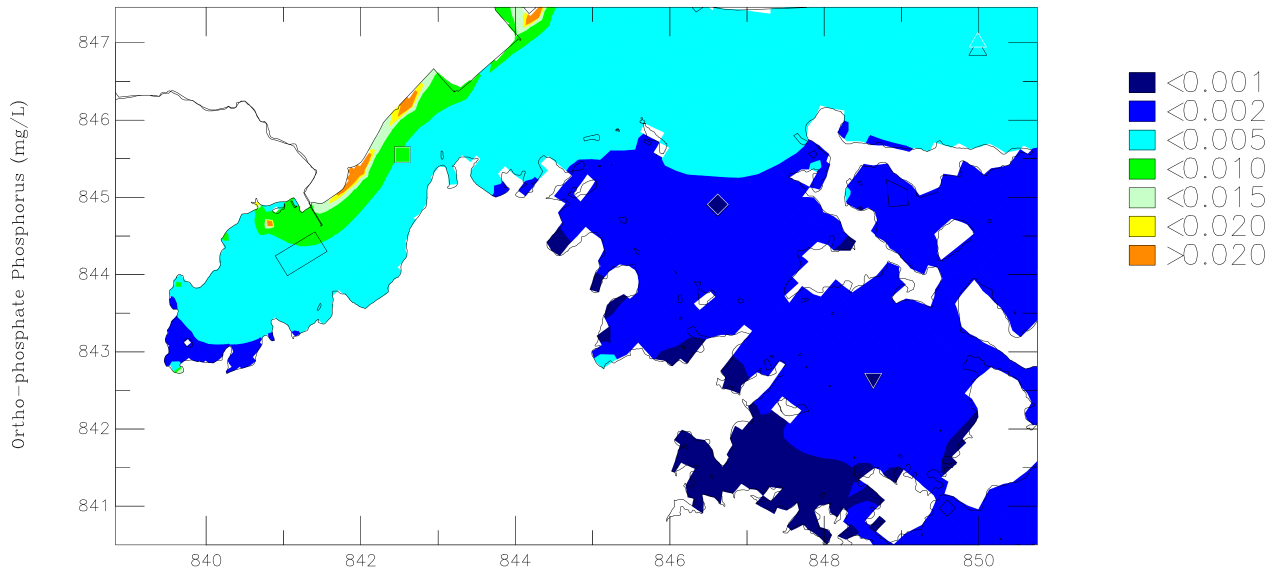
Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

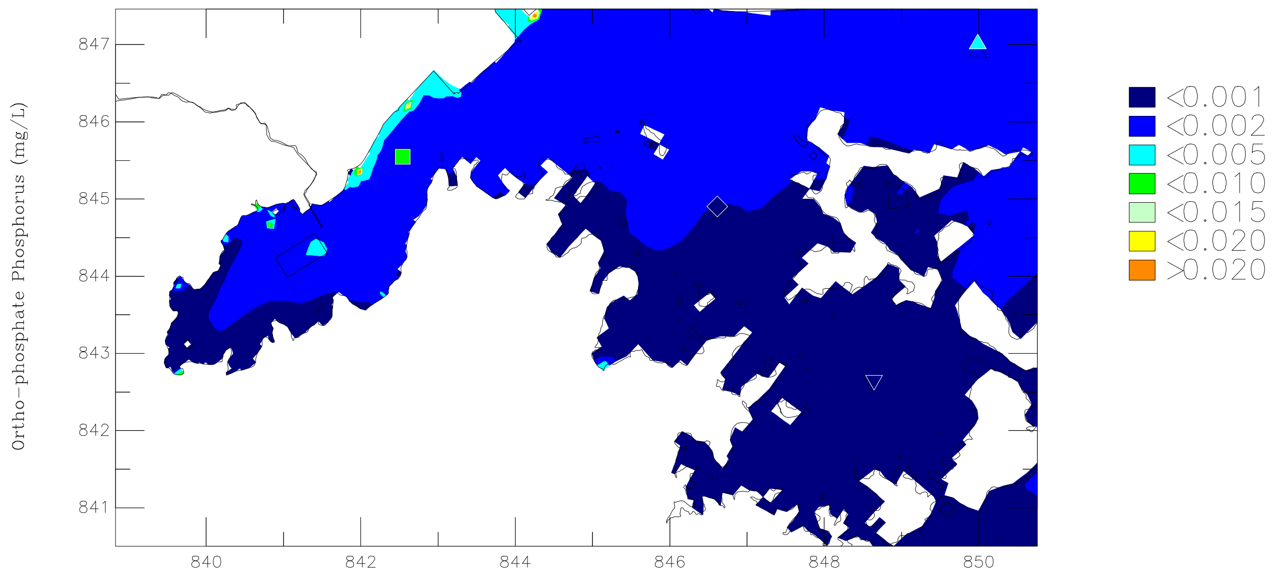
Year 2011	Jan
Annex 5C-06	

ERM HK Limited

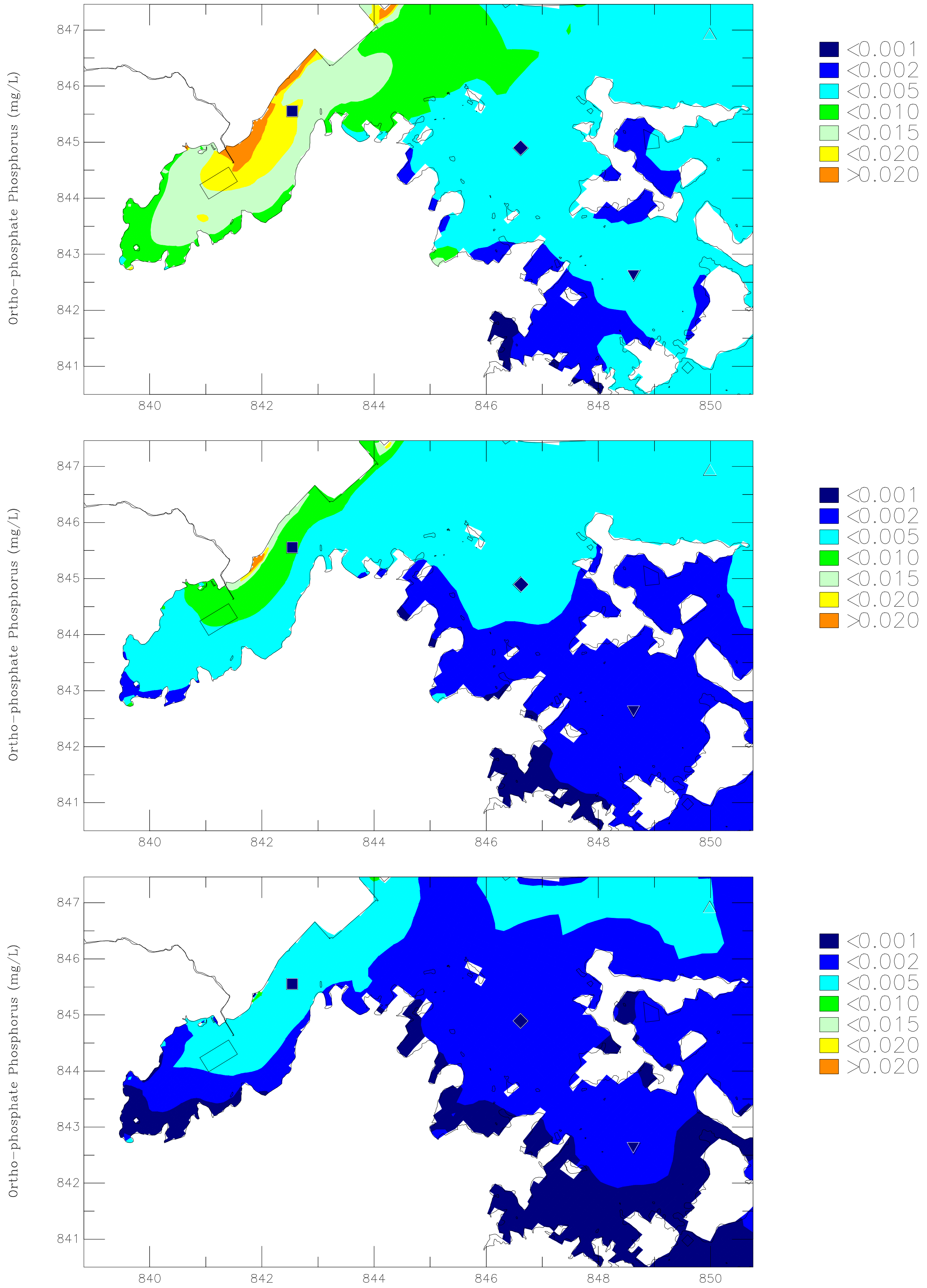
0211731/GPP	WQ-Cal.ssn







Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan – Ortho-phosphate Phosphorus Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jan
	Annex 5C–07	
ERM HK Limited	0211731/GPP	WQ-Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

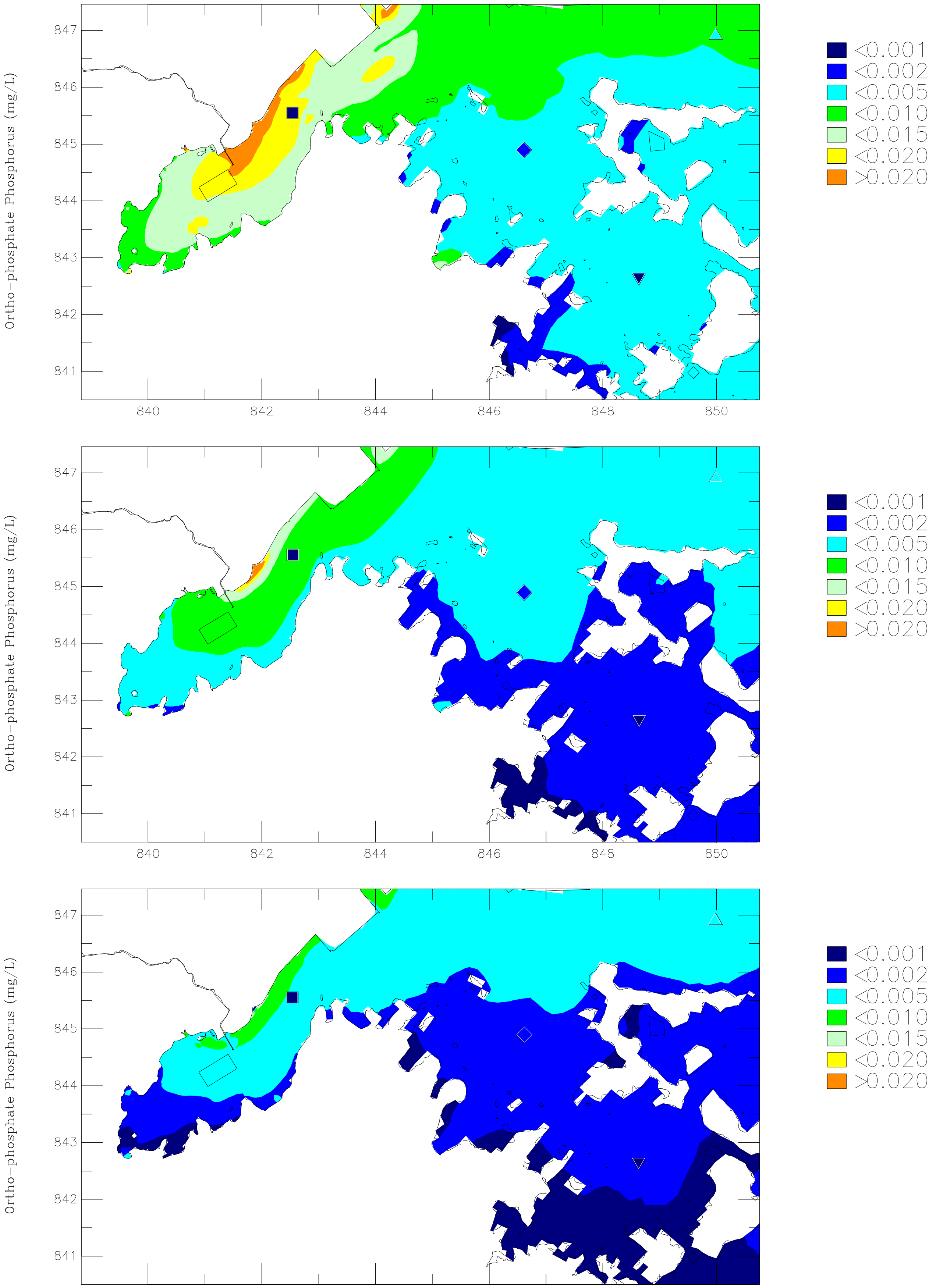
Water Quality Prediction 2011 Jan – Ortho-phosphate Phosphorus

Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jan
Annex 5C-08	

ERM HK Limited

0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

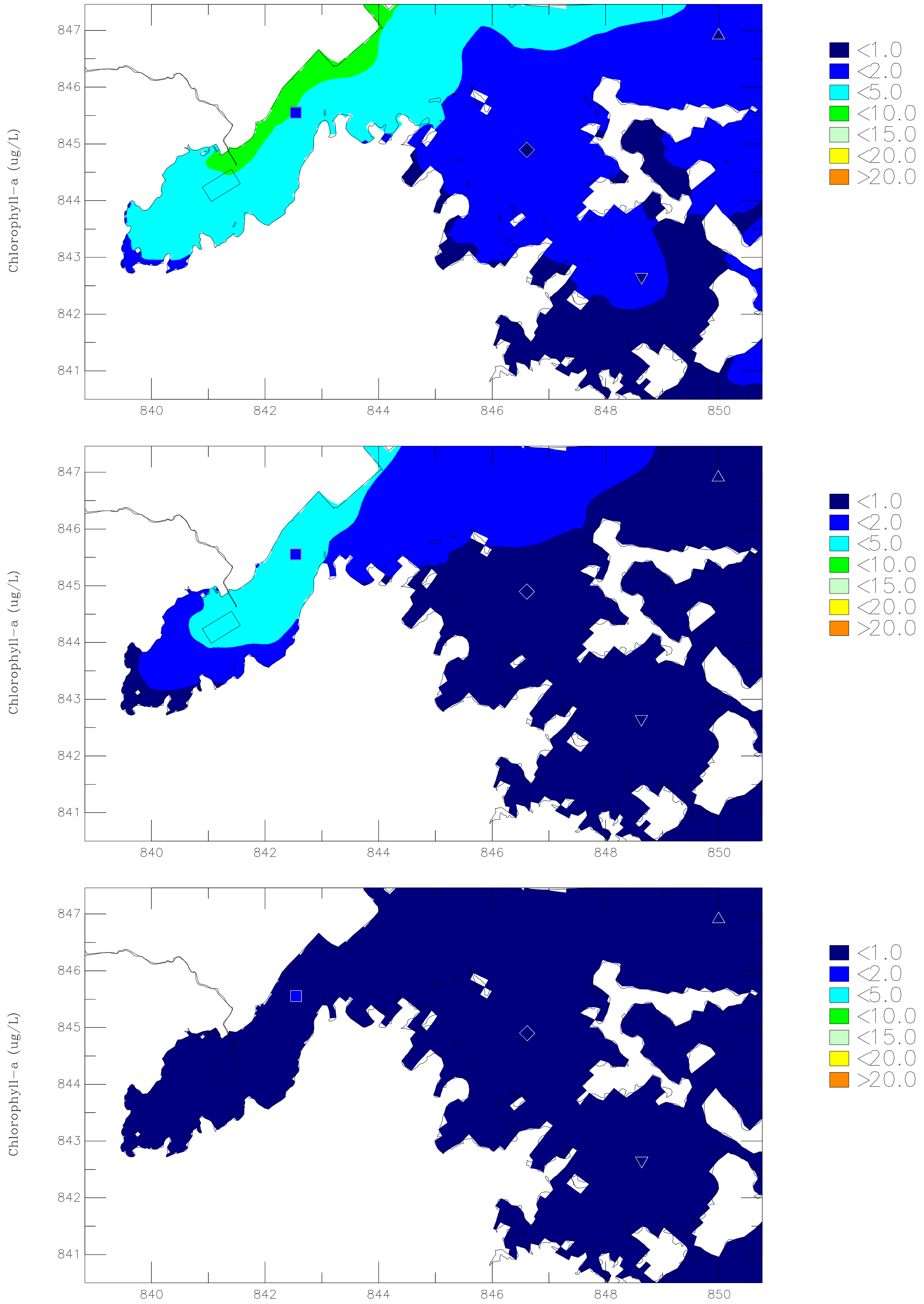
Water Quality Prediction 2011 Jan – Ortho-phosphate Phosphorus

Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jan
Annex 5C–09	

ERM HK Limited

0211731/GPP	WQ·Cal.ssn



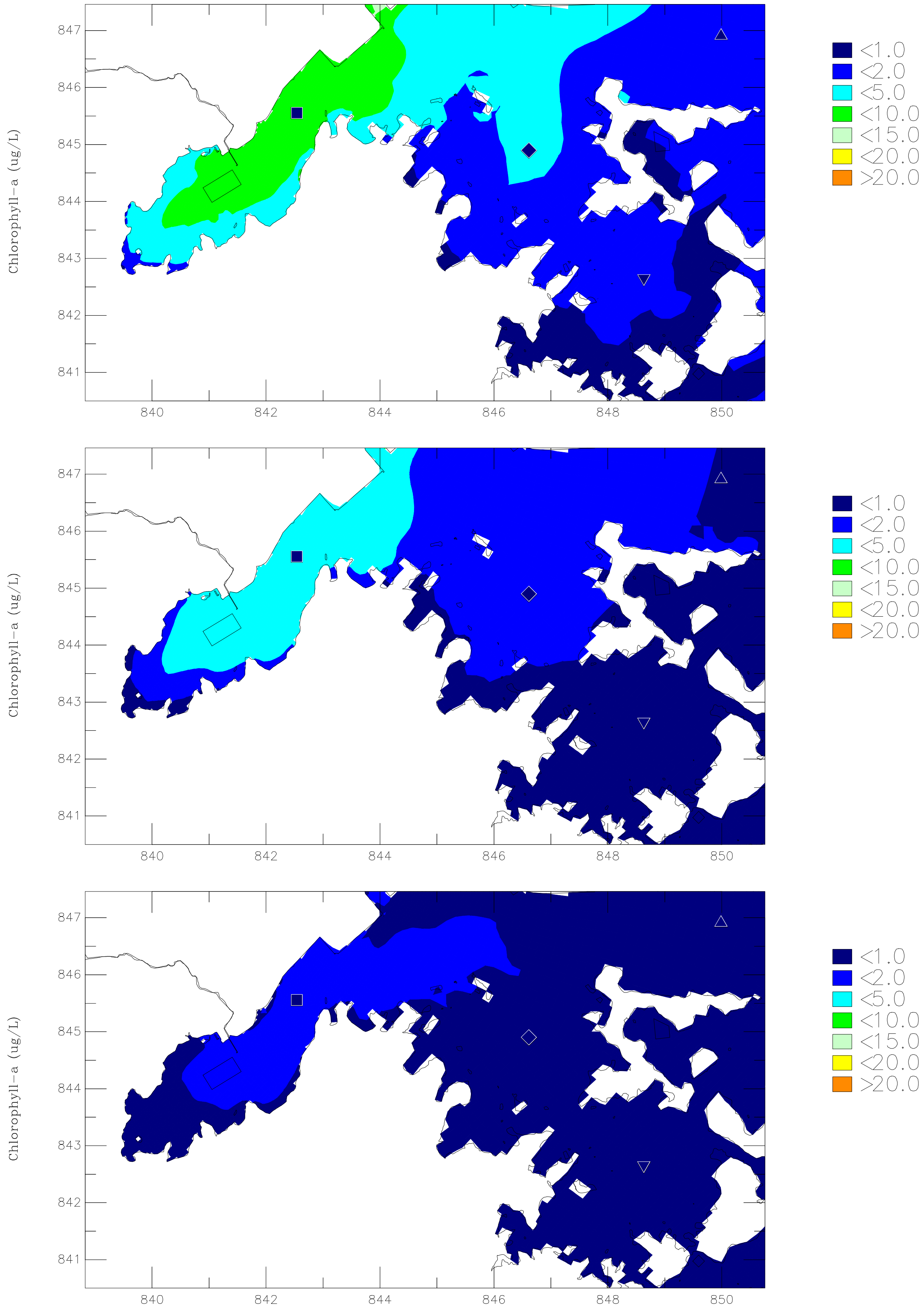
Expansion of Sha Tau Kok Sewage Treatment Works

Water Quality Prediction 2011 Jan – Chlorophyll-a

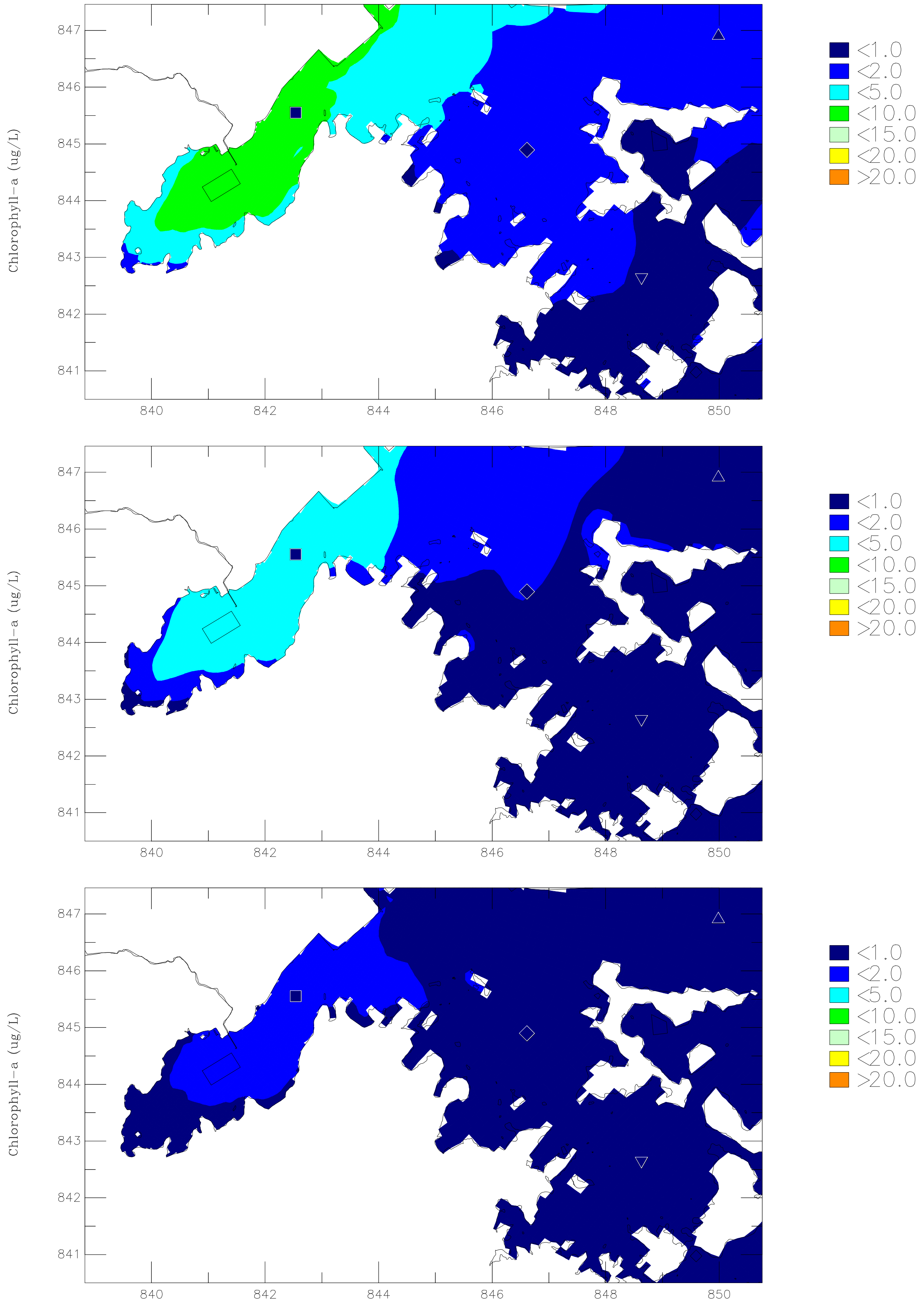
Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jan
Annex 5C-10	
0211731/GPP	WQ·Cal.ssn

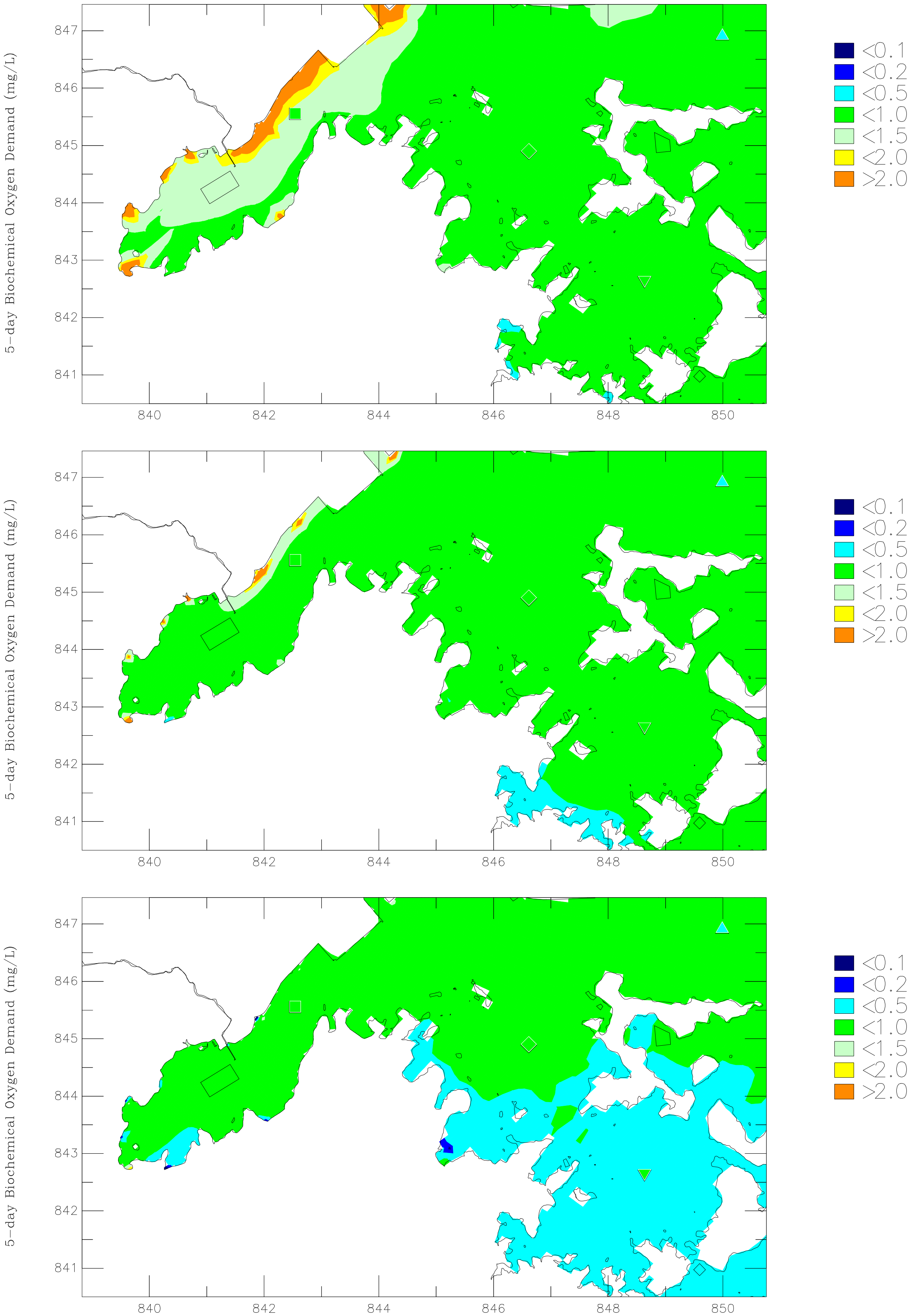
ERM HK Limited



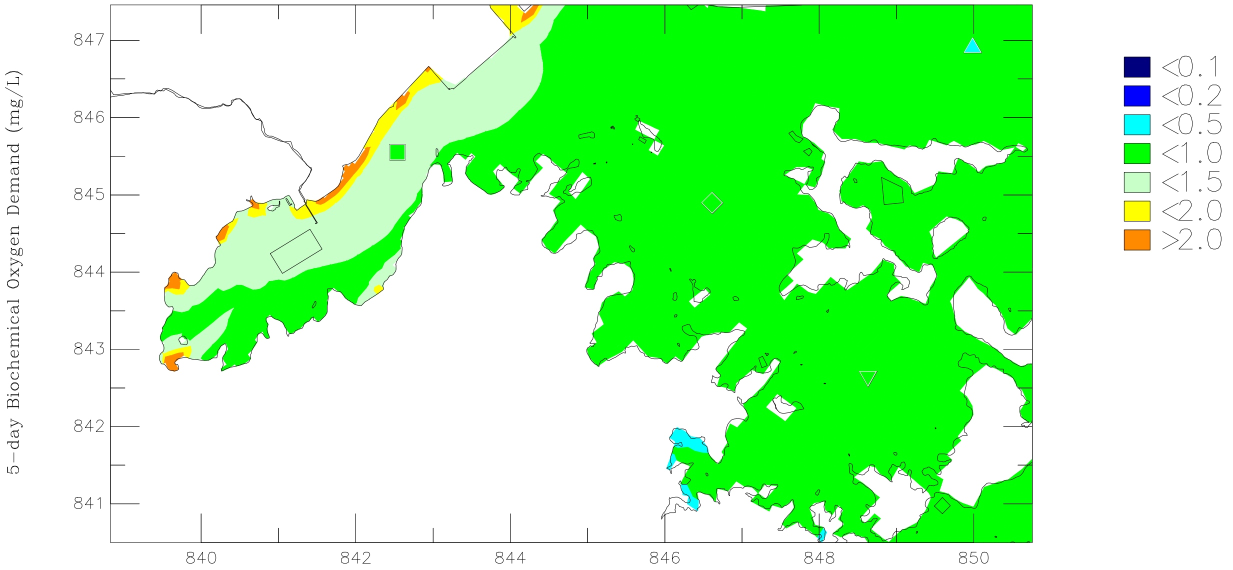
Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan – Chlorophyll-a Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jan
	Annex 5C-11	
ERM HK Limited	0211731/GPP	WQ-Cal.ssn

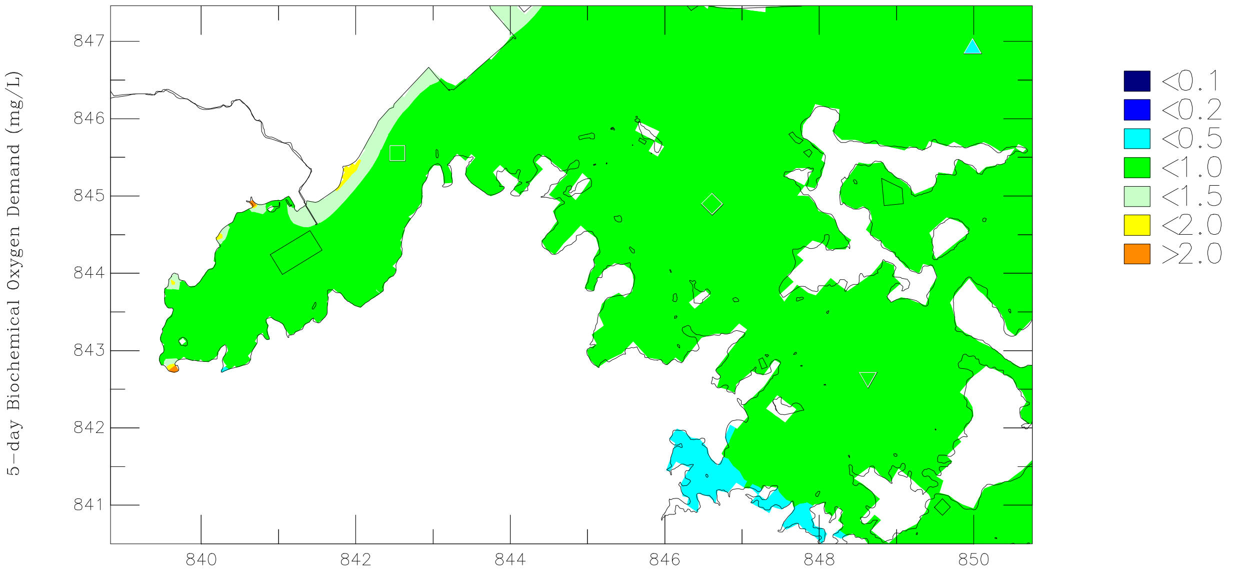


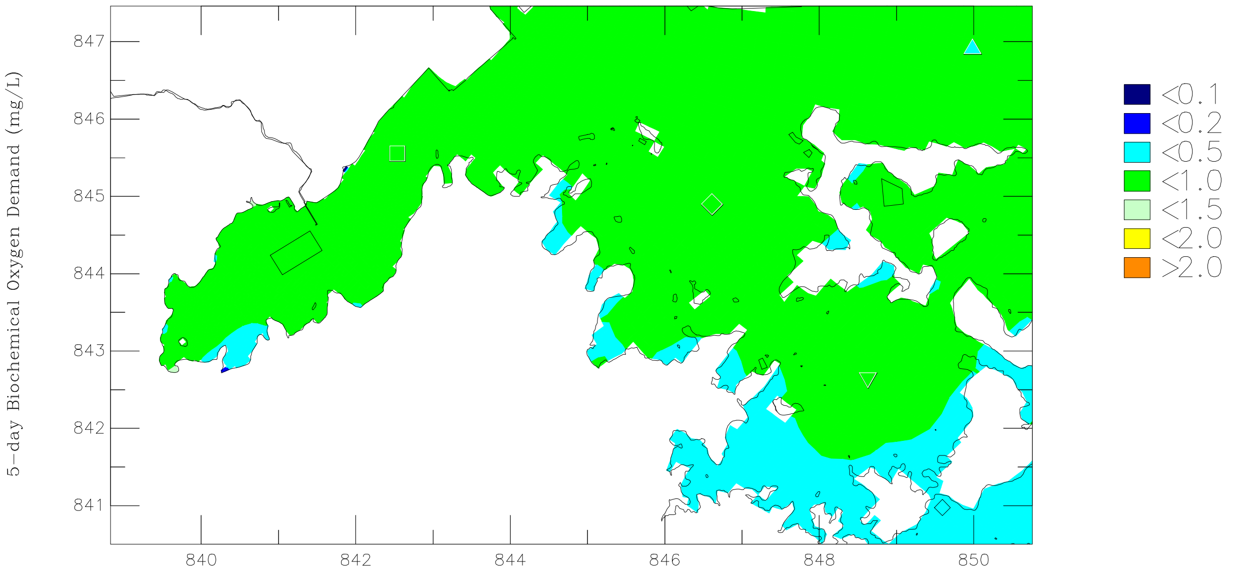
Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan − Chlorophyll−a Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jan
	Annex 5C−12	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



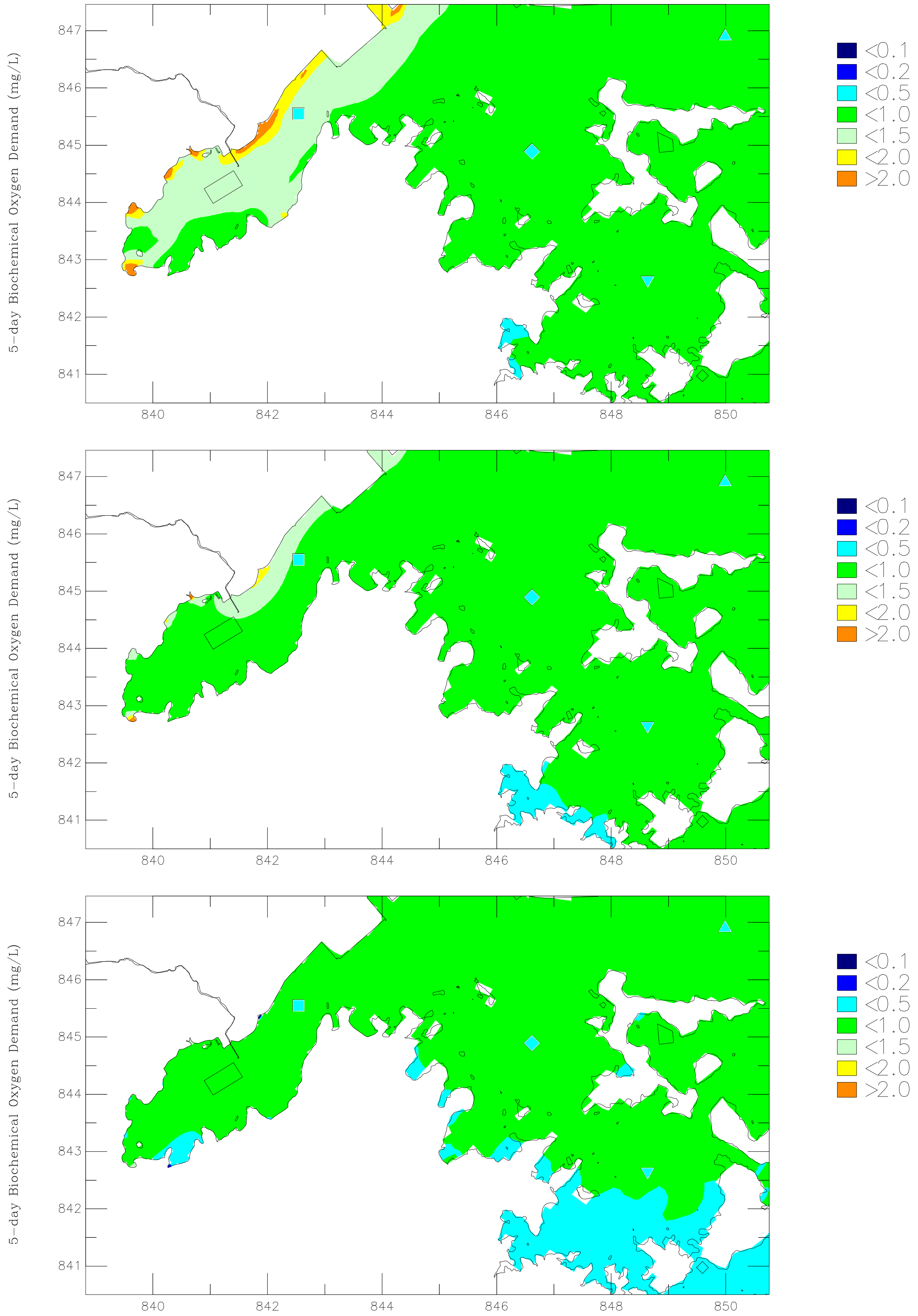
Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan – 5-day Biochemical Oxygen Demand Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jan
	Annex 5C-13	
ERM HK Limited	0211731/GPP	WQ-Cal.ssn







Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan – 5-day Biochemical Oxygen Demand Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jan
	Annex 5C–14	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

Water Quality Prediction 2011 Jan – 5-day Biochemical Oxygen Demand

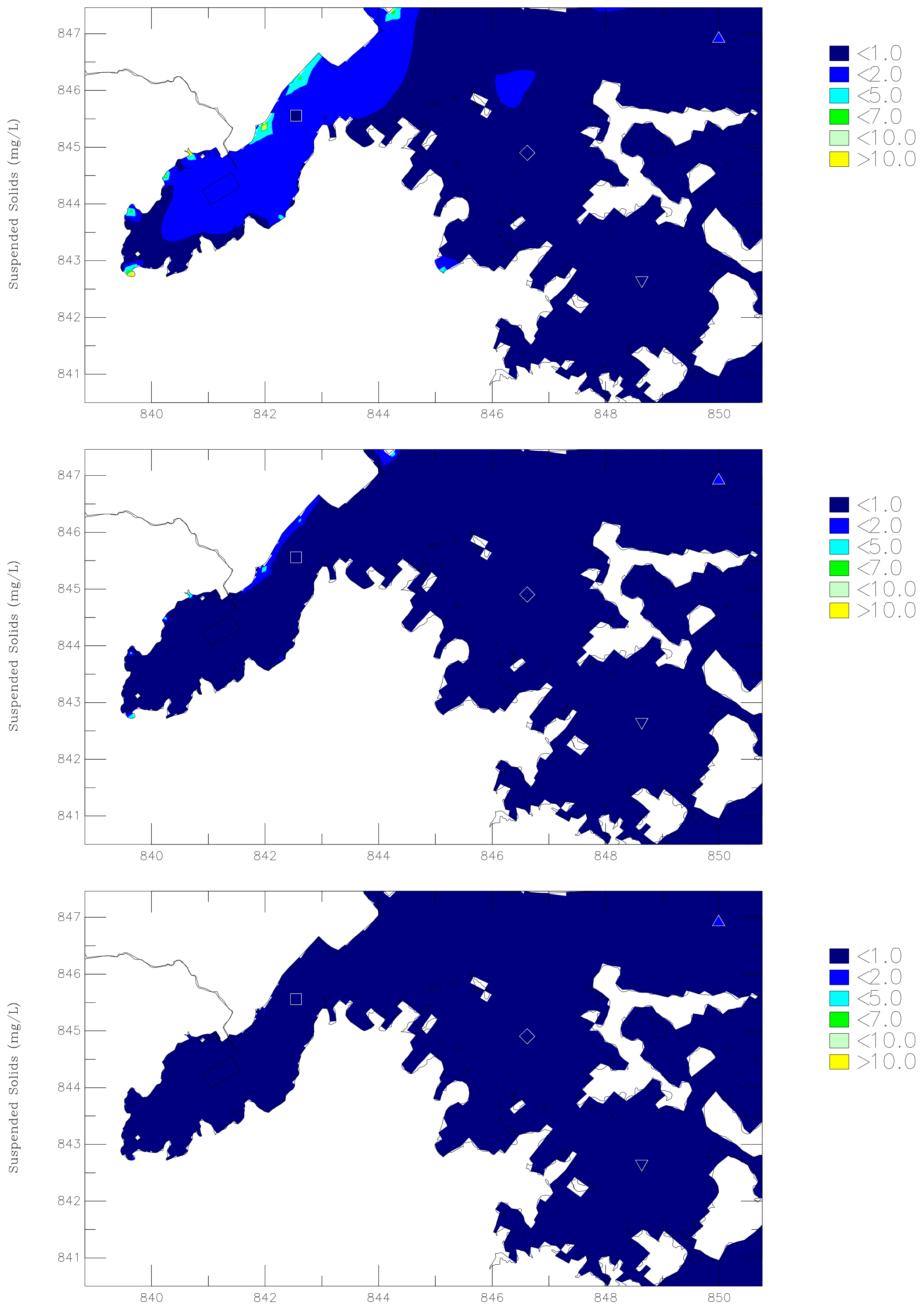
Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011 | Jan

Annex 5C–15

ERM HK Limited

0211731/GPP | WQ·Cal.ssn



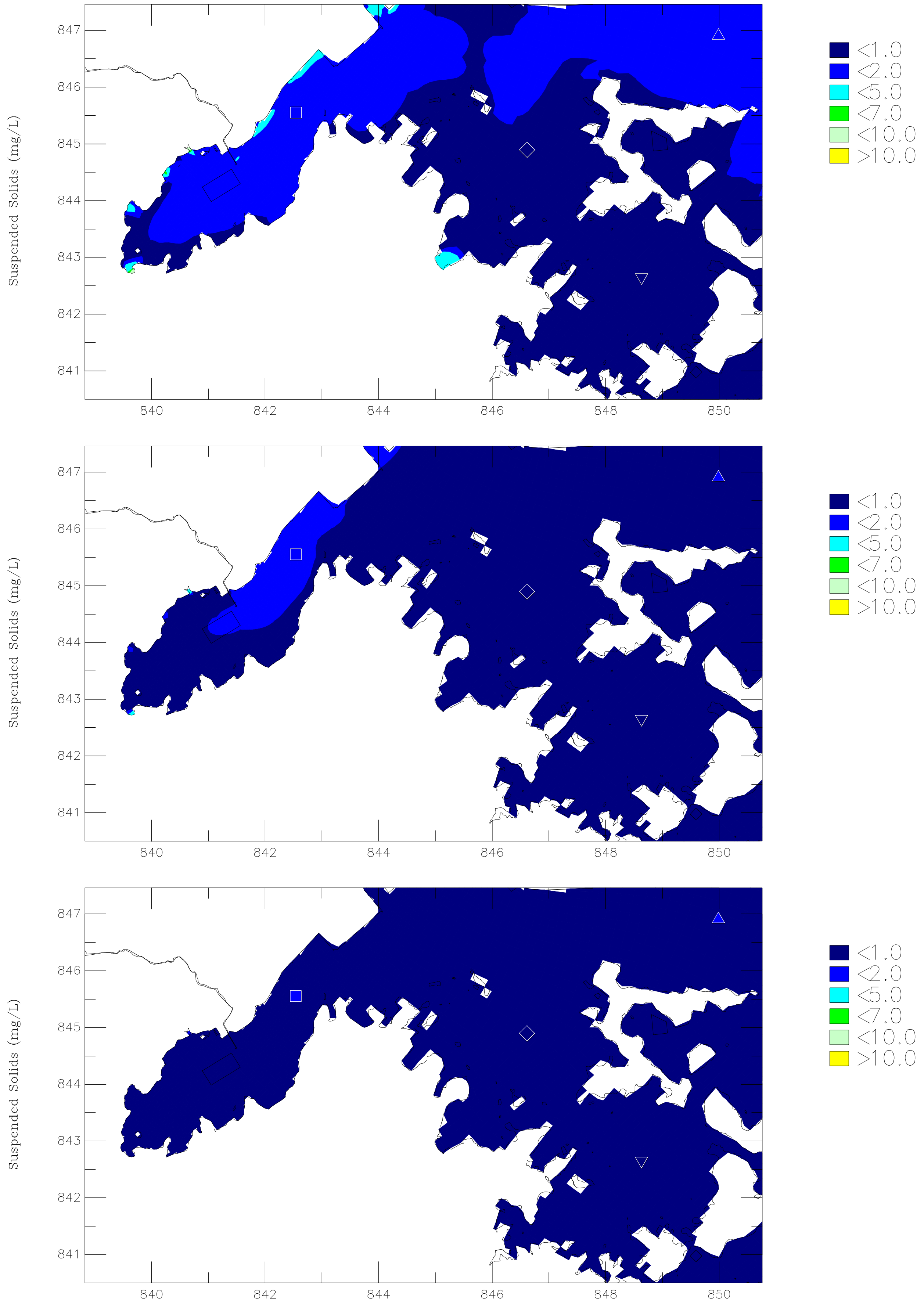
Expansion of Sha Tau Kok Sewage Treatment Works

Water Quality Prediction 2011 Jan – Suspended Solids

Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jan
Annex 5C–16	
0211731/GPP	WQ·Cal.ssn

ERM HK Limited



Expansion of Sha Tau Kok Sewage Treatment Works

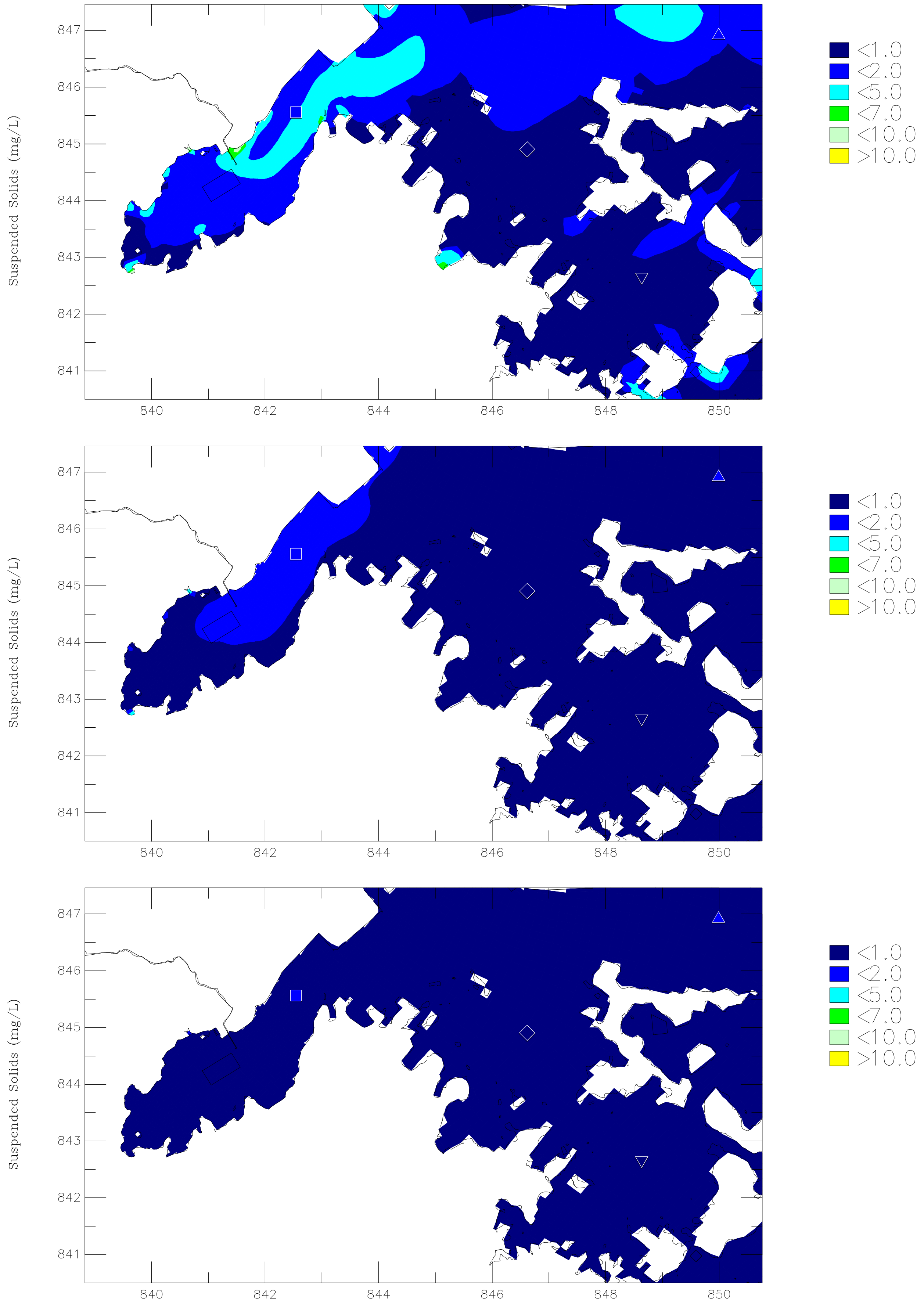
Water Quality Prediction 2011 Jan – Suspended Solids

Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jan
Annex 5C–17	

ERM HK Limited

0211731/GPP | WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

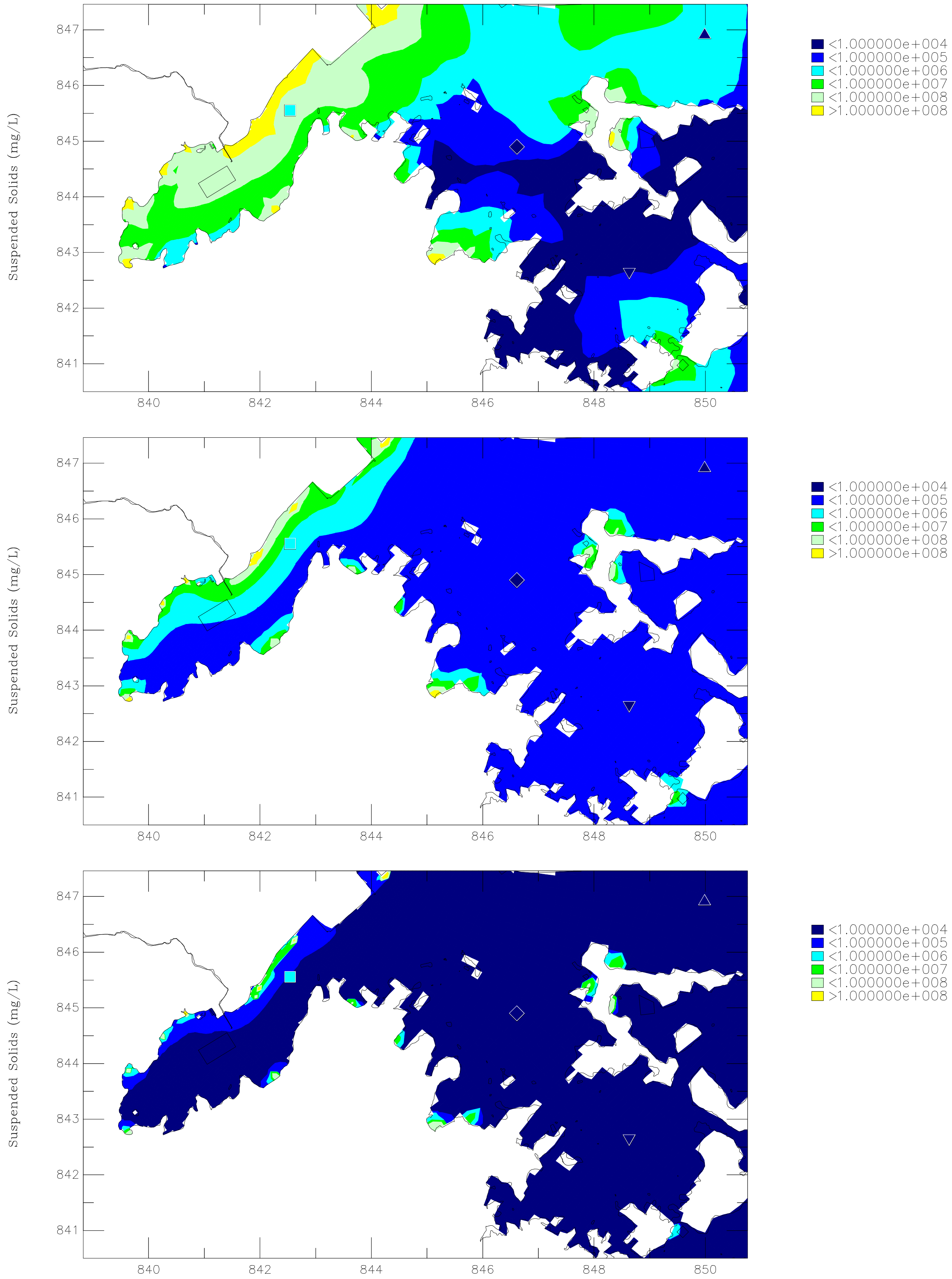
Water Quality Prediction 2011 Jan – Suspended Solids

Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

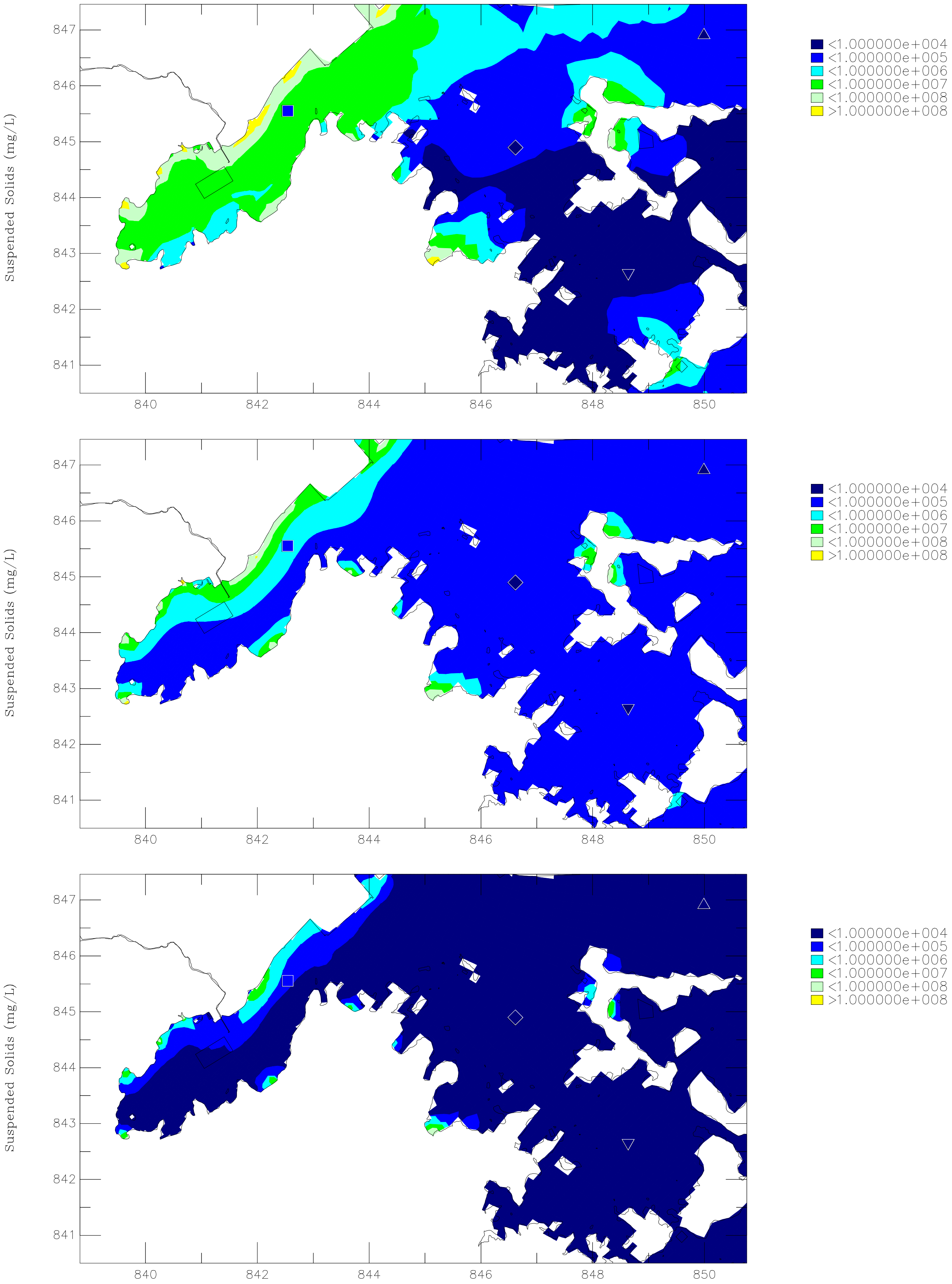
Year 2011	Jan
Annex 5C–18	

ERM HK Limited

0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan – E.coli Surface Layer; Top: Maximum; Middle: Geometric Mean; Bottom: Minimum	Year 2011	Jan
	Annex 5C–19	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

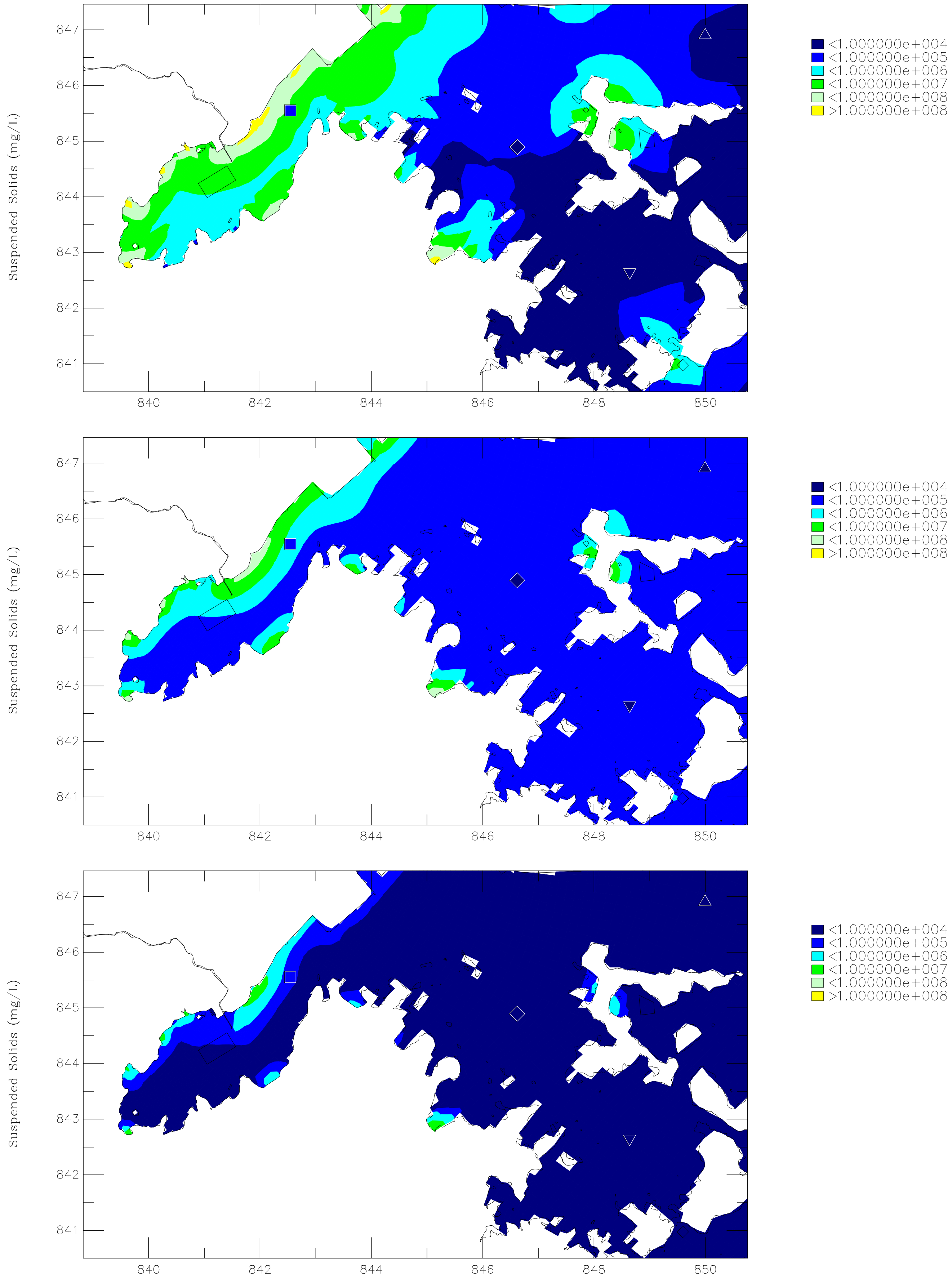
Water Quality Prediction 2011 Jan – Suspended Solids

Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

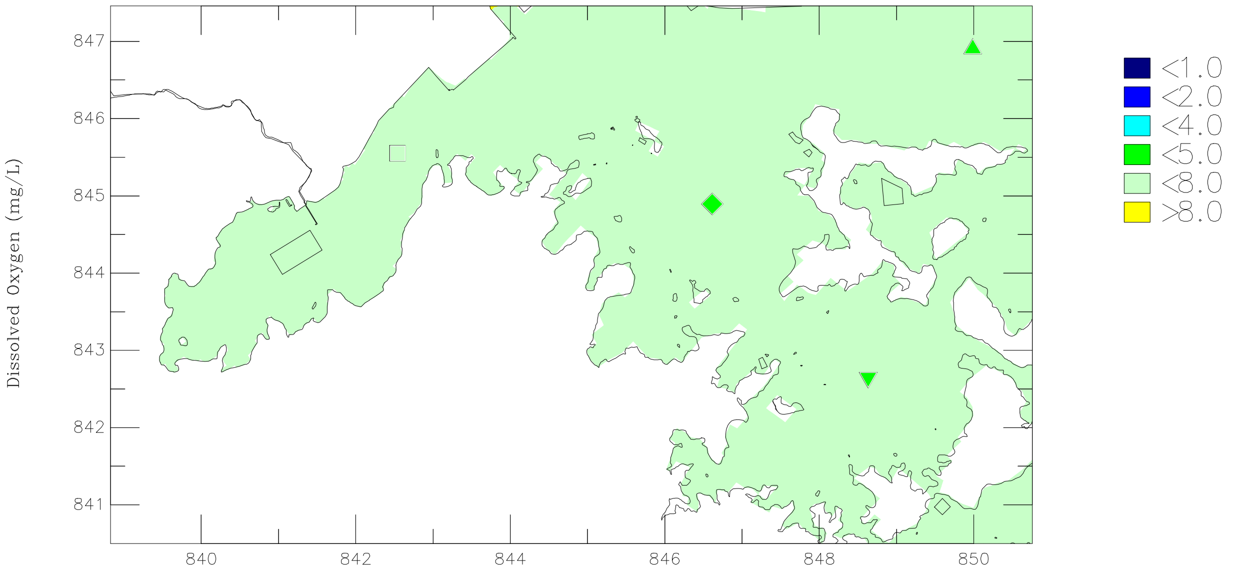
Year 2011	Jan
Annex 5C–20	

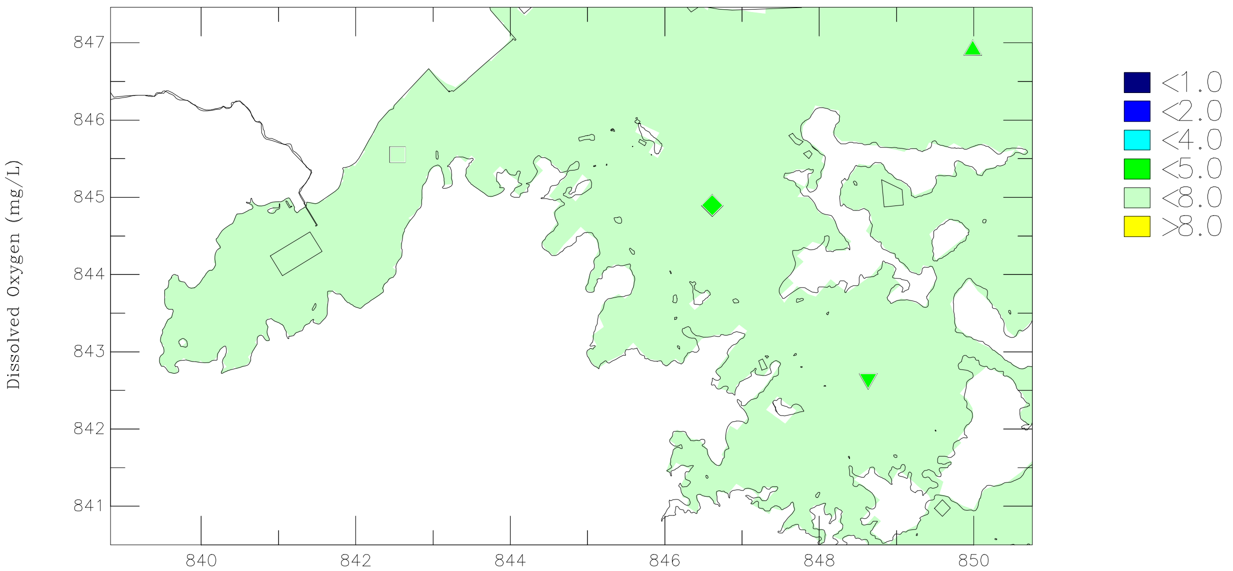
ERM HK Limited

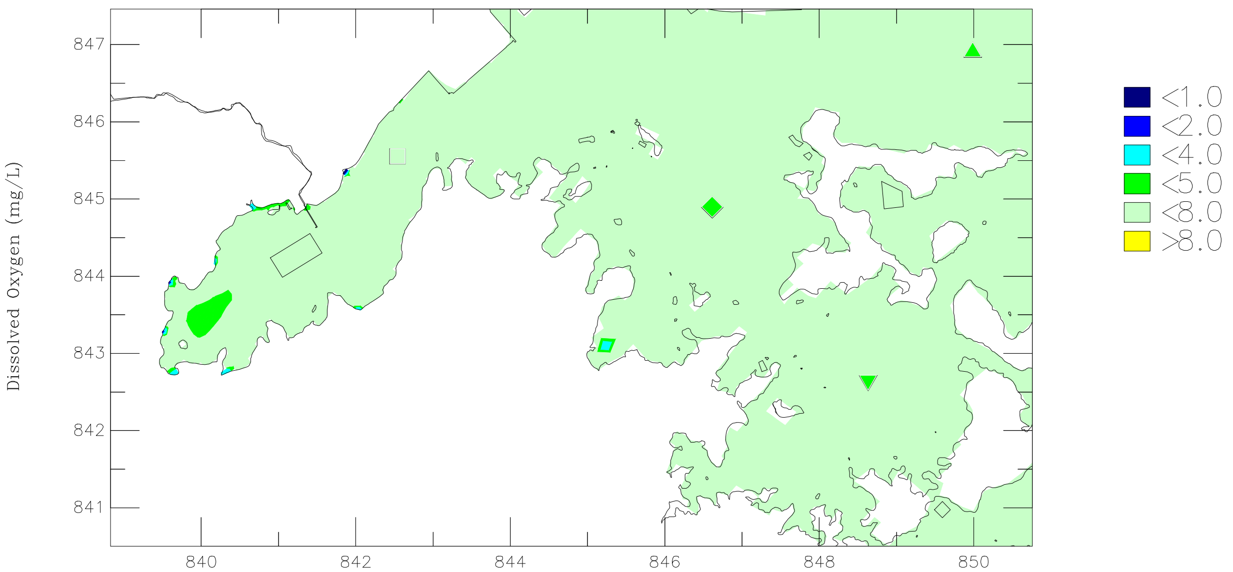
0211731/GPP | WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan – Suspended Solids Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jan
	Annex 5C–21	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn







Expansion of Sha Tau Kok Sewage Treatment Works

Water Quality Prediction 2011 Jan – Dissolved Oxygen

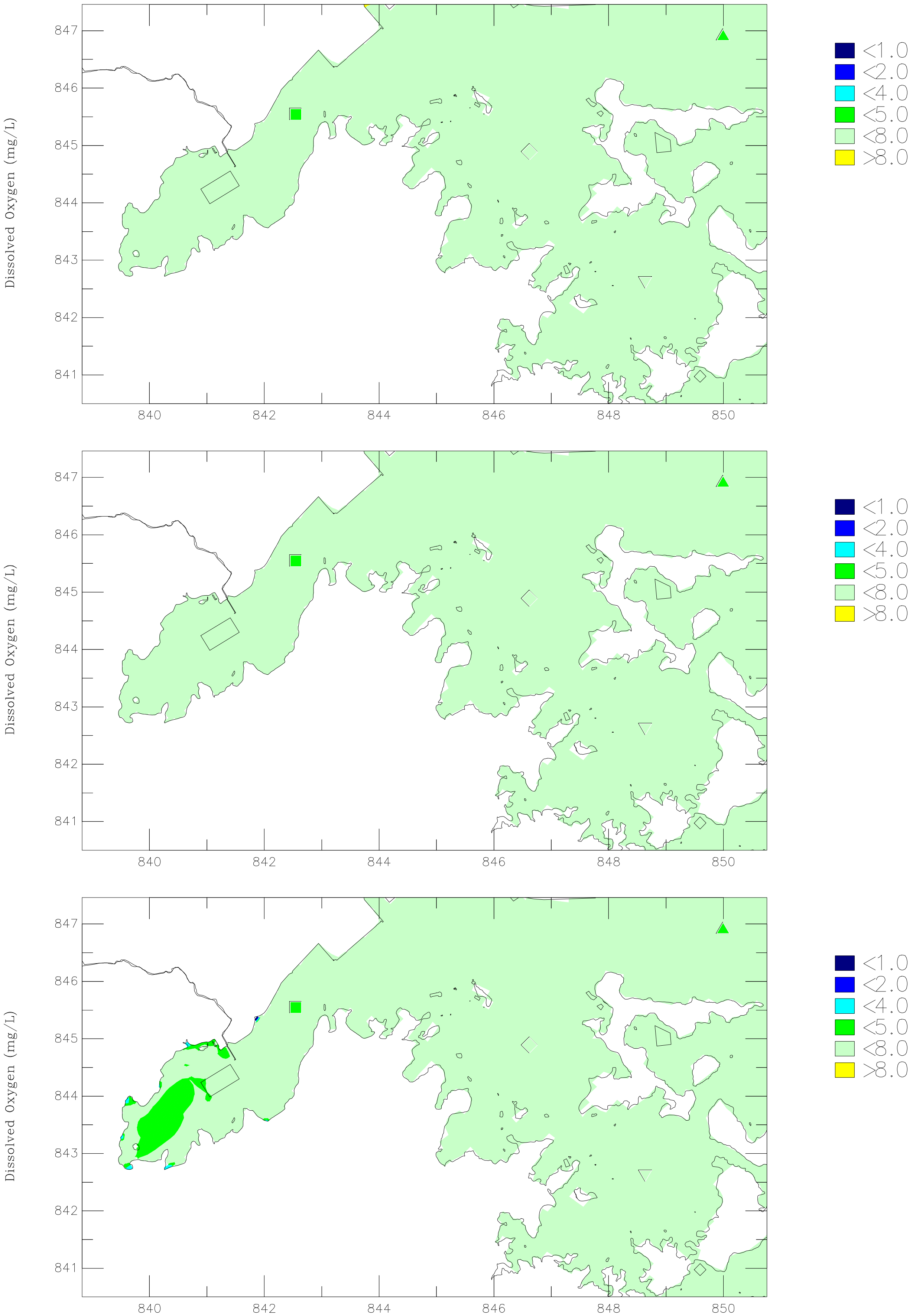
Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011 | Jan

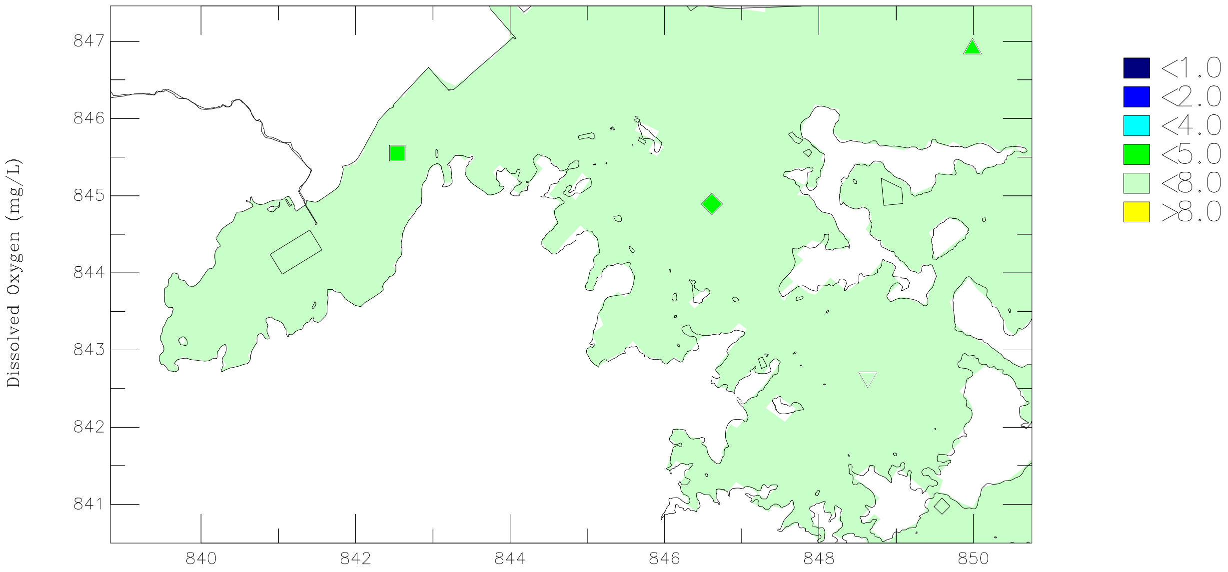
Annex 5C–22

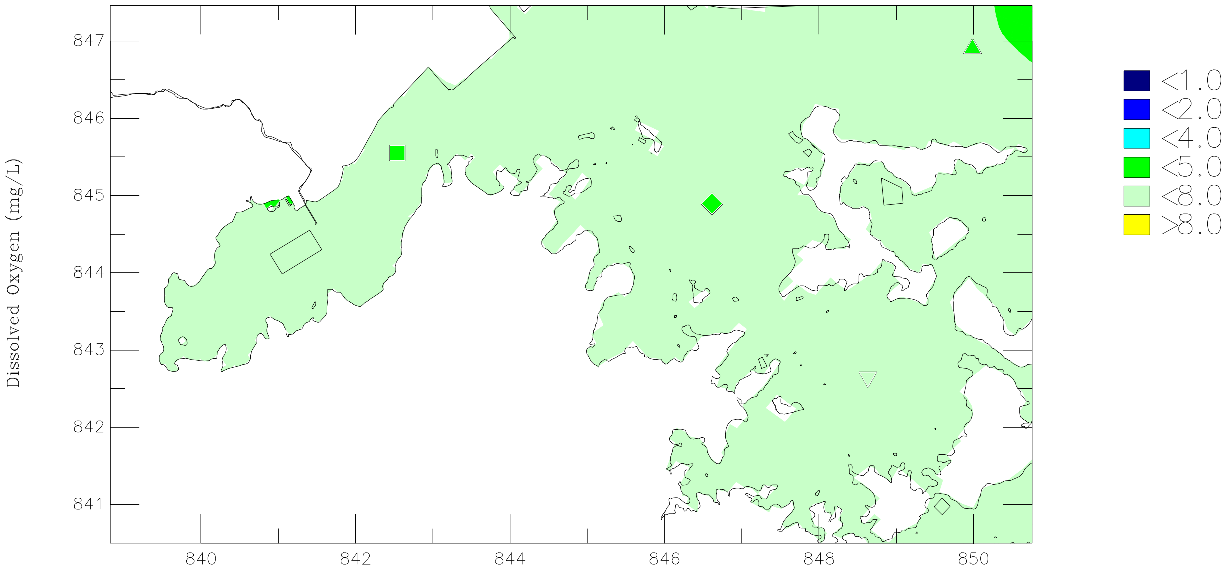
ERM HK Limited

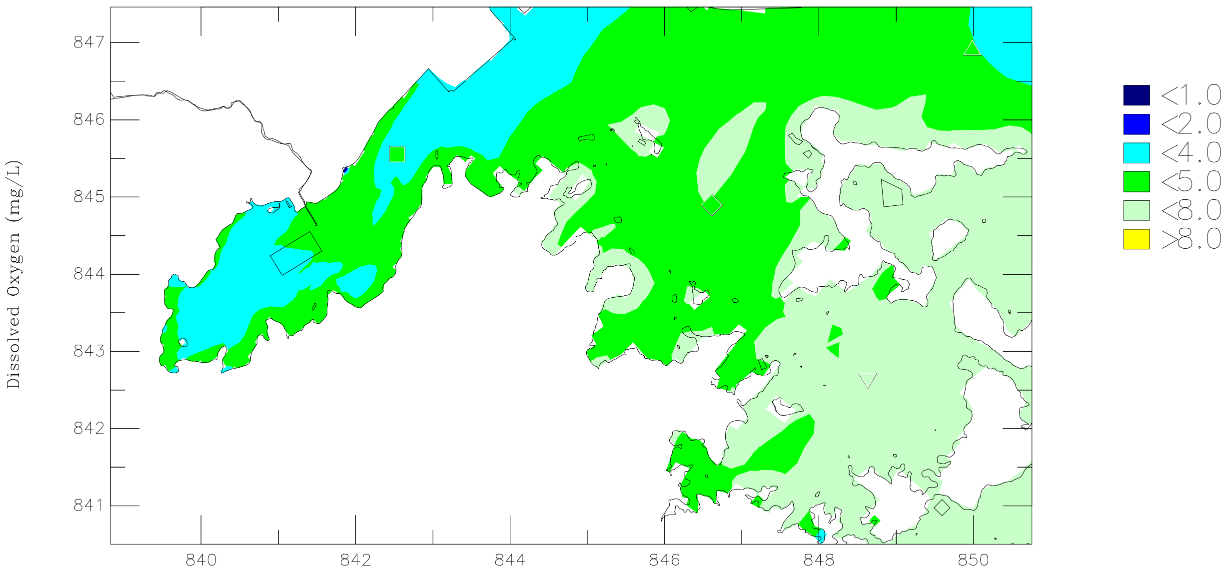
0211731/GPP | WQ·Cal.ssn



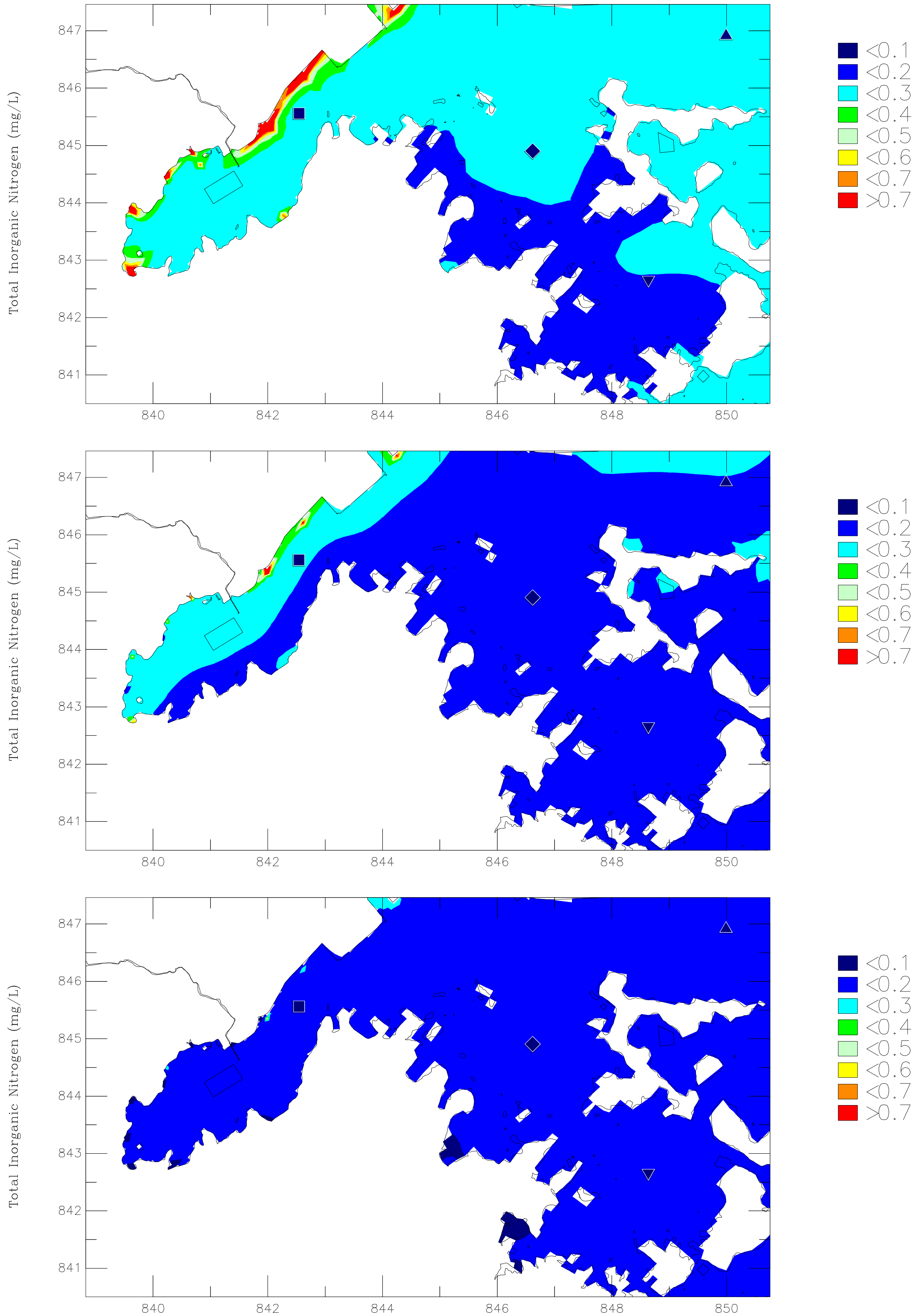
Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan – Dissolved Oxygen Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jan
	Annex 5C–23	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



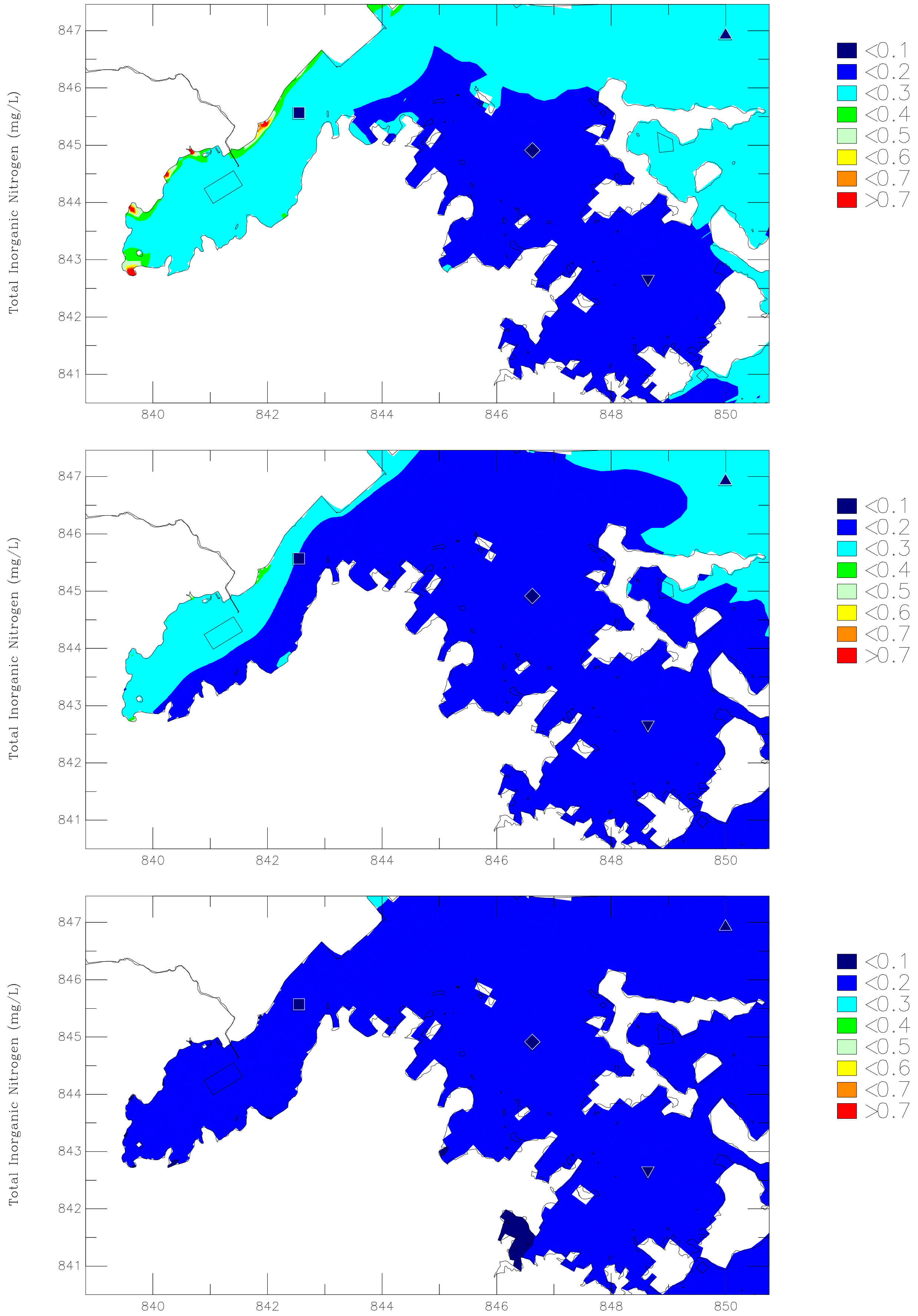




Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jan – Dissolved Oxygen Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jan
	Annex 5C–24	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jun – Total Inorganic Nitrogen Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jun
	Annex 5C–25	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn

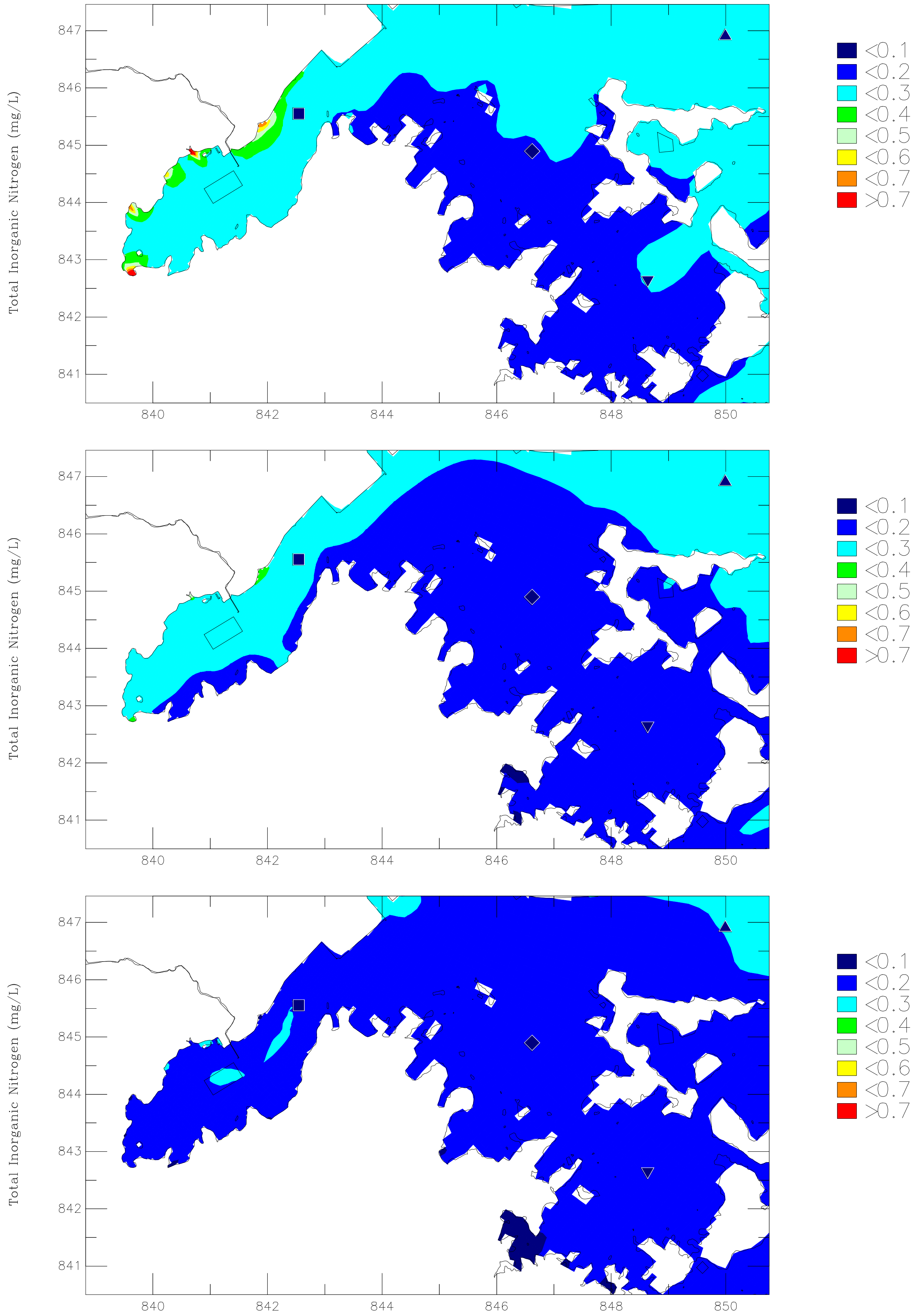


Expansion of Sha Tau Kok Sewage Treatment Works

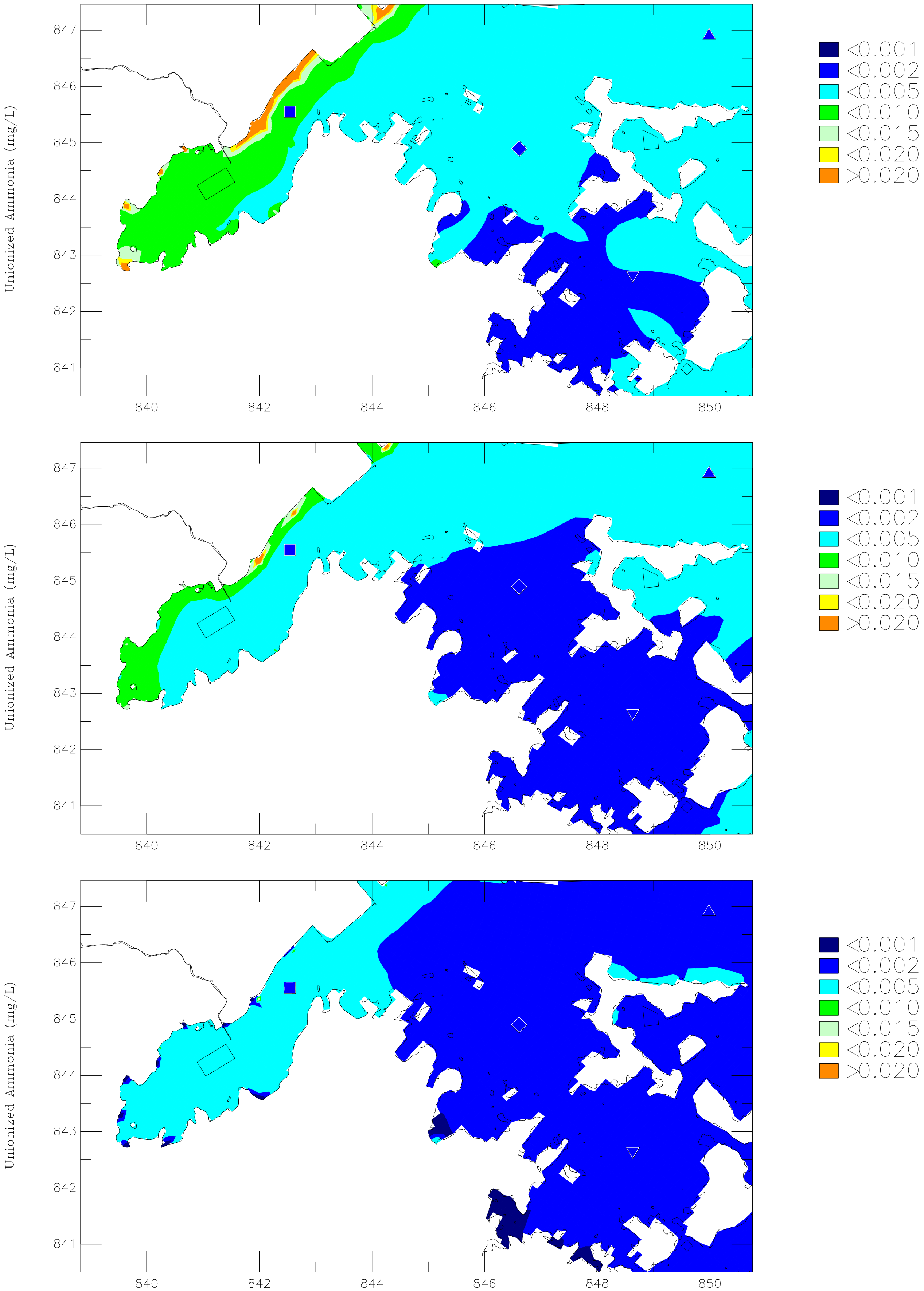
Water Quality Prediction 2011 Jun – Total Inorganic Nitrogen

Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jun	
Annex 5C–26		
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jun – Total Inorganic Nitrogen Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jun
	Annex 5C–27	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

Water Quality Prediction 2011 Jun – Unionized Ammonia

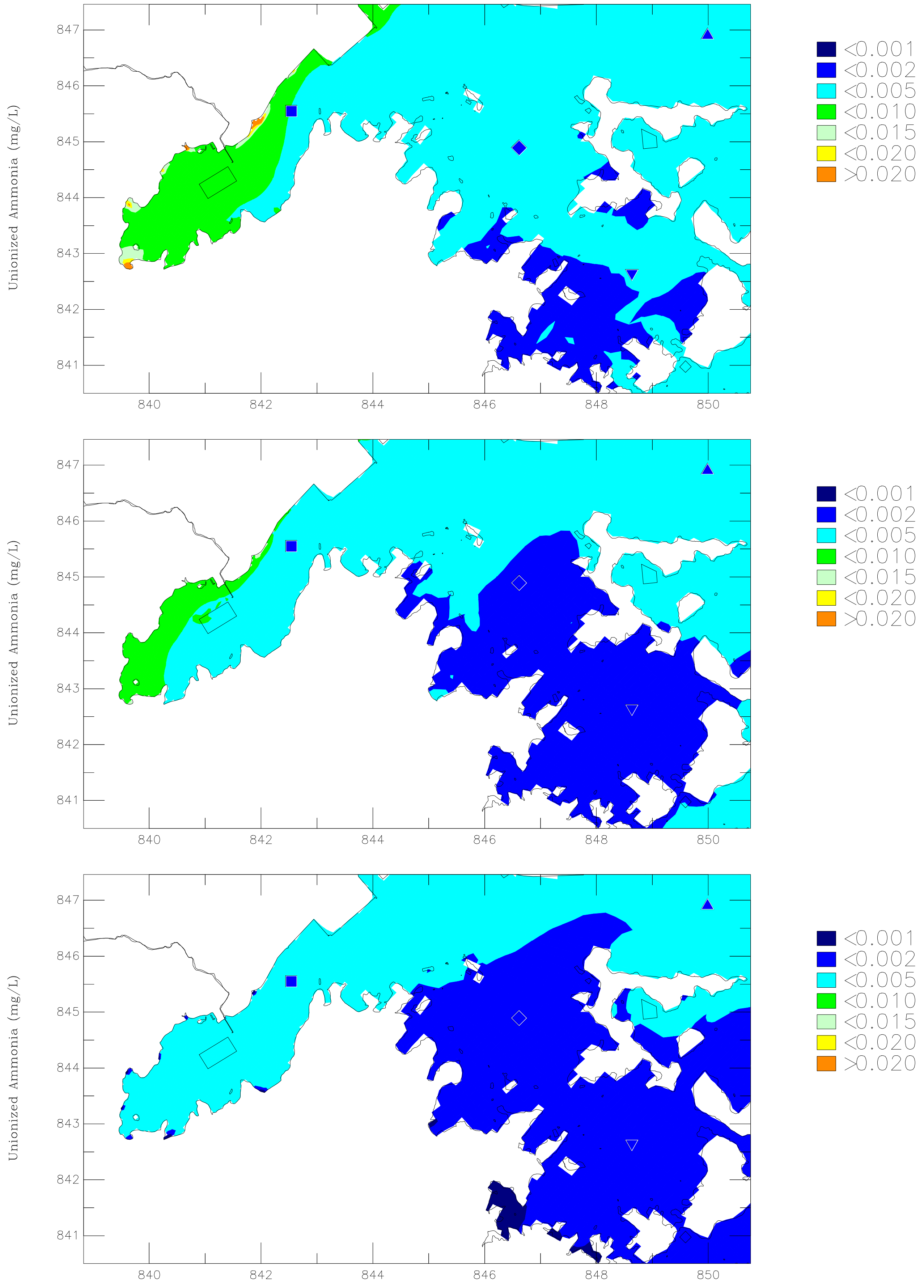
Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011 | Jun

Annex 5C–28

ERM HK Limited

0211731/GPP | WQ·Cal.ssn



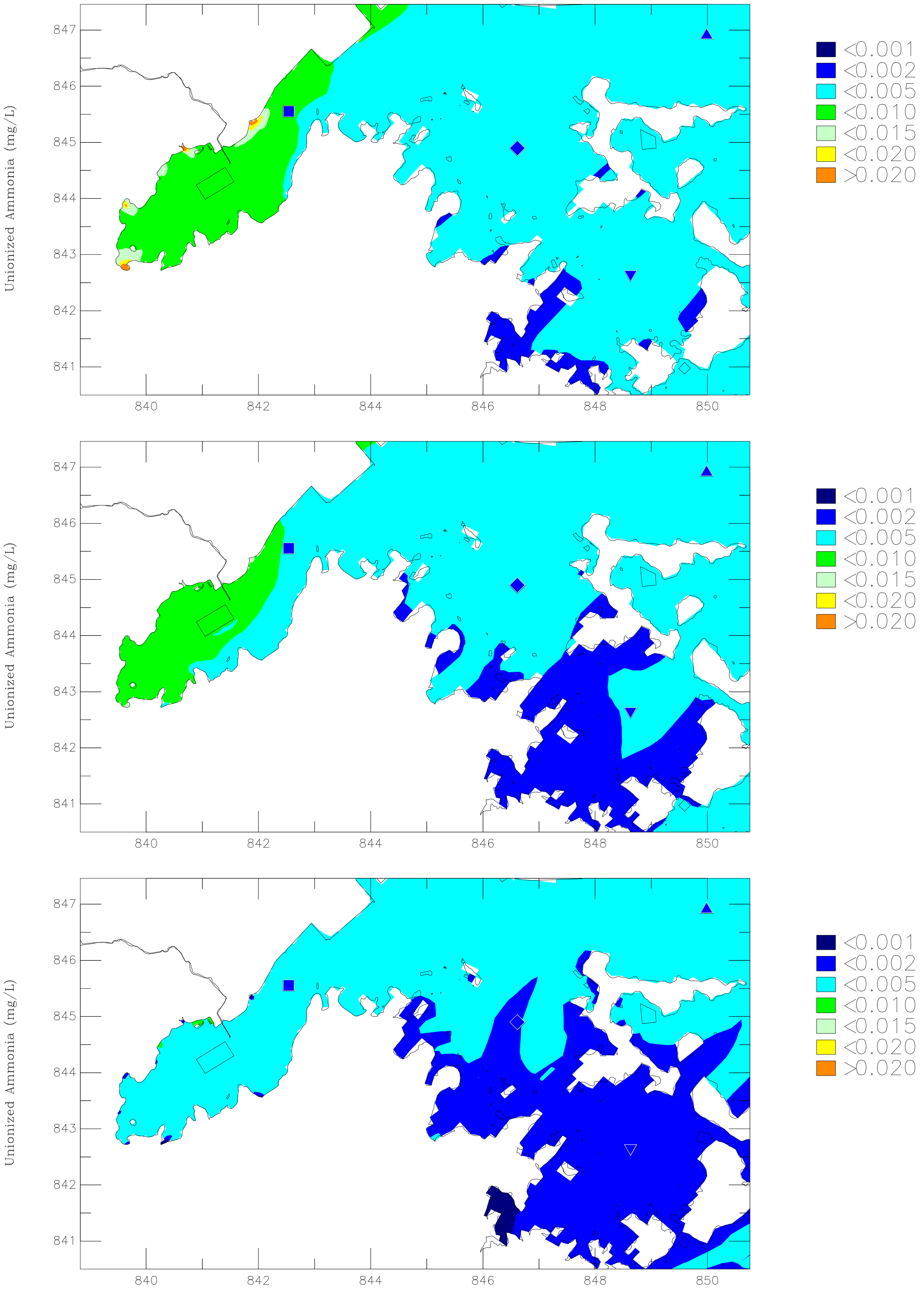
Expansion of Sha Tau Kok Sewage Treatment Works

Water Quality Prediction 2011 Jun – Unionized Ammonia

Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jun
Annex 5C–29	
0211731/GPP	WQ·Cal.ssn

ERM HK Limited



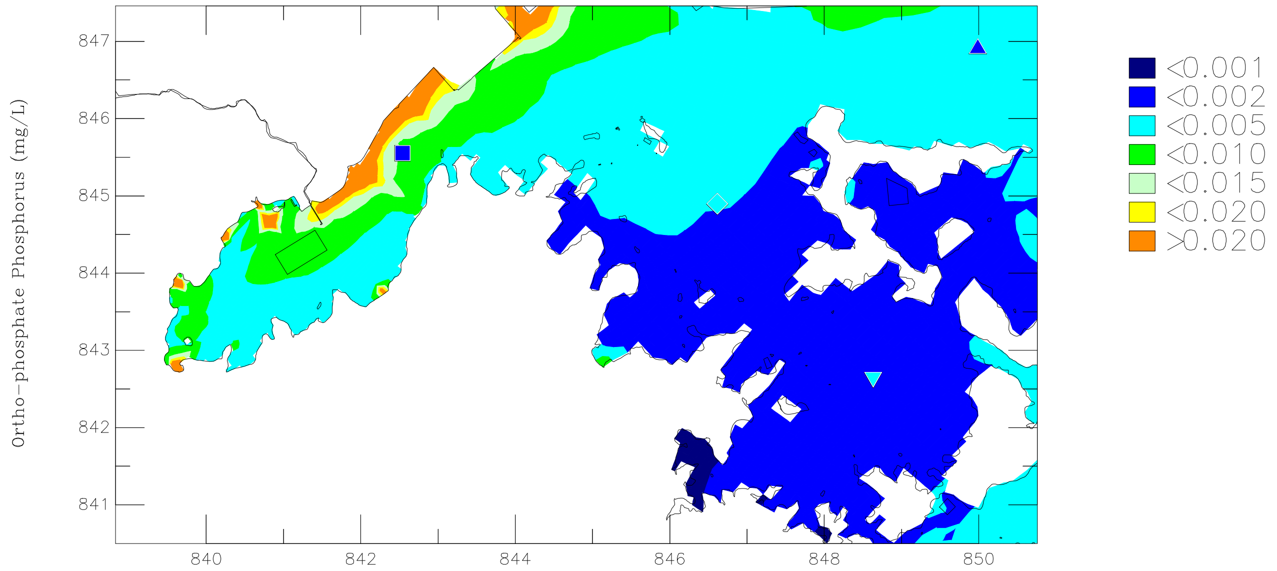
Expansion of Sha Tau Kok Sewage Treatment Works

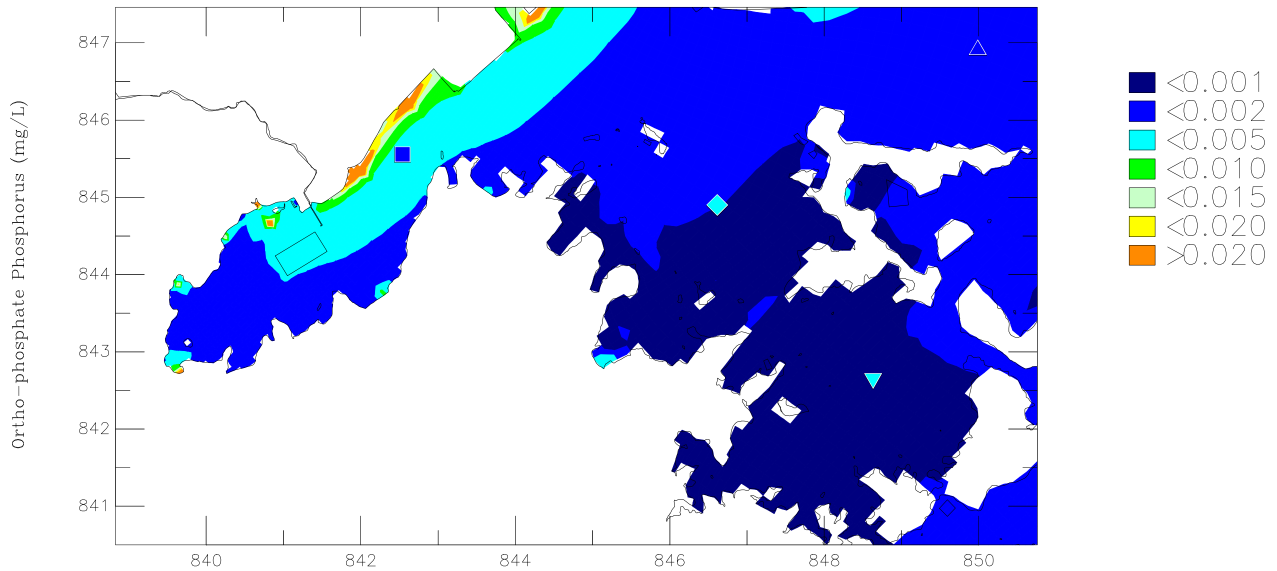
Water Quality Prediction 2011 Jun – Unionized Ammonia

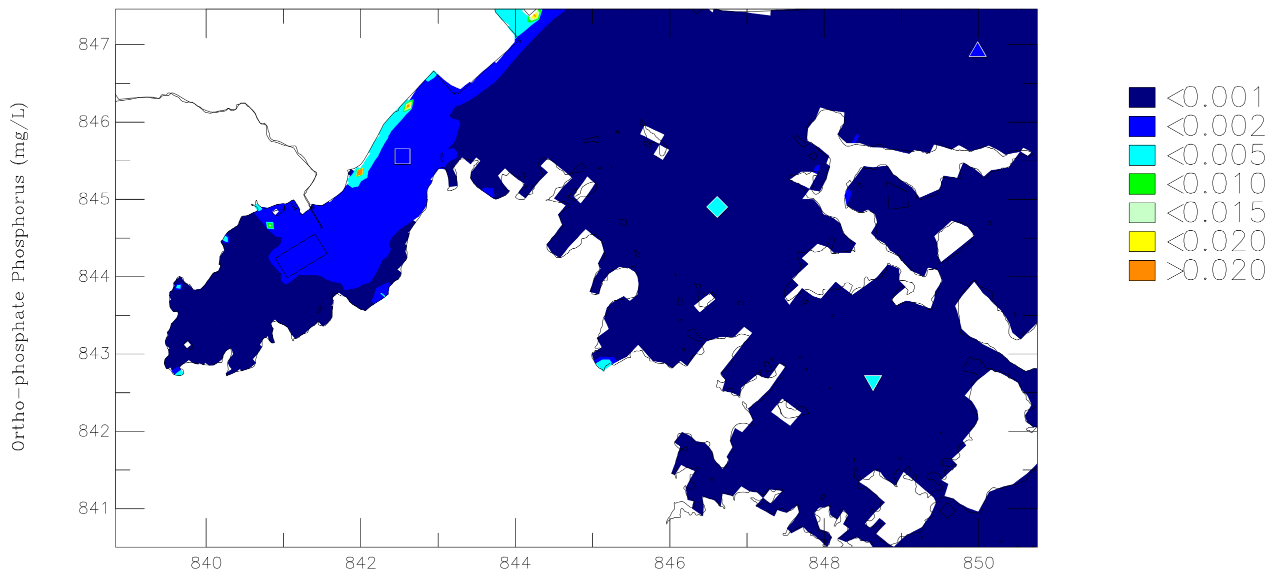
Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jun
Annex 5C–30	
0211731/GPP	WQ·Cal.ssn

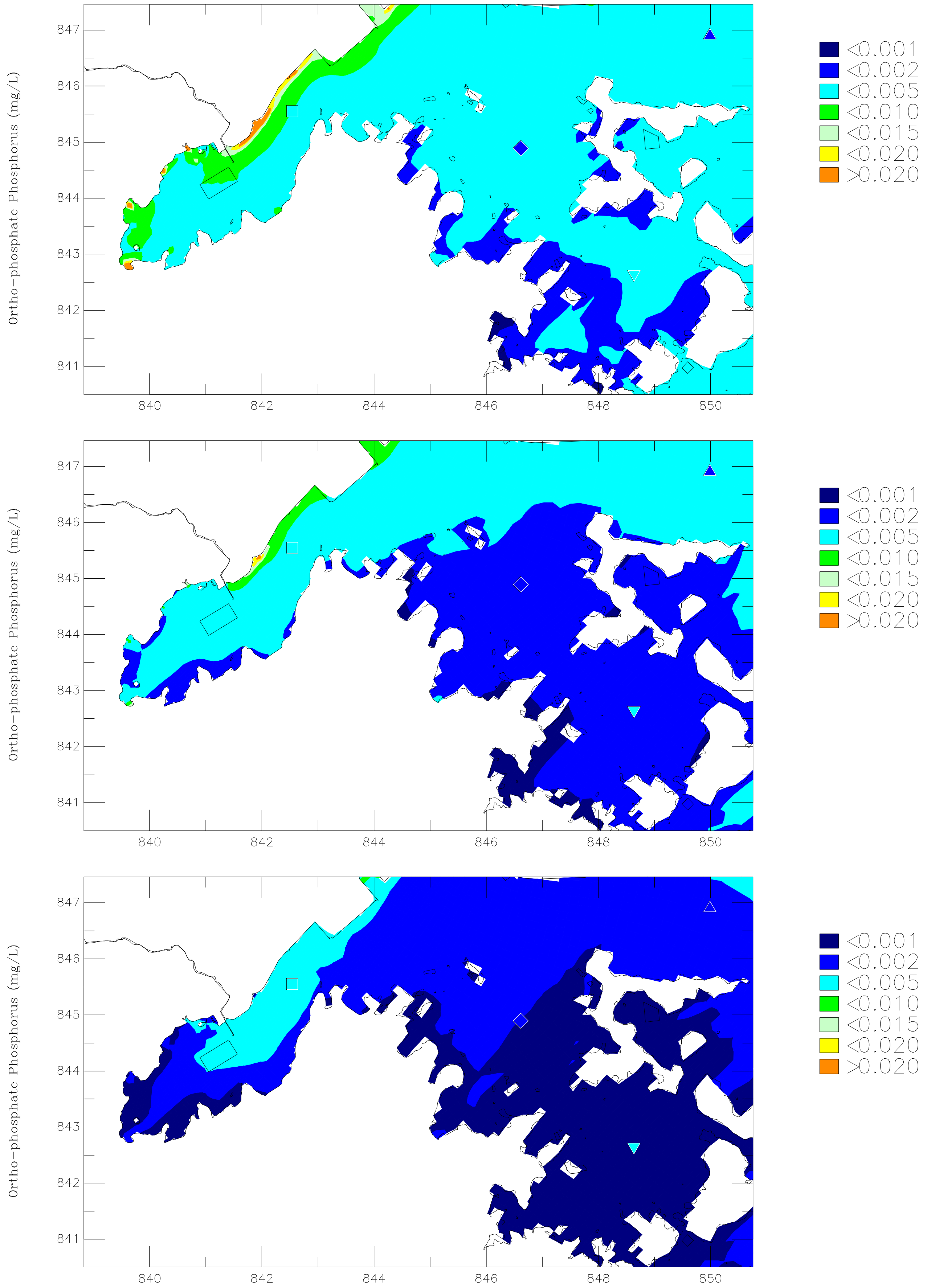
ERM HK Limited







Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jun – Ortho-phosphate Phosphorus Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jun
	Annex 5C-31	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



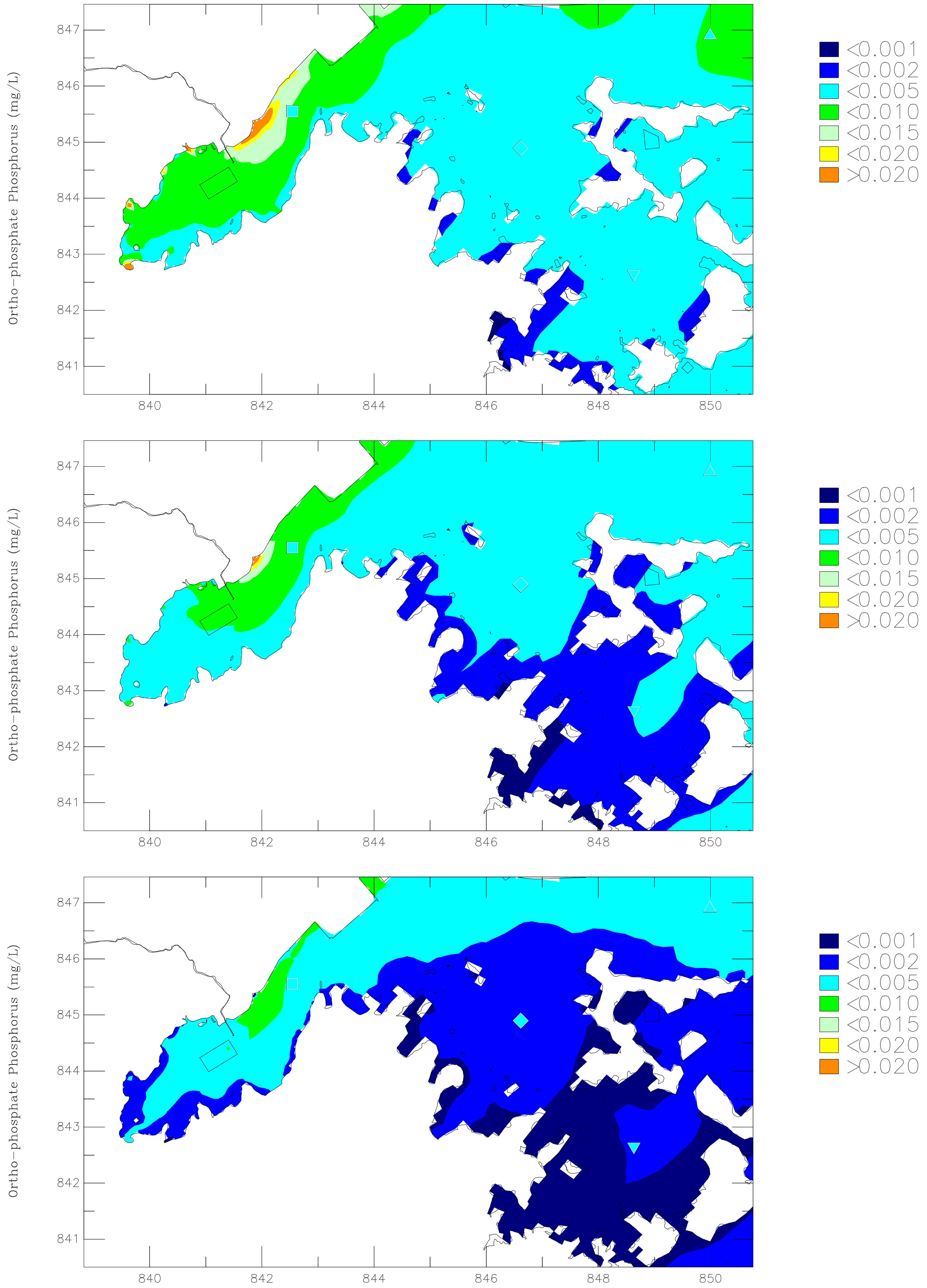
Expansion of Sha Tau Kok Sewage Treatment Works

Water Quality Prediction 2011 Jun – Ortho-phosphate Phosphorus

Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jun
Annex 5C-32	
0211731/GPP	WQ-Cal.ssn

ERM HK Limited



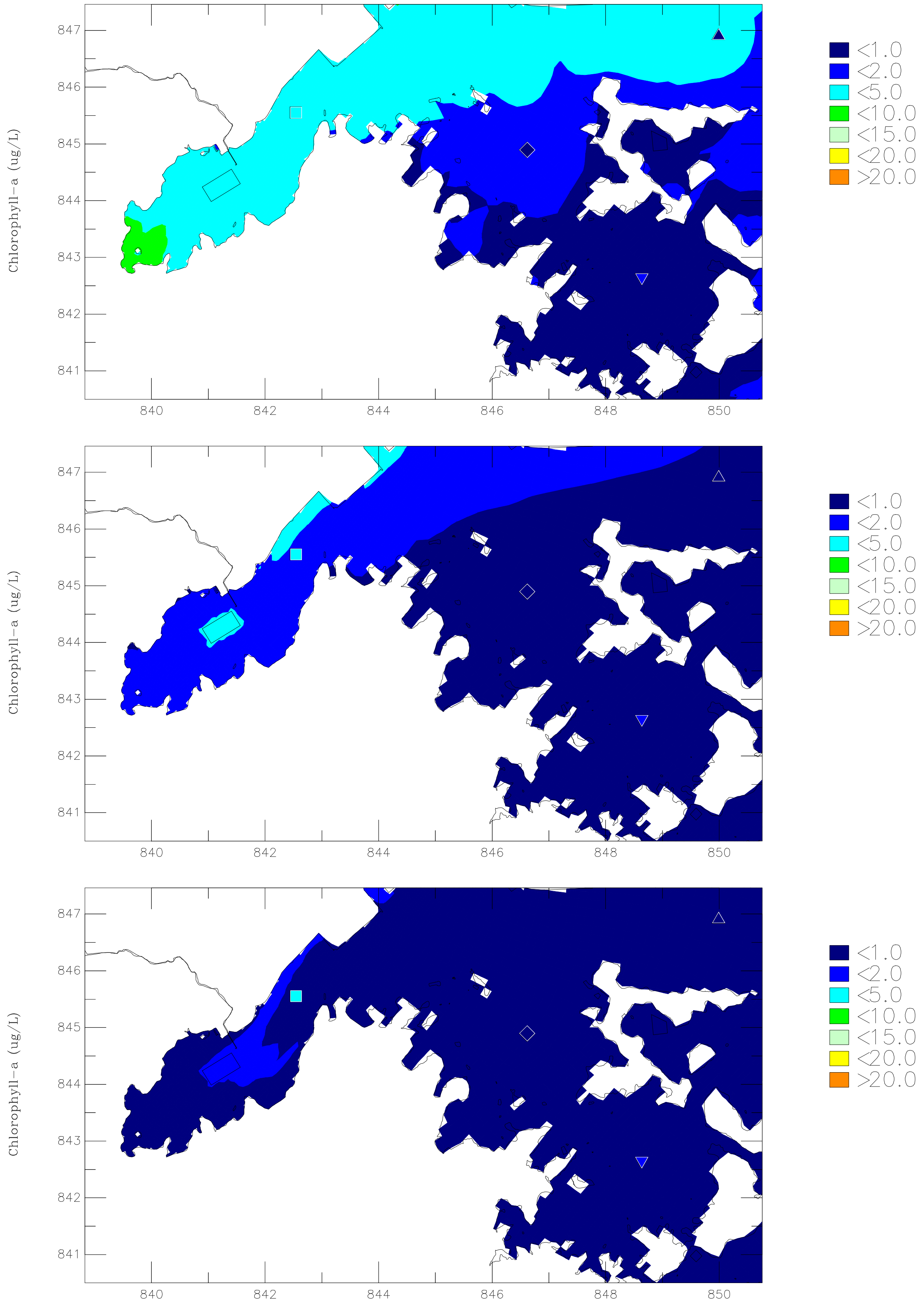
Expansion of Sha Tau Kok Sewage Treatment Works

Water Quality Prediction 2011 Jun – Ortho-phosphate Phosphorus

Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jun
Annex 5C-33	
0211731/GPP	WQ·Cal.ssn

ERM HK Limited



Expansion of Sha Tau Kok Sewage Treatment Works

Water Quality Prediction 2011 Jun – Chlorophyll-a

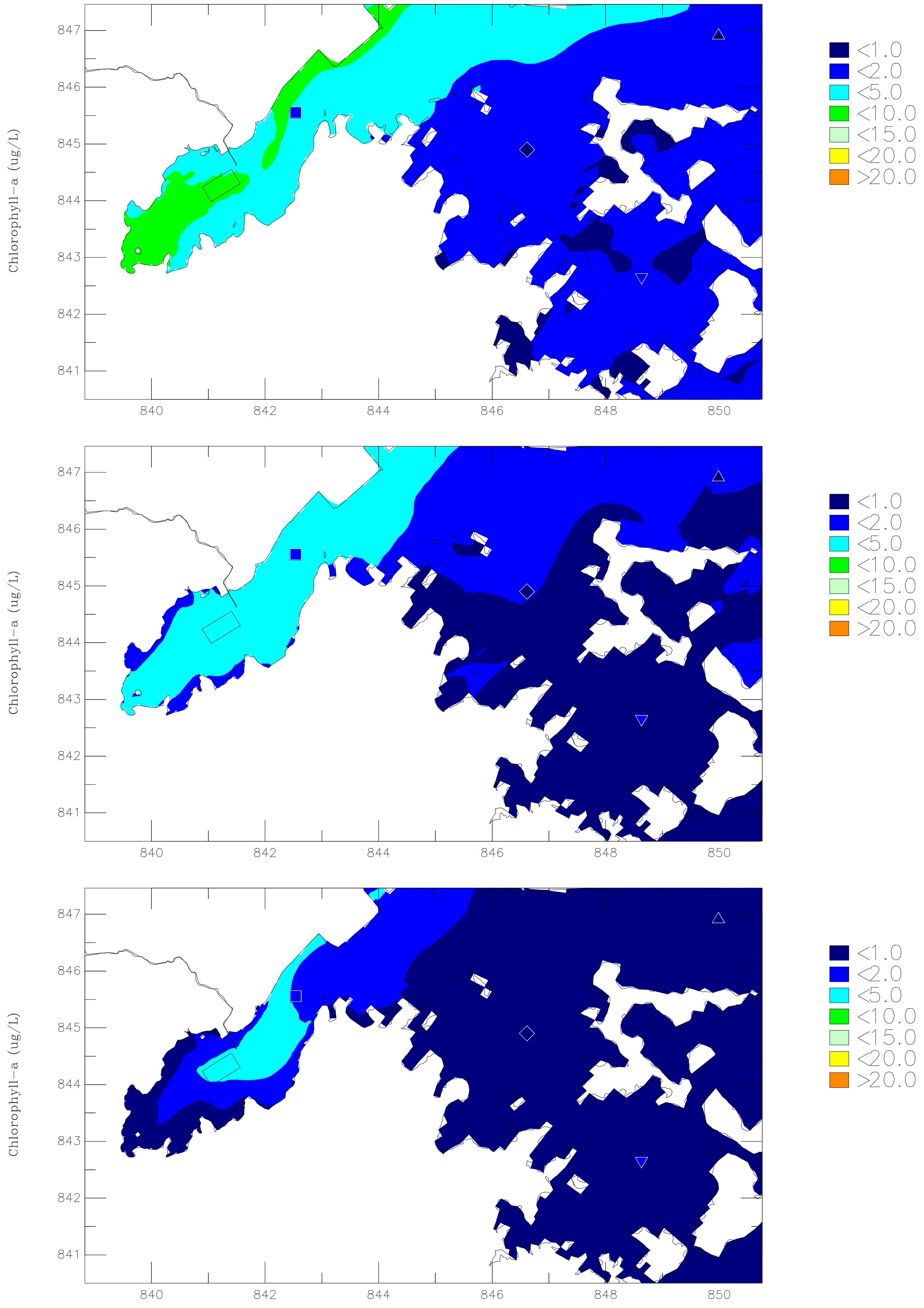
Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011 | Jun

Annex 5C-34

ERM HK Limited

0211731/GPP | WQ-Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

Water Quality Prediction 2011 Jun – Chlorophyll-a

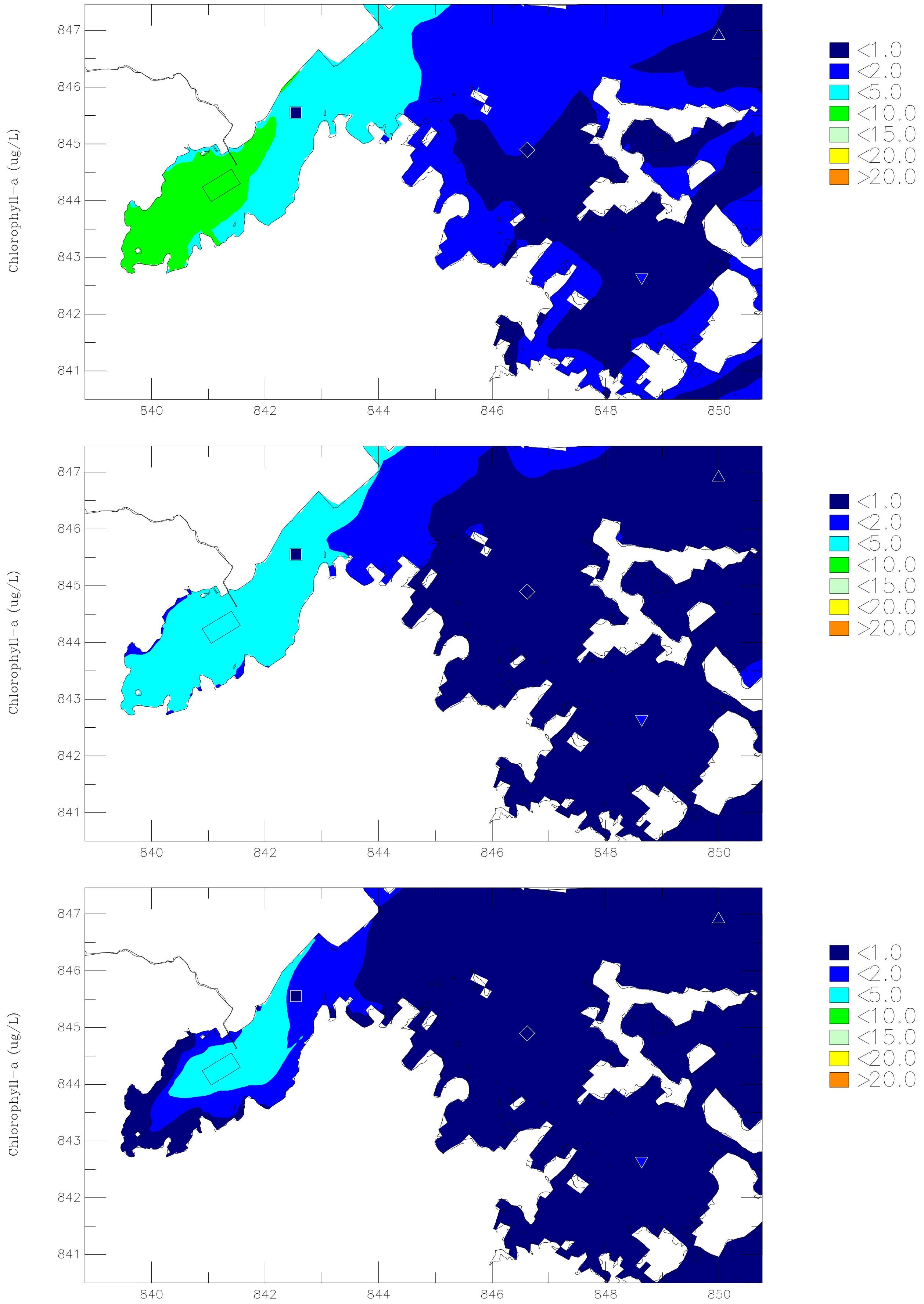
Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011 | Jun

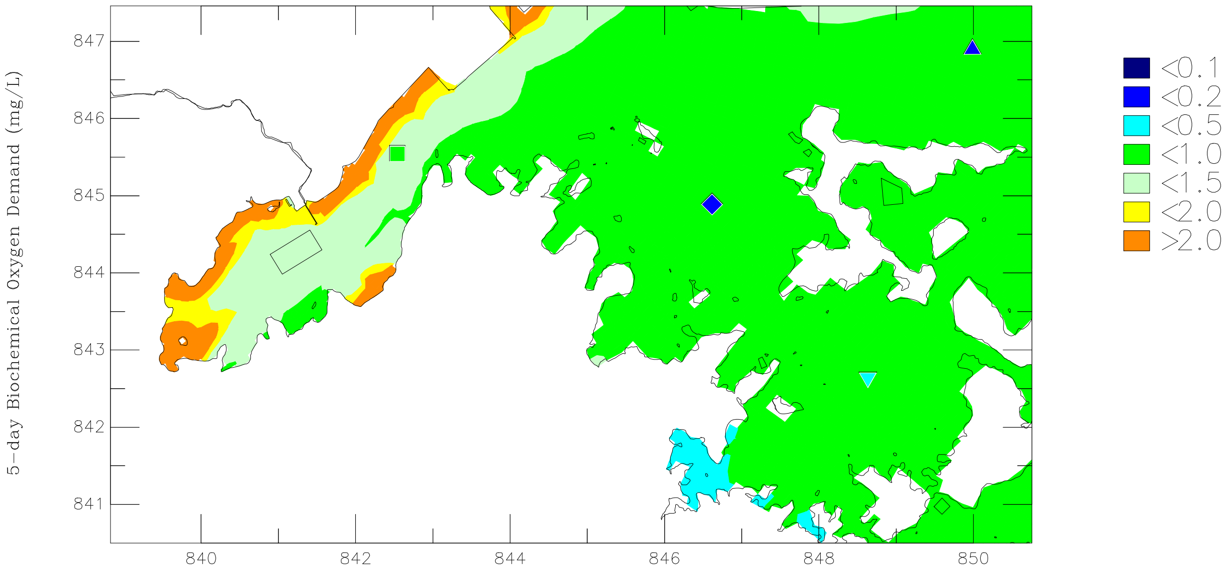
Annex 5C–35

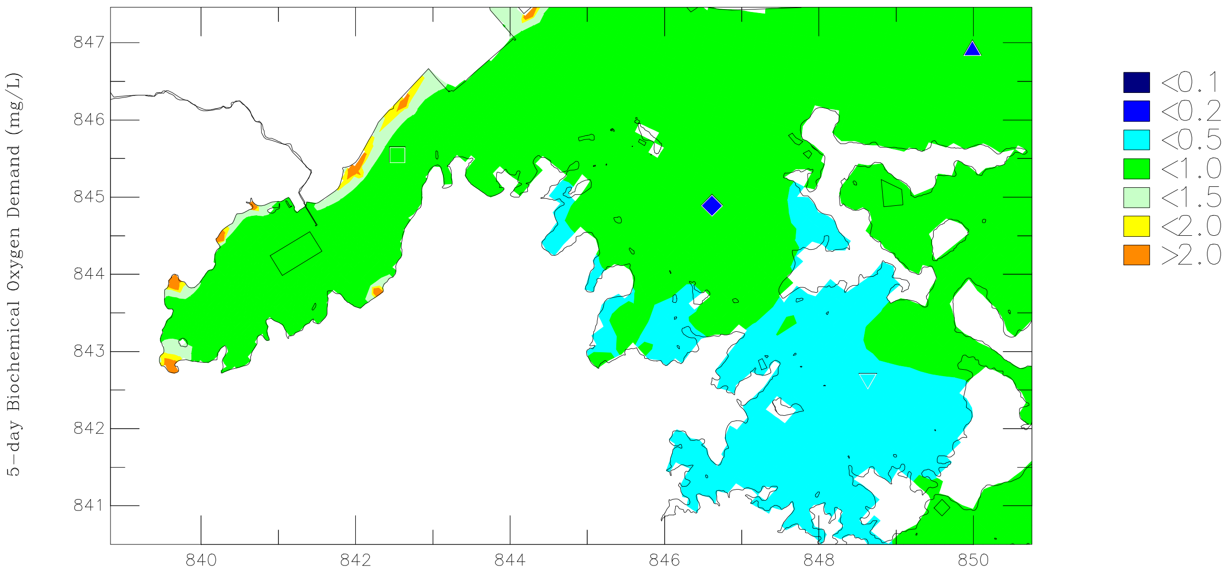
ERM HK Limited

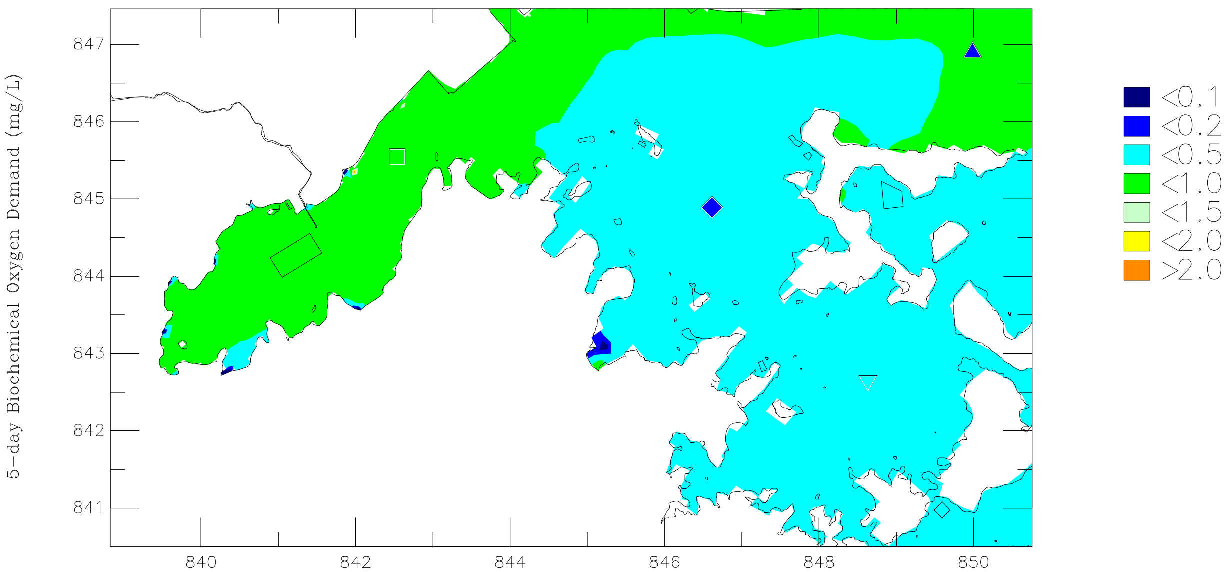
0211731/GPP | WQ·Cal.ssn



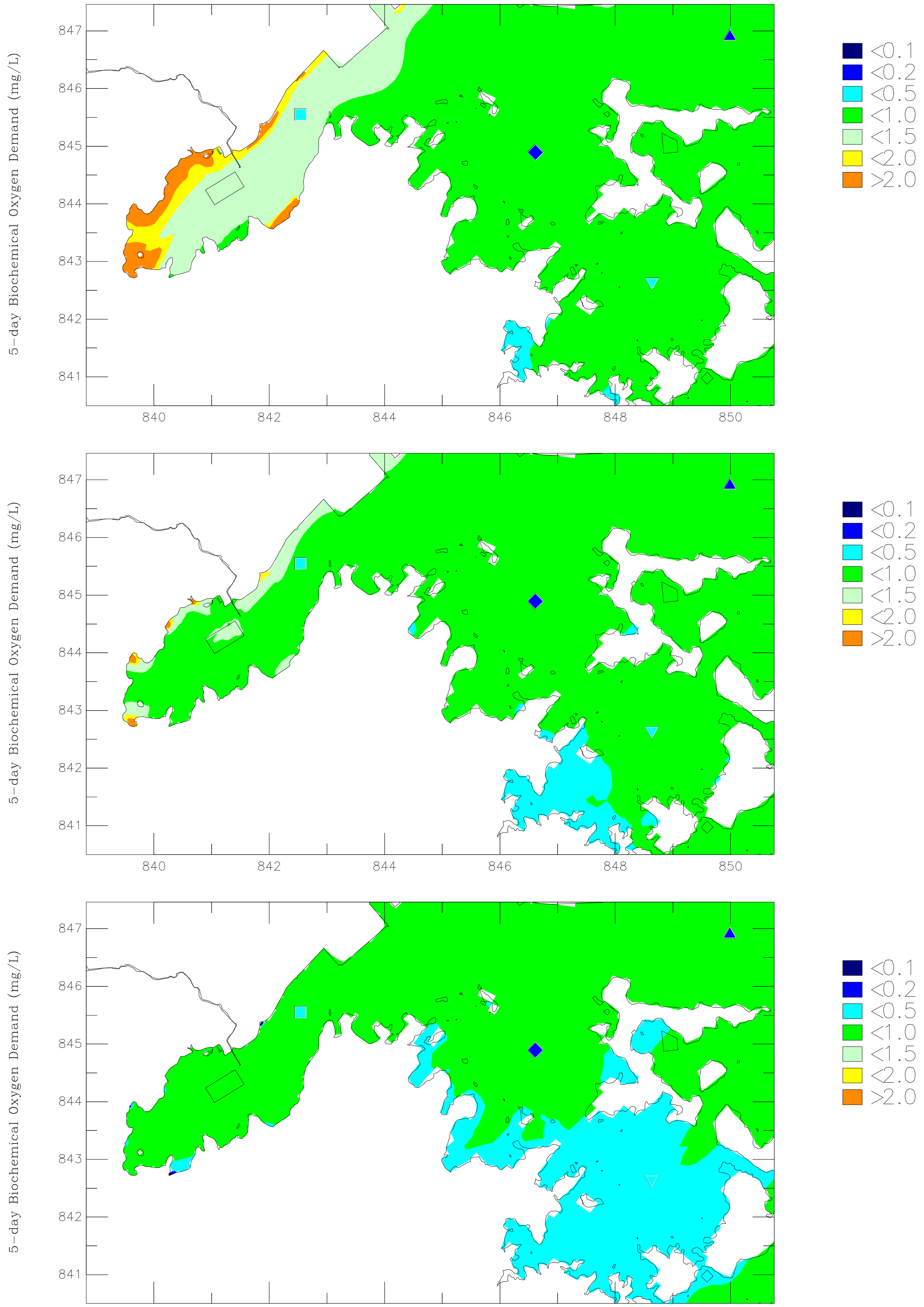
Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jun – Chlorophyll-a Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jun
	Annex 5C-36	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



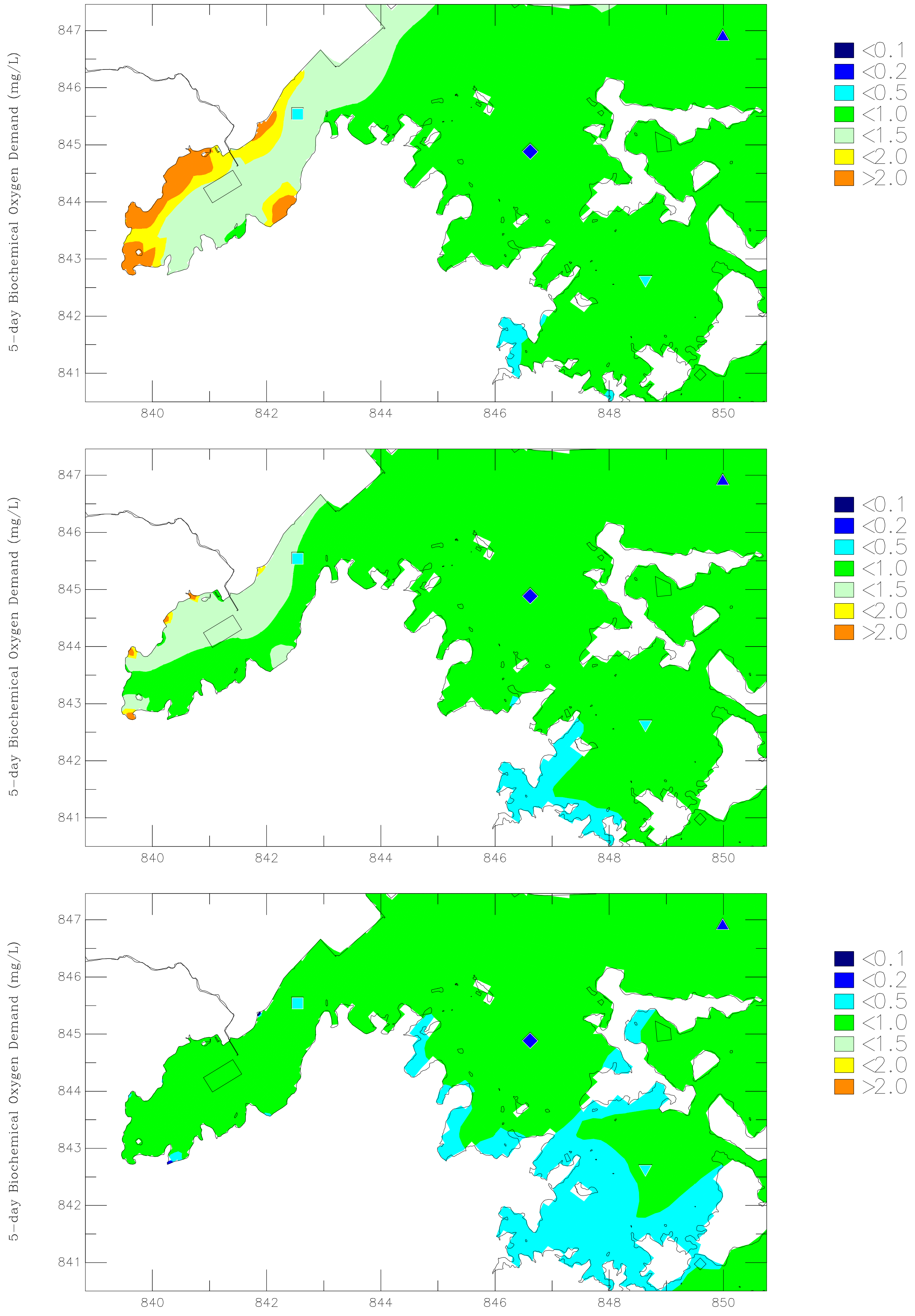




Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jun – 5-day Biochemical Oxygen Demand Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jun
	Annex 5C–37	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jun – 5-day Biochemical Oxygen Demand Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jun
	Annex 5C–38	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

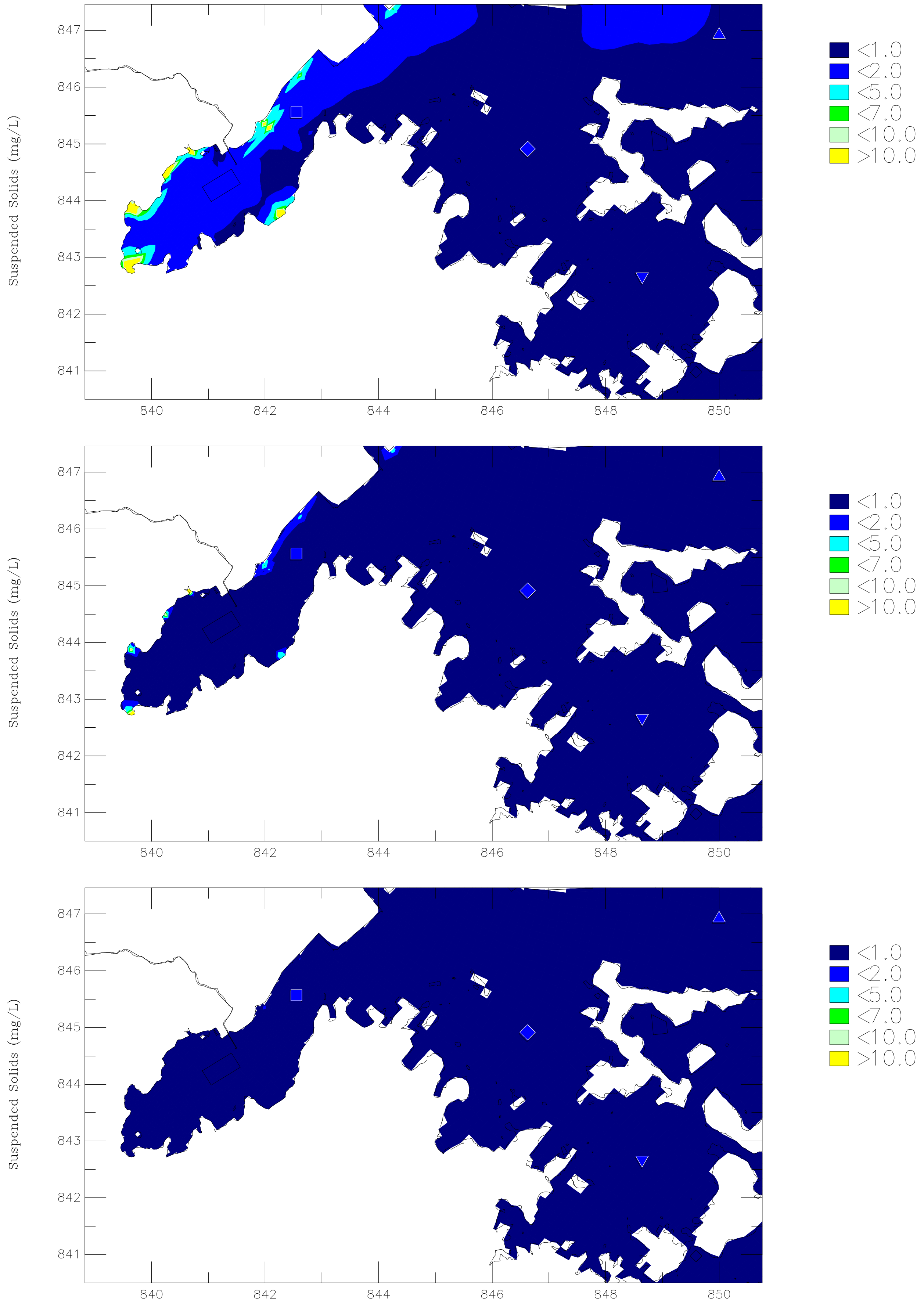
Water Quality Prediction 2011 Jun – 5-day Biochemical Oxygen Demand

Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jun
Annex 5C–39	

ERM HK Limited

0211731/GPP | WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

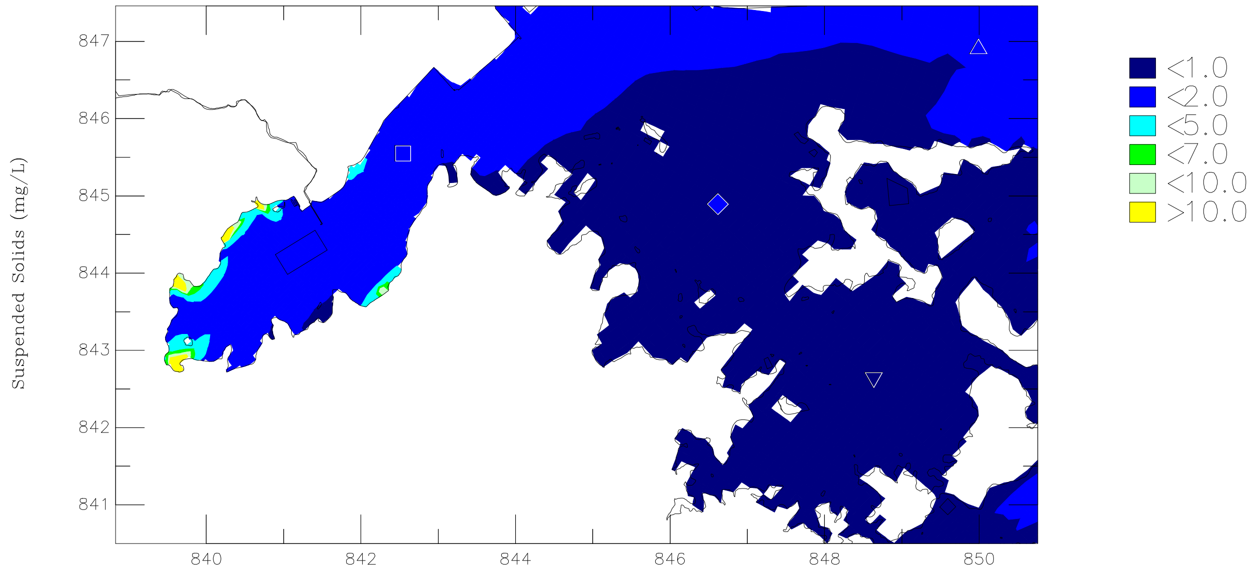
Water Quality Prediction 2011 Jun – Suspended Solids

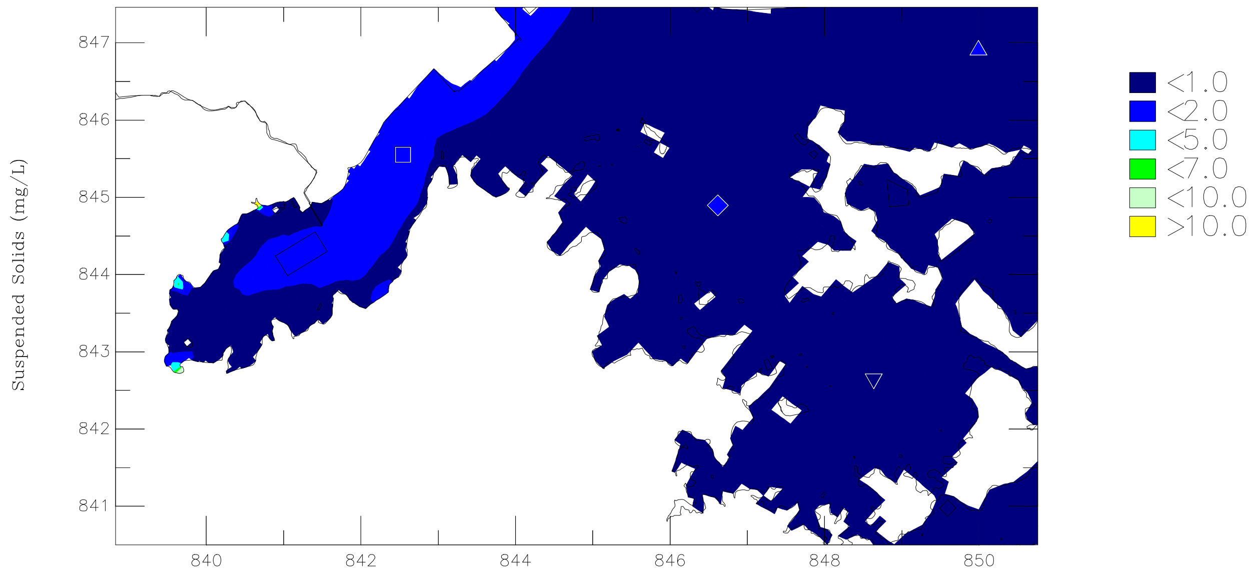
Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

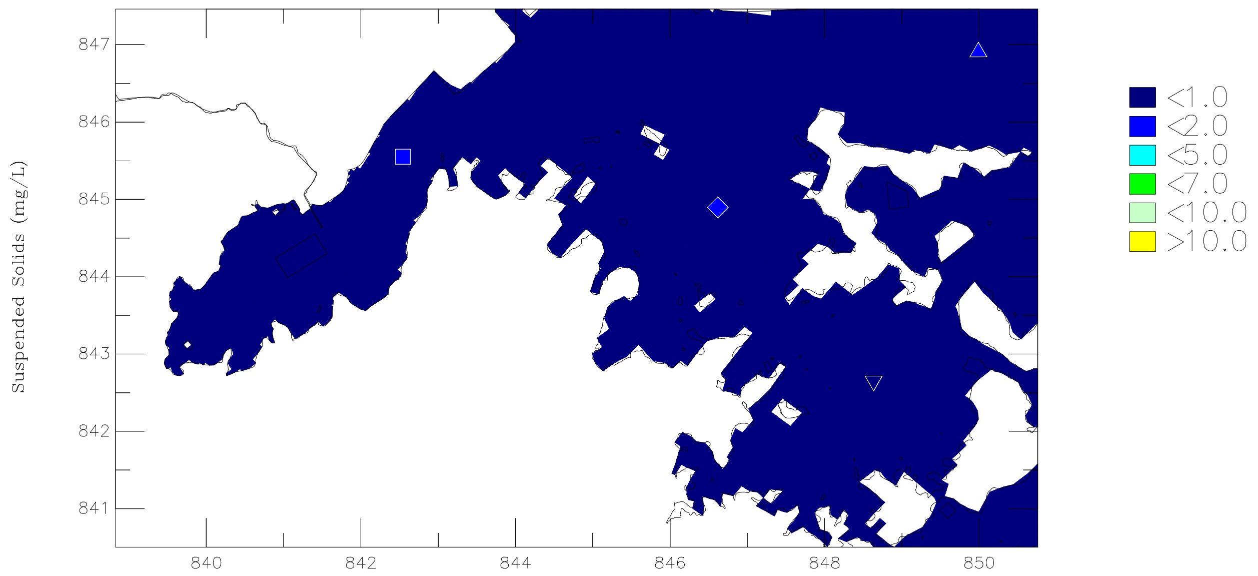
Year 2011	Jun
Annex 5C–40	

ERM HK Limited

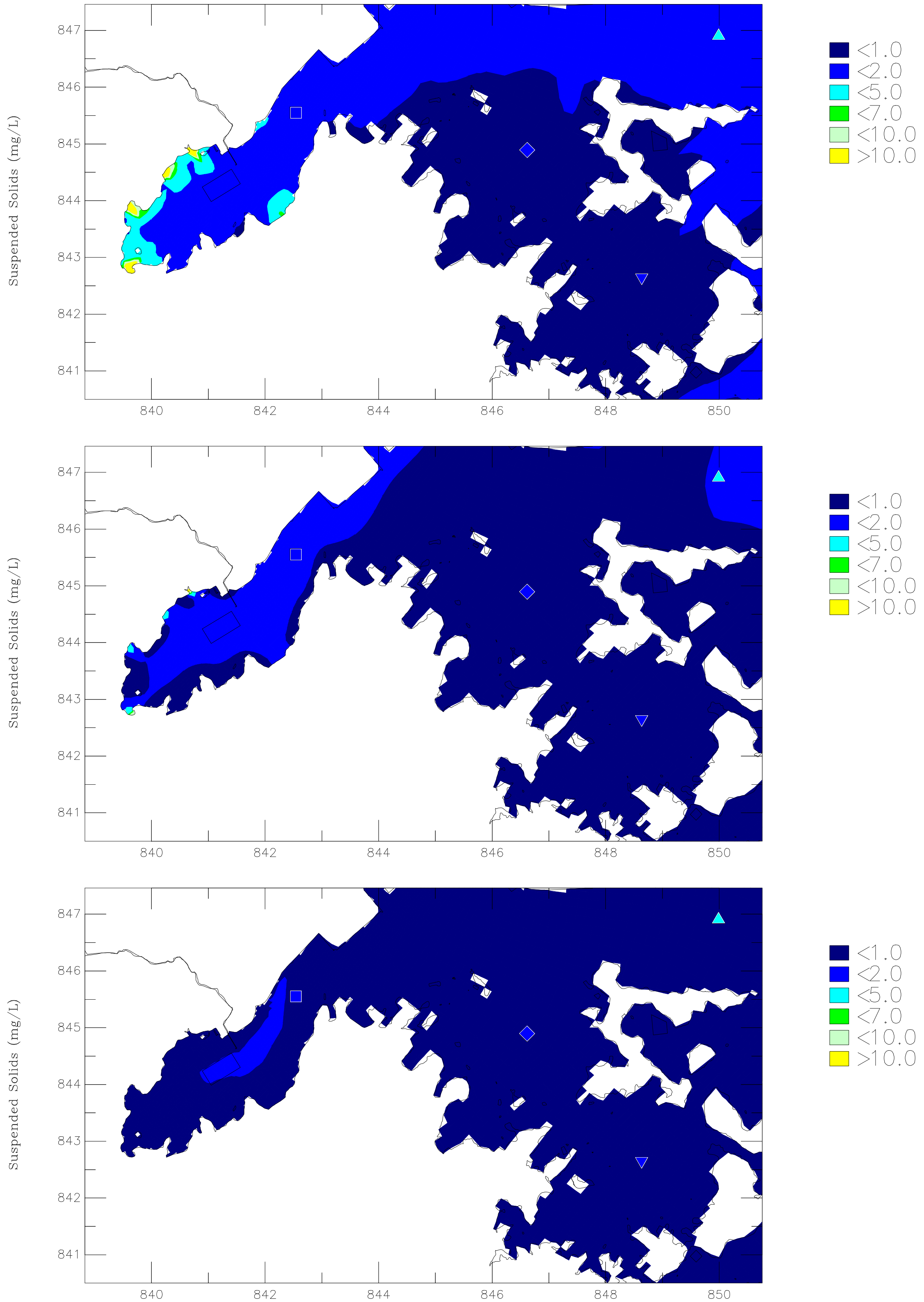
0211731/GPP WQ·Cal.ssn



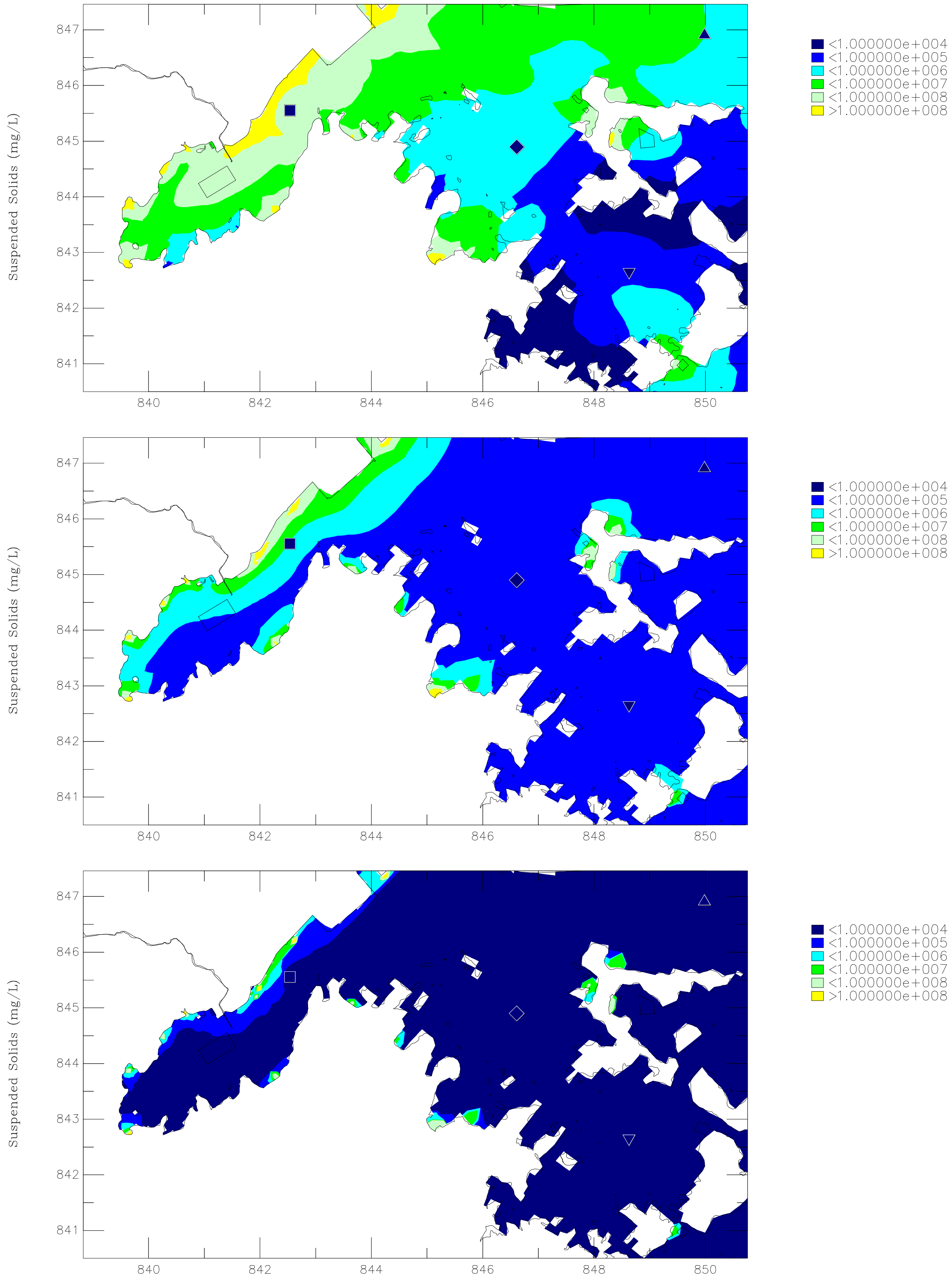




Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jun – Suspended Solids Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jun
	Annex 5C–41	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jun – Suspended Solids Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jun
	Annex 5C–42	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn

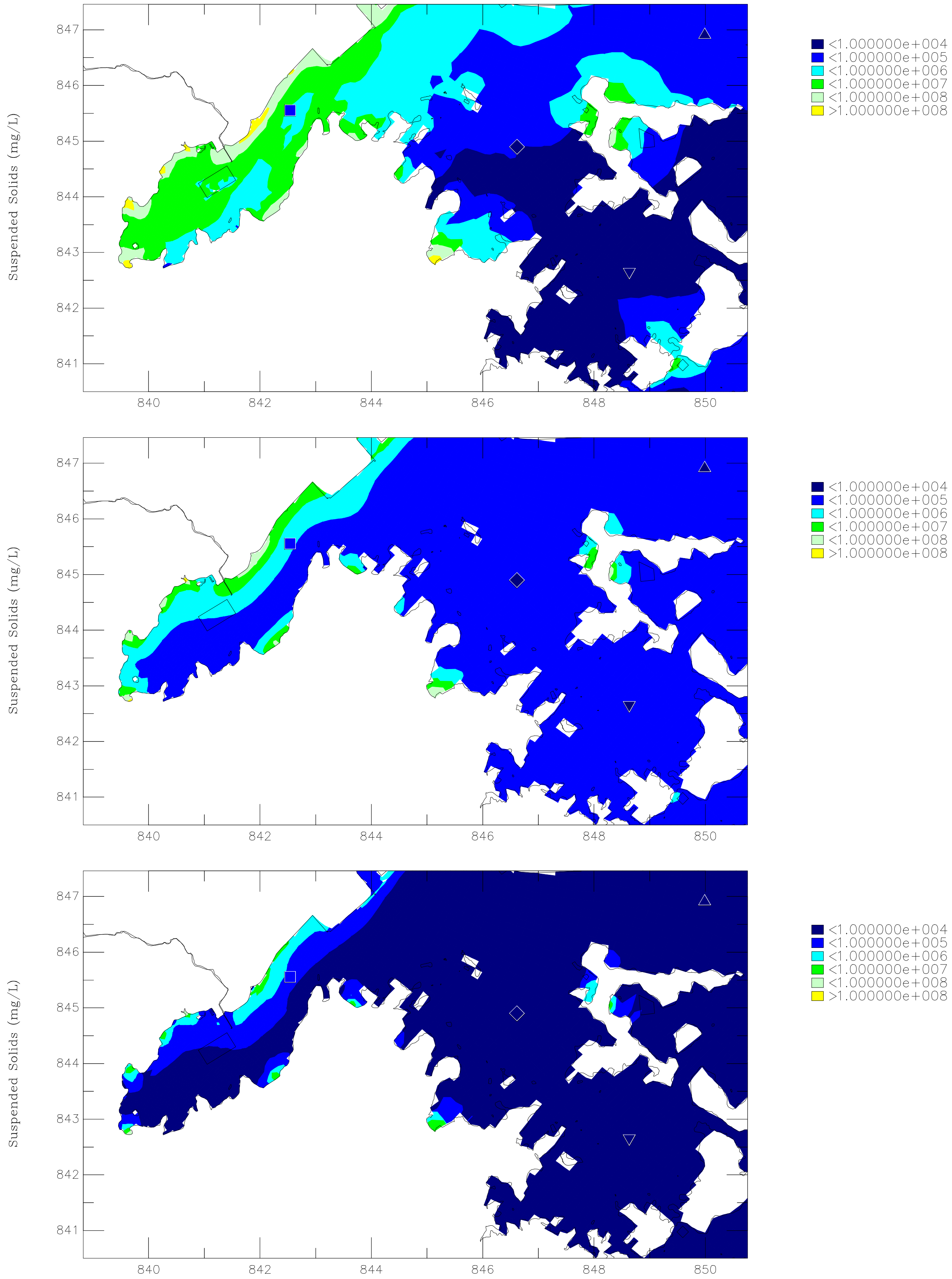


Expansion of Sha Tau Kok Sewage Treatment Works

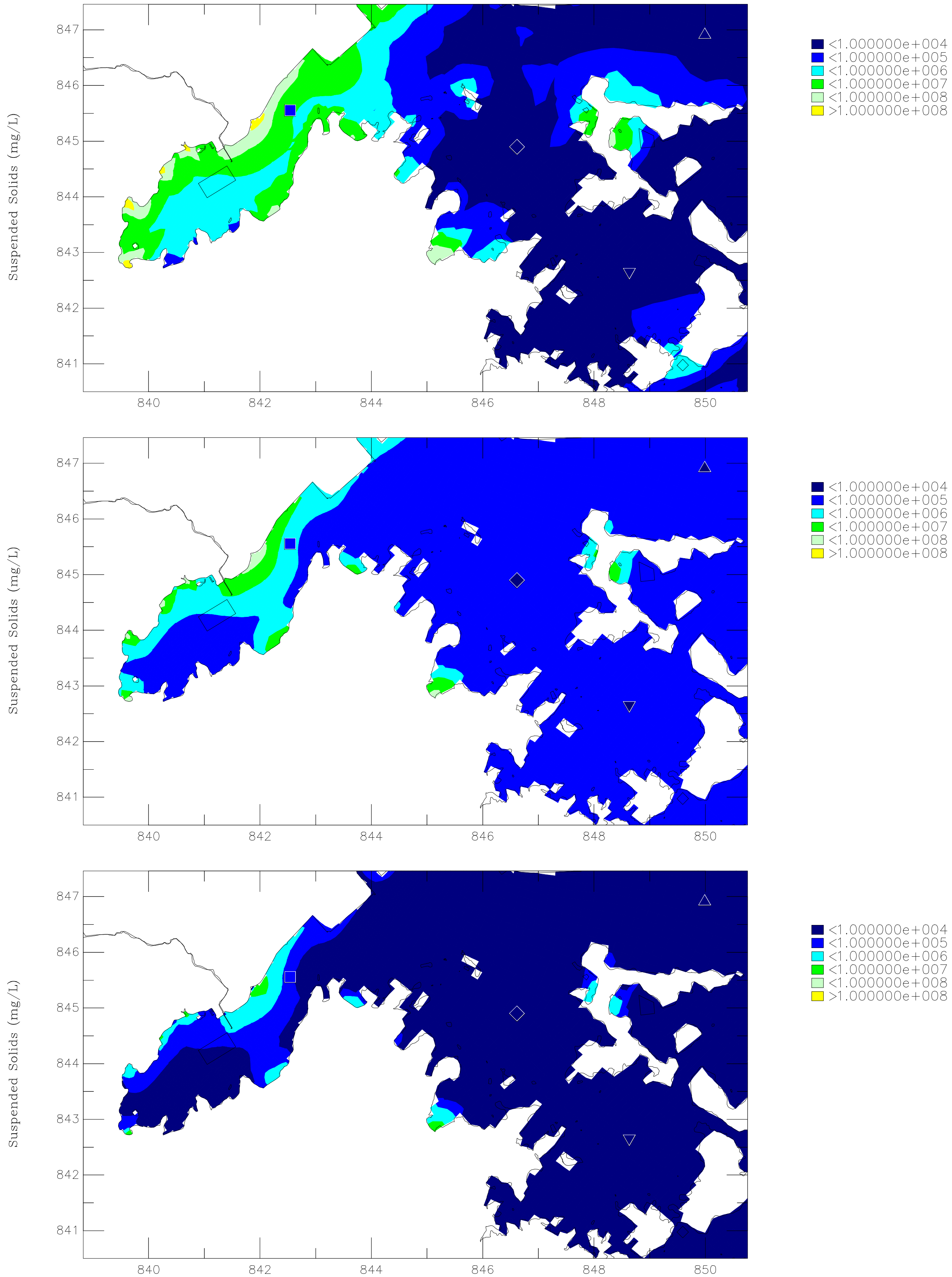
Water Quality Prediction 2011 Jun – E.coli

Surface Layer; Top: Maximum; Middle: Geometric Mean; Bottom: Minimum

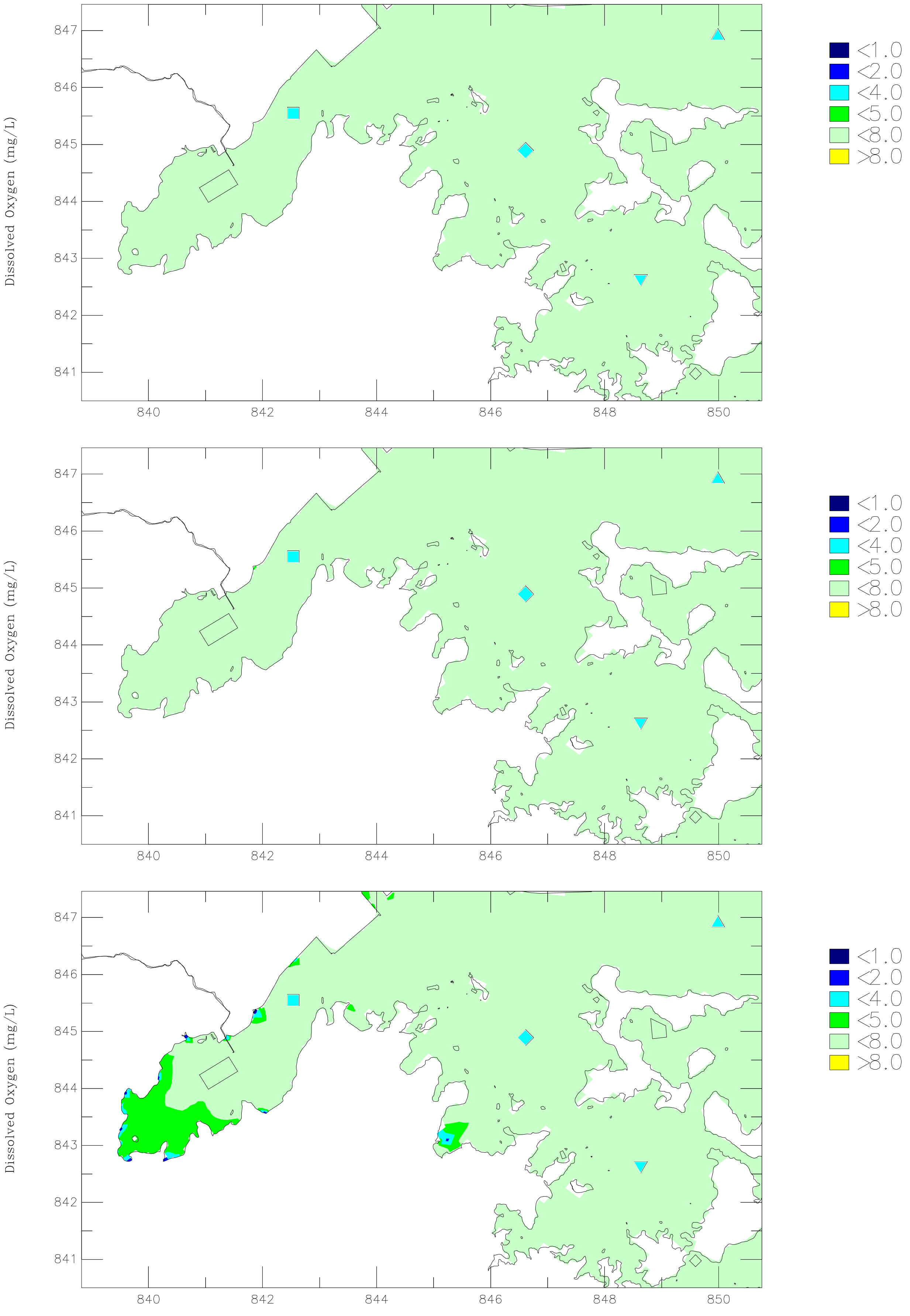
Year 2011	Jun	
Annex 5C–43		
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



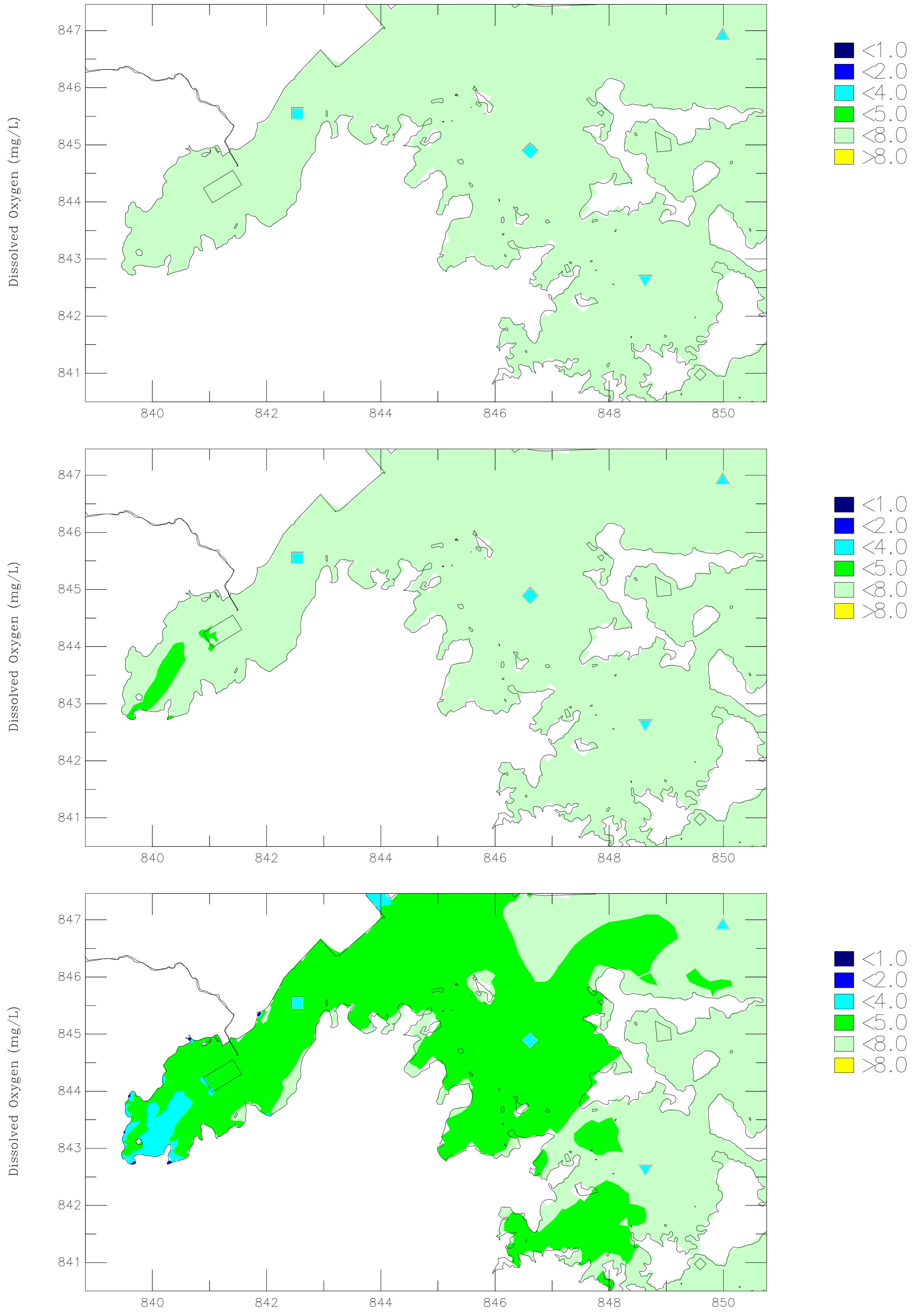
Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jun – Suspended Solids Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jun
	Annex 5C–44	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



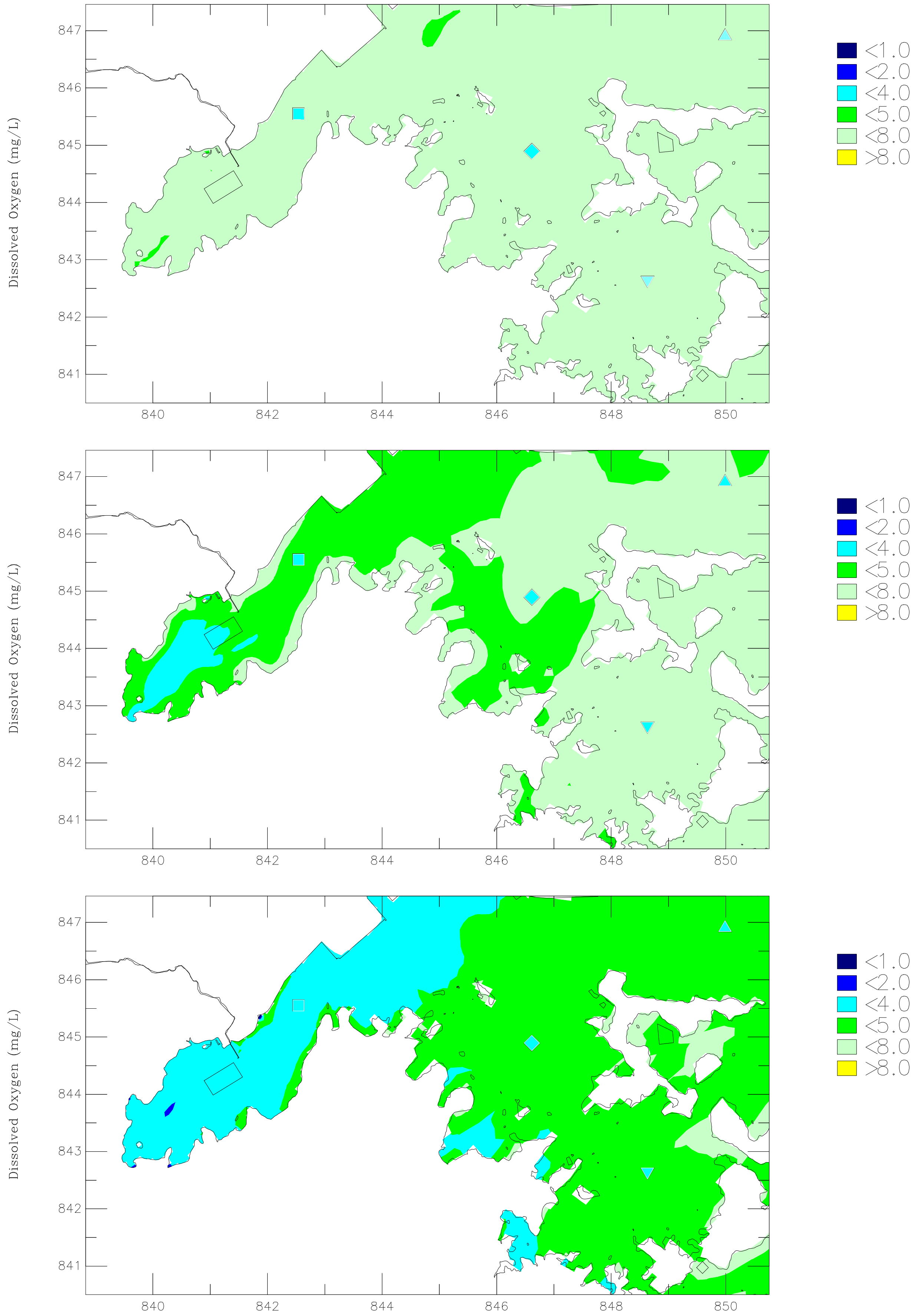
Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jun – Suspended Solids Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jun
	Annex 5C–35	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jun – Dissolved Oxygen Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jun
	Annex 5C–46	
ERM HK Limited	0211731/GPP	WQ·Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works Water Quality Prediction 2011 Jun – Dissolved Oxygen Middle Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2011	Jun
	Annex 5C–47	
ERM HK Limited	0211731/GPP	WQ-Cal.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

Water Quality Prediction 2011 Jun – Dissolved Oxygen

Bottom Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2011	Jun
Annex 5C–48	
0211731/GPP	WQ·Cal.ssn

ERM HK Limited