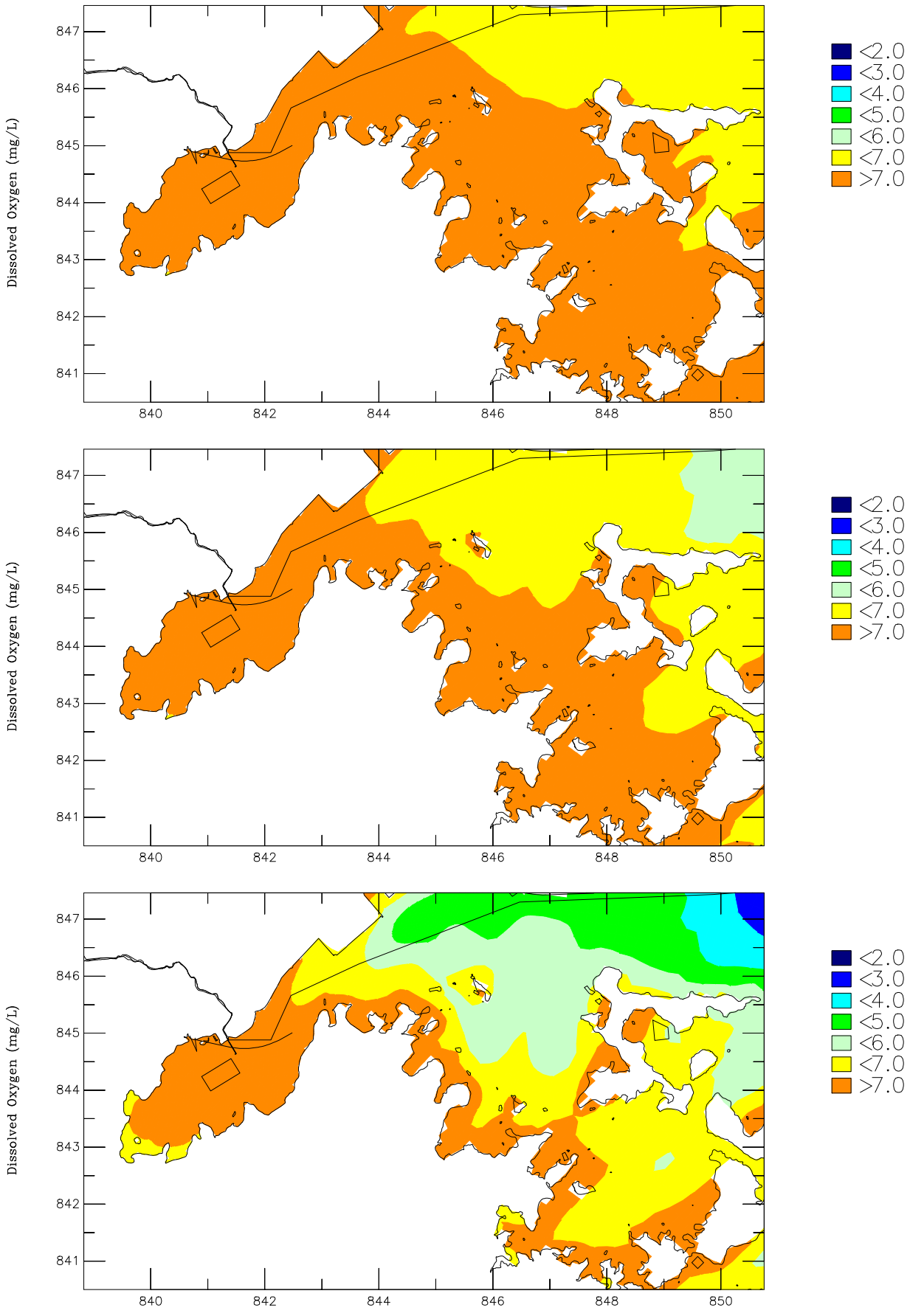
Annex 5H

Delft3D WAQ Modelling Results 2030 Baseline and Expanded STKSTW Operation



Expansion of Sha Tau Kok Sewage Treatment Works

2030 Baseline Operation of Existing STKSTW – Mean Dissolved Oxygen

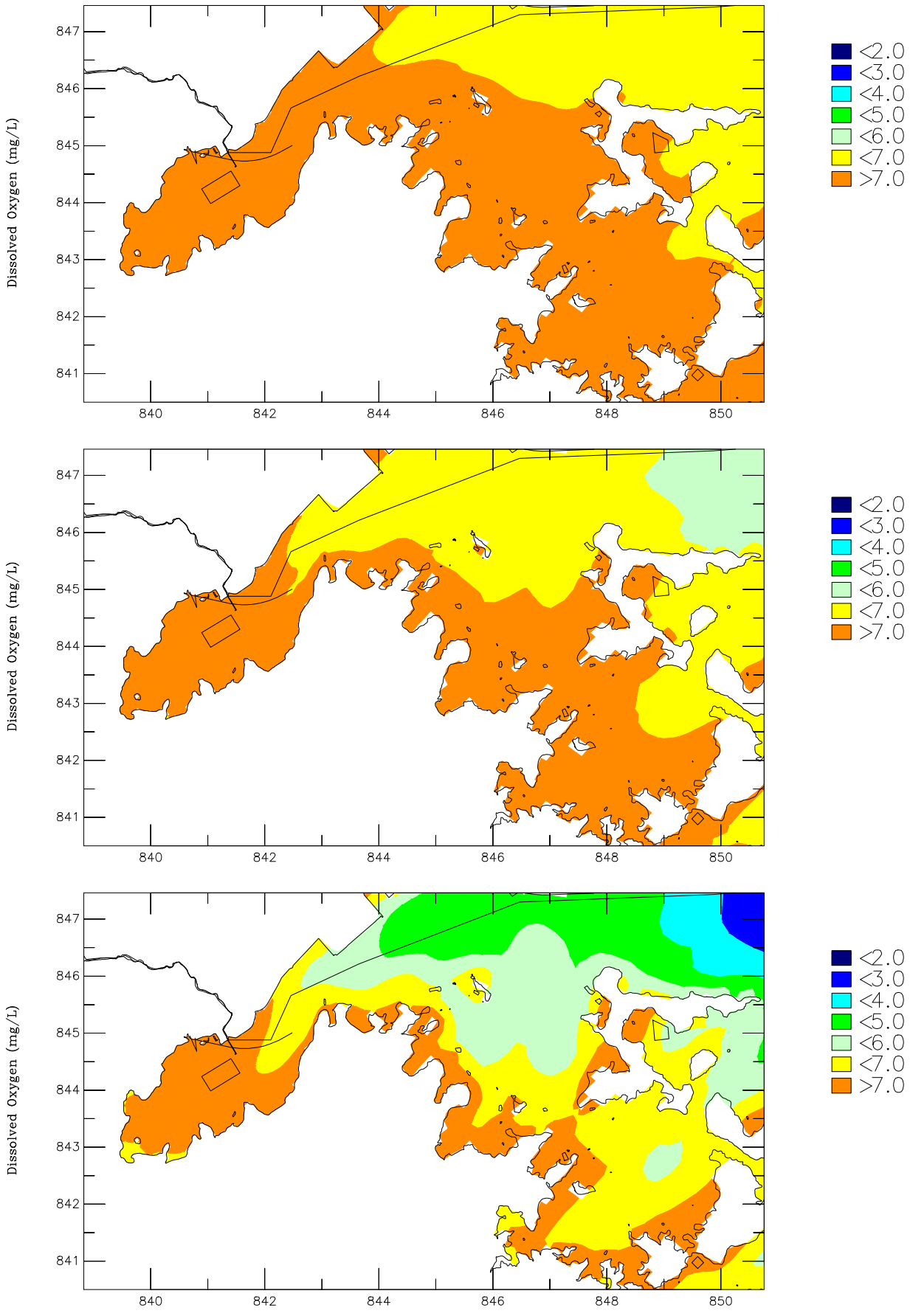
Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2030 | Dry

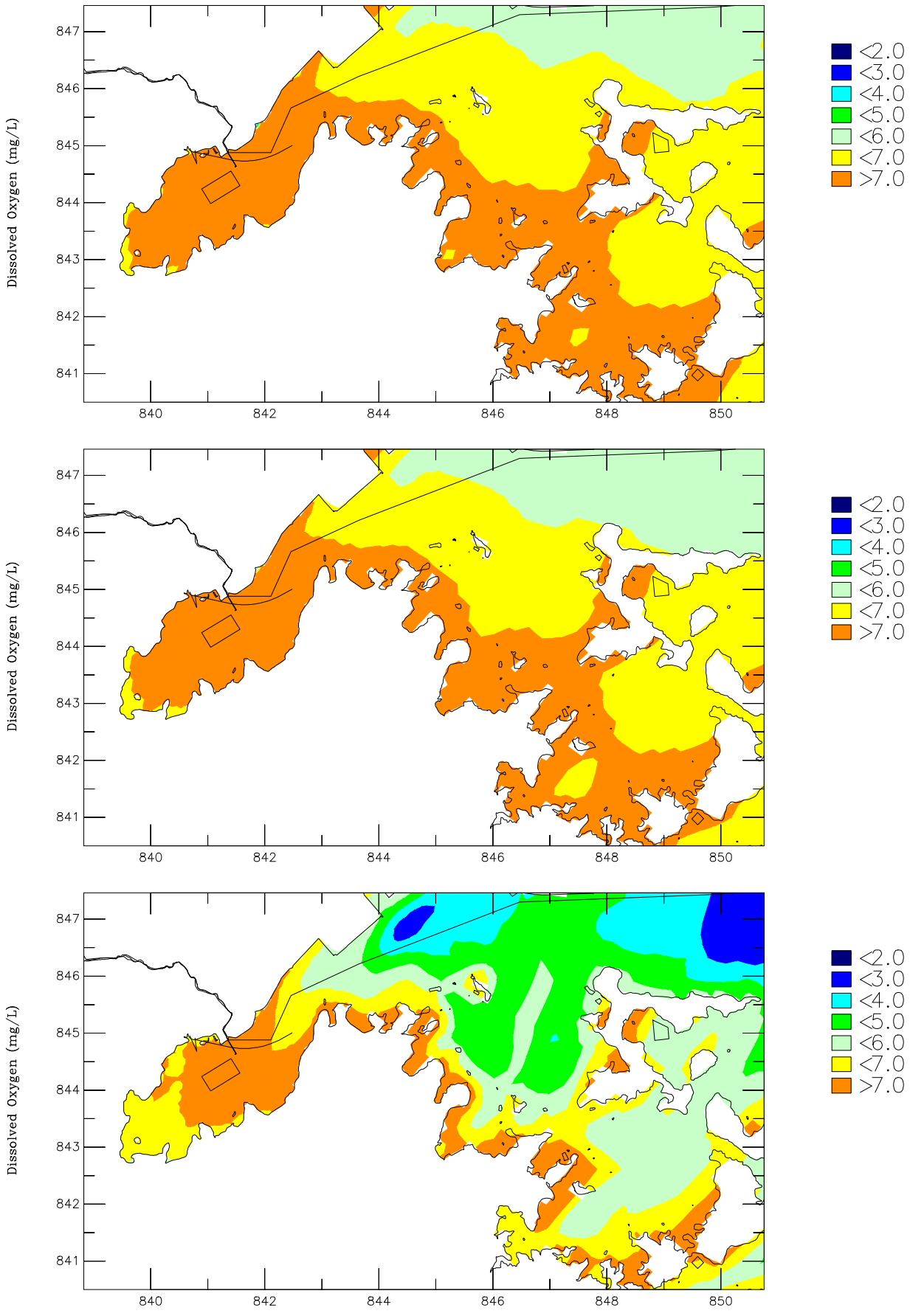
Annex5H-01

ERM HK Limited

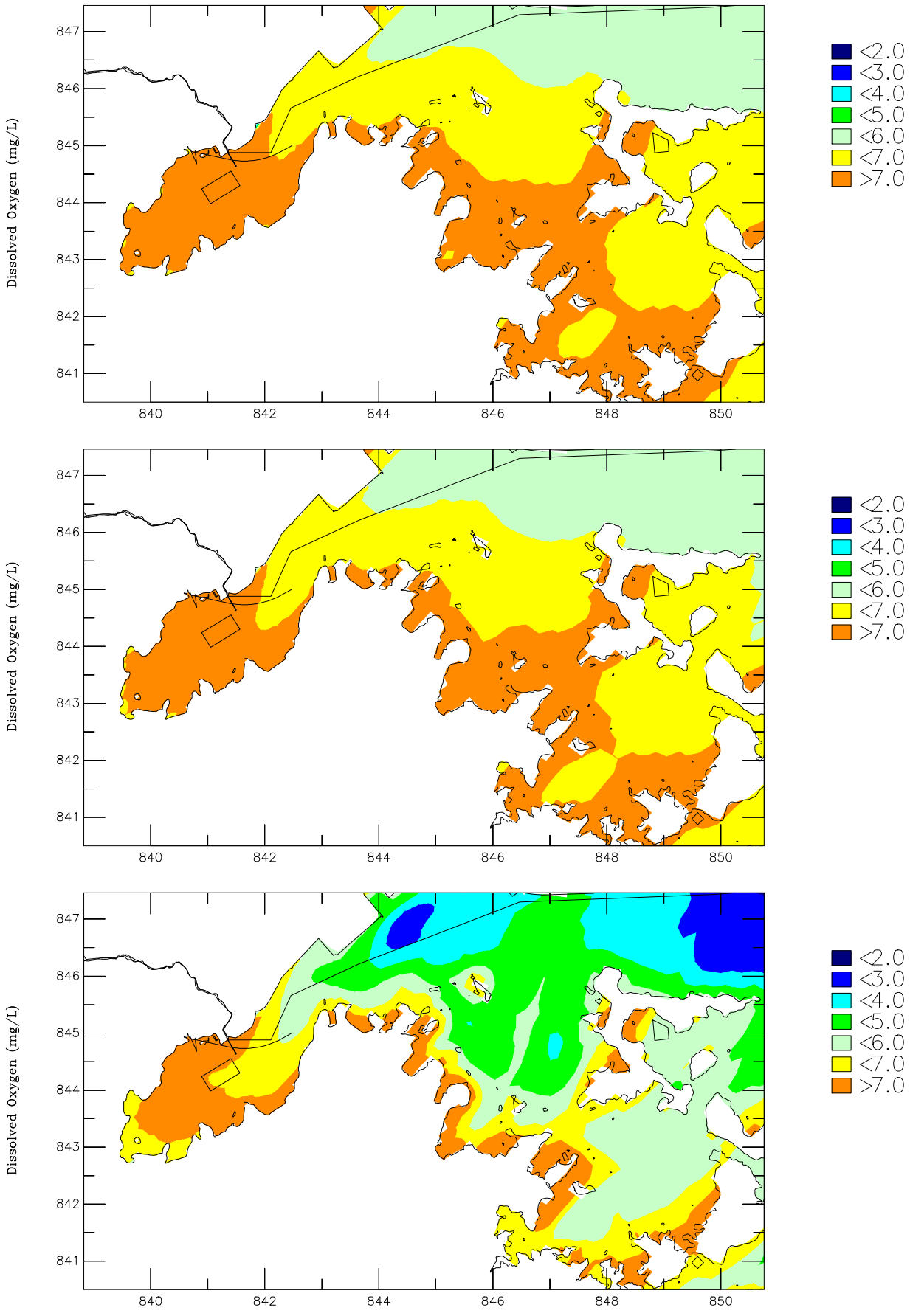
0211731/GPP | WQ.ssn



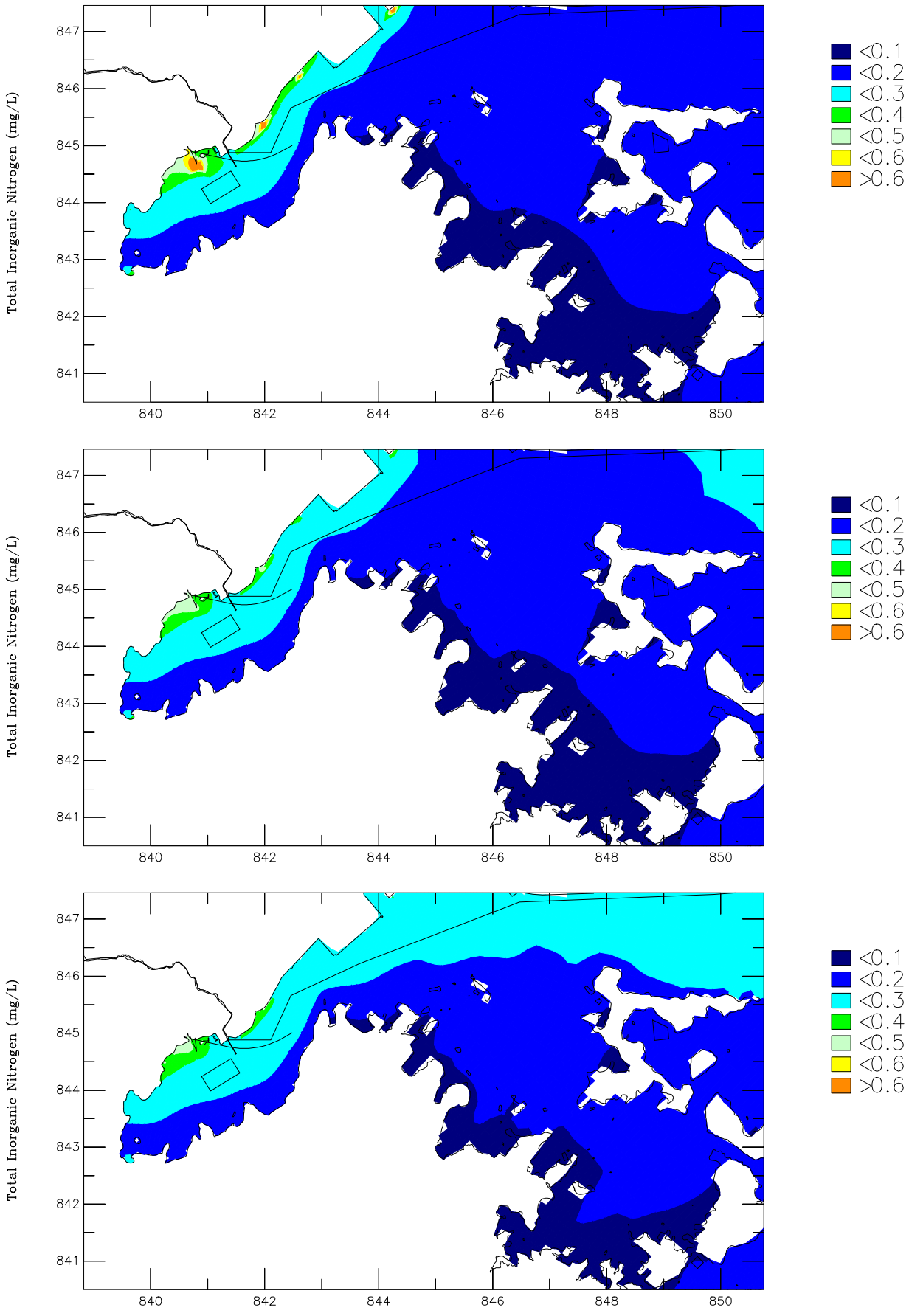
Expansion of Sha Tau Kok Sewage Treatment Works 2030 Operation of Expanded STKSTW – Mean Dissolved Oxygen Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2030	Dry
	Annex5H-02	
ERM HK Limited	0211731/GPP	WQ.ssn



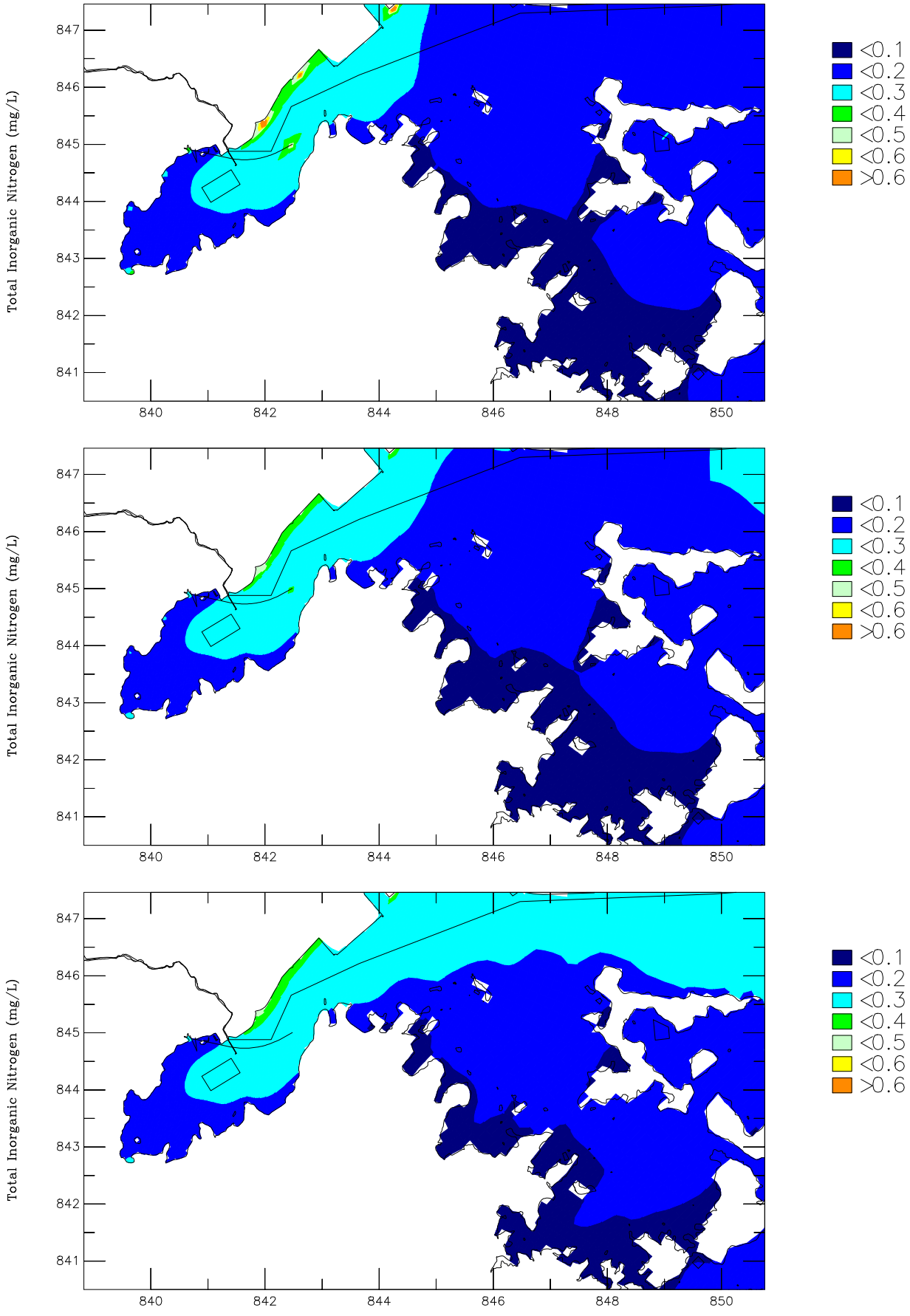
Expansion of Sha Tau Kok Sewage Treatment Works	Year 2030	Dry
2030 Baseline Operation of Existing STKSTW – 10th-Percentile Dissolved Oxygen (WQO: 4mg/L for depth-average; 2mg/L for bottom) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Annex5H-03	
ERM HK Limited	0211731/GPP	WQ.ssn



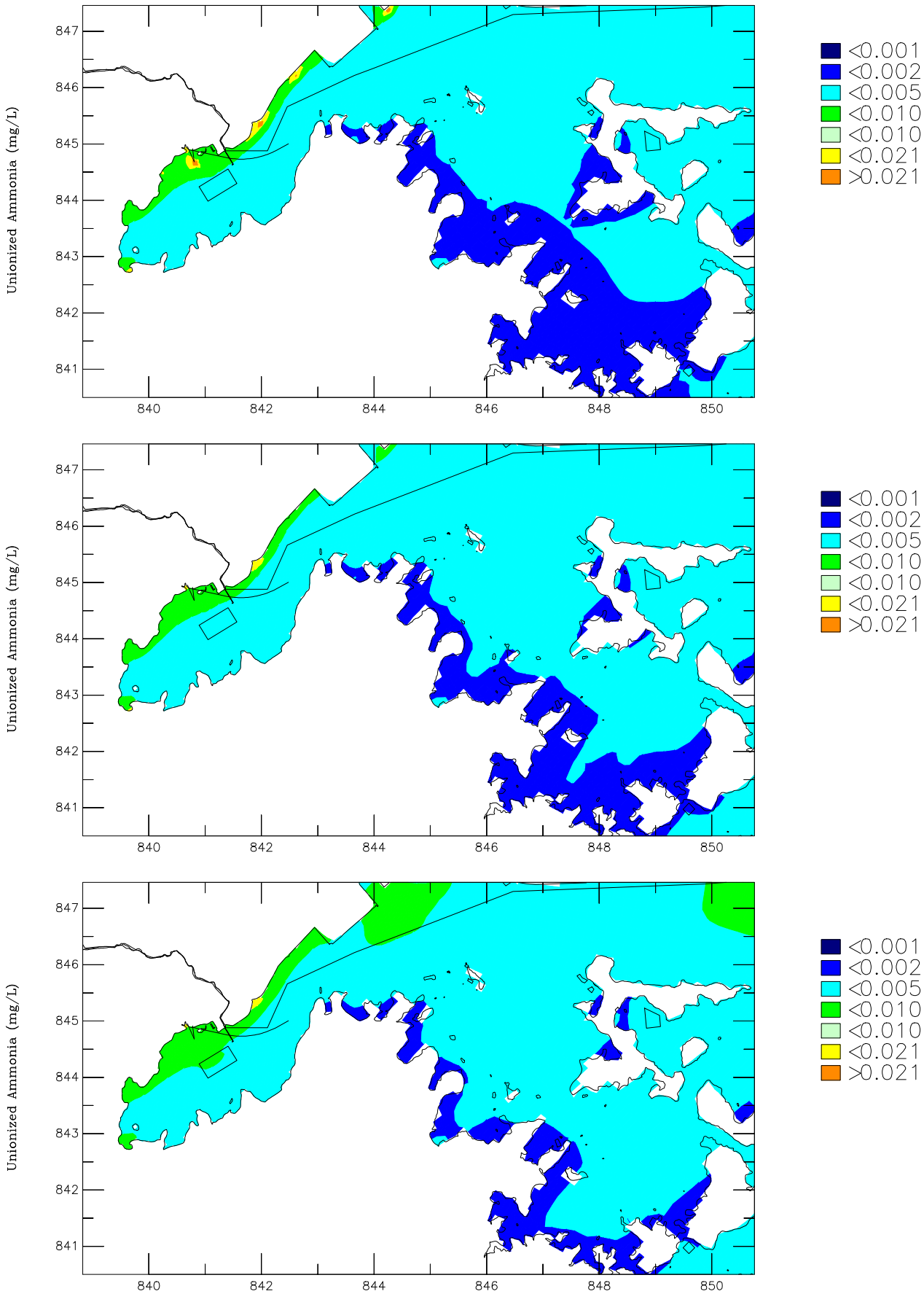
Expansion of Sha Tau Kok Sewage Treatment Works	Year 2030	Dry
2030 Operation of Expanded STKSTW – 10th–Percentile Dissolved Oxygen (WQO: 4mg/L for depth–average; 2mg/L for bottom) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Annex5H-04	
ERM HK Limited	0211731/GPP	WQ.ssn



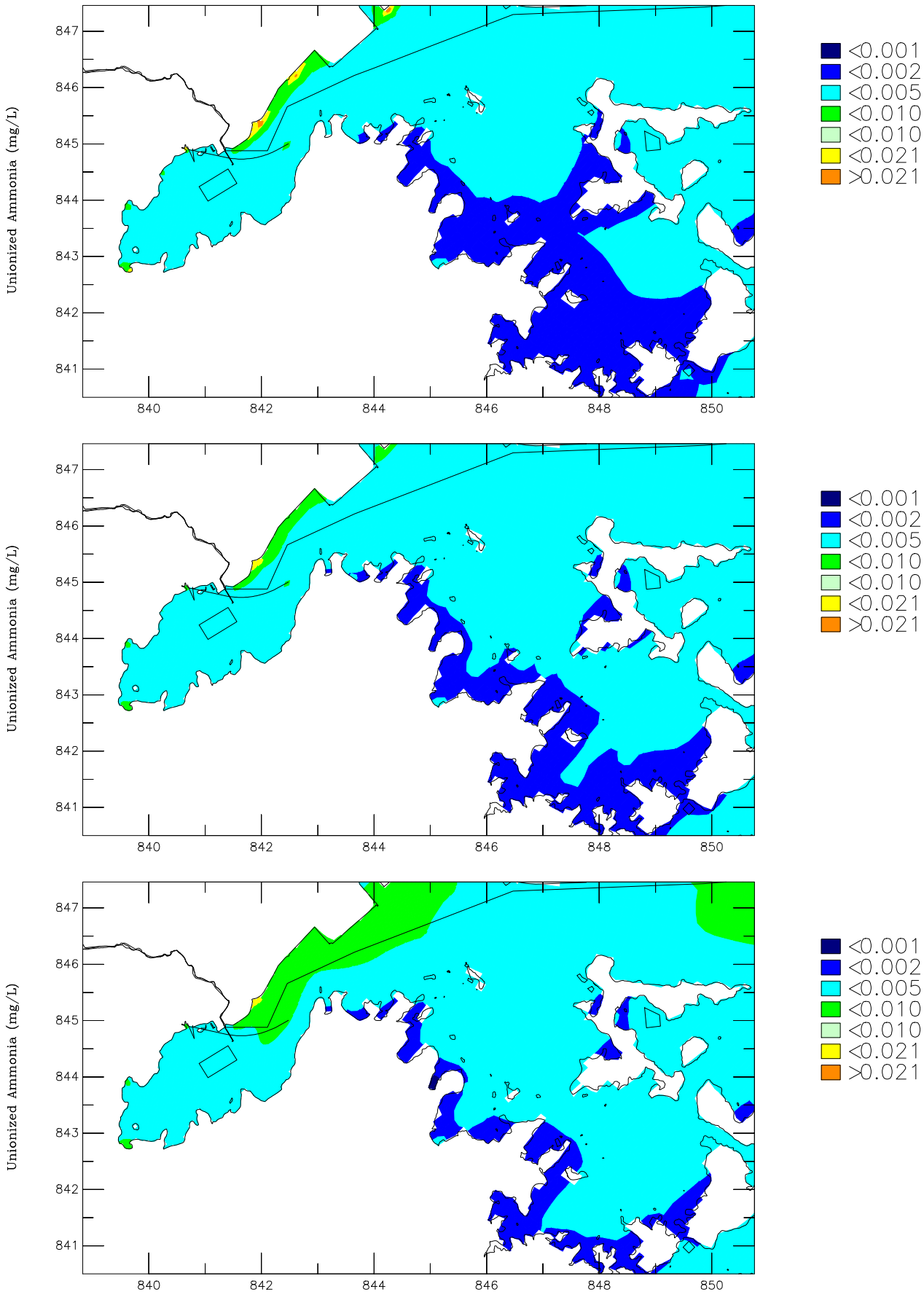
Expansion of Sha Tau Kok Sewage Treatment Works 2030 Baseline Operation of Existing STKSTW – Mean Total Inorganic Nitrogen (WQO: 0.3mg/L) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2030	Dry
	Annex5H-05	
ERM HK Limited	0211731/GPP	WQ.ssn



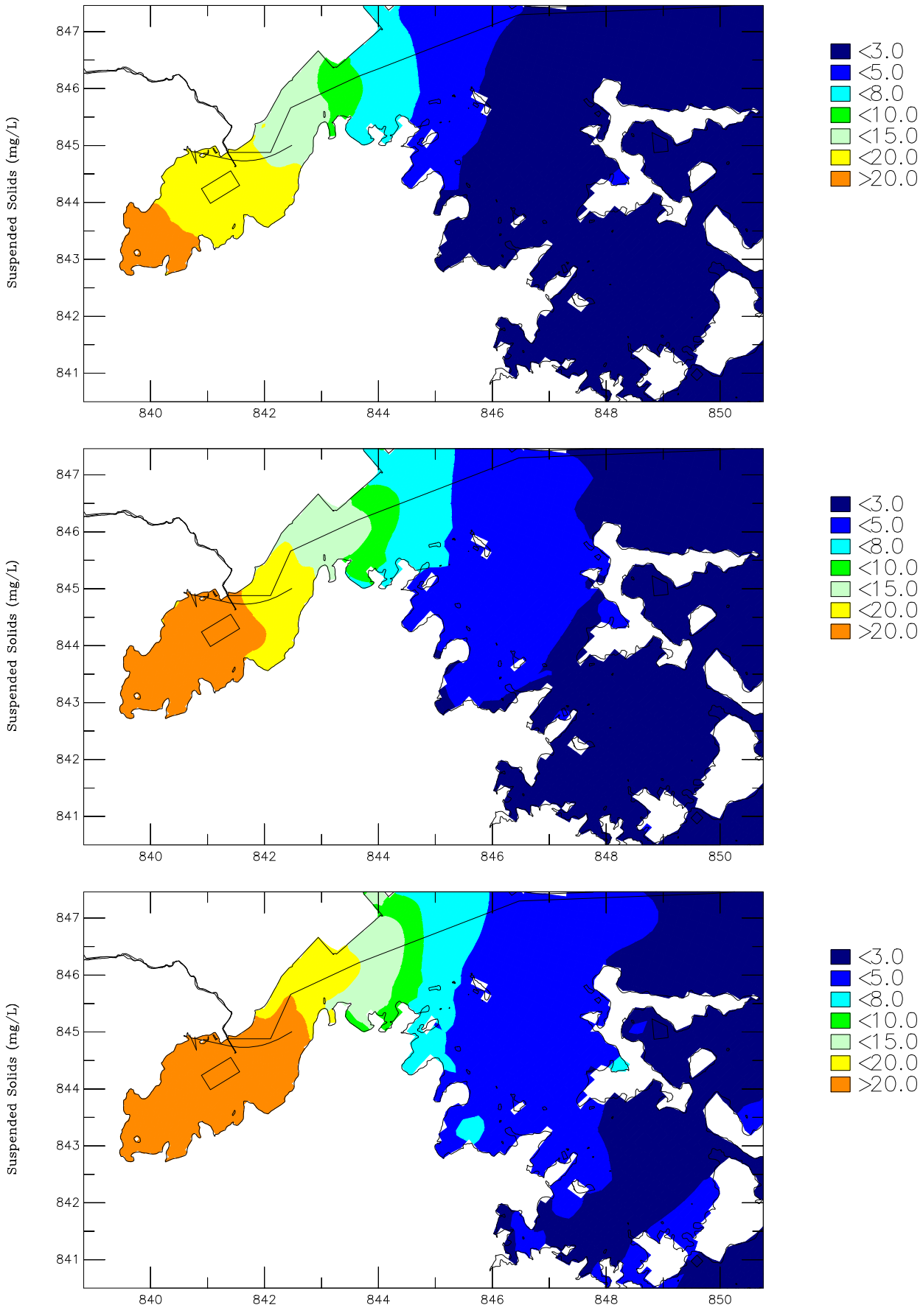
Expansion of Sha Tau Kok Sewage Treatment Works	Year 2030	Dry
2030 Operation of Expanded STKSTW – Mean Total Inorganic Nitrogen (WQO: 0.3mg/L) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Annex5H-06	
ERM HK Limited	0211731/GPP	WQ.ssn



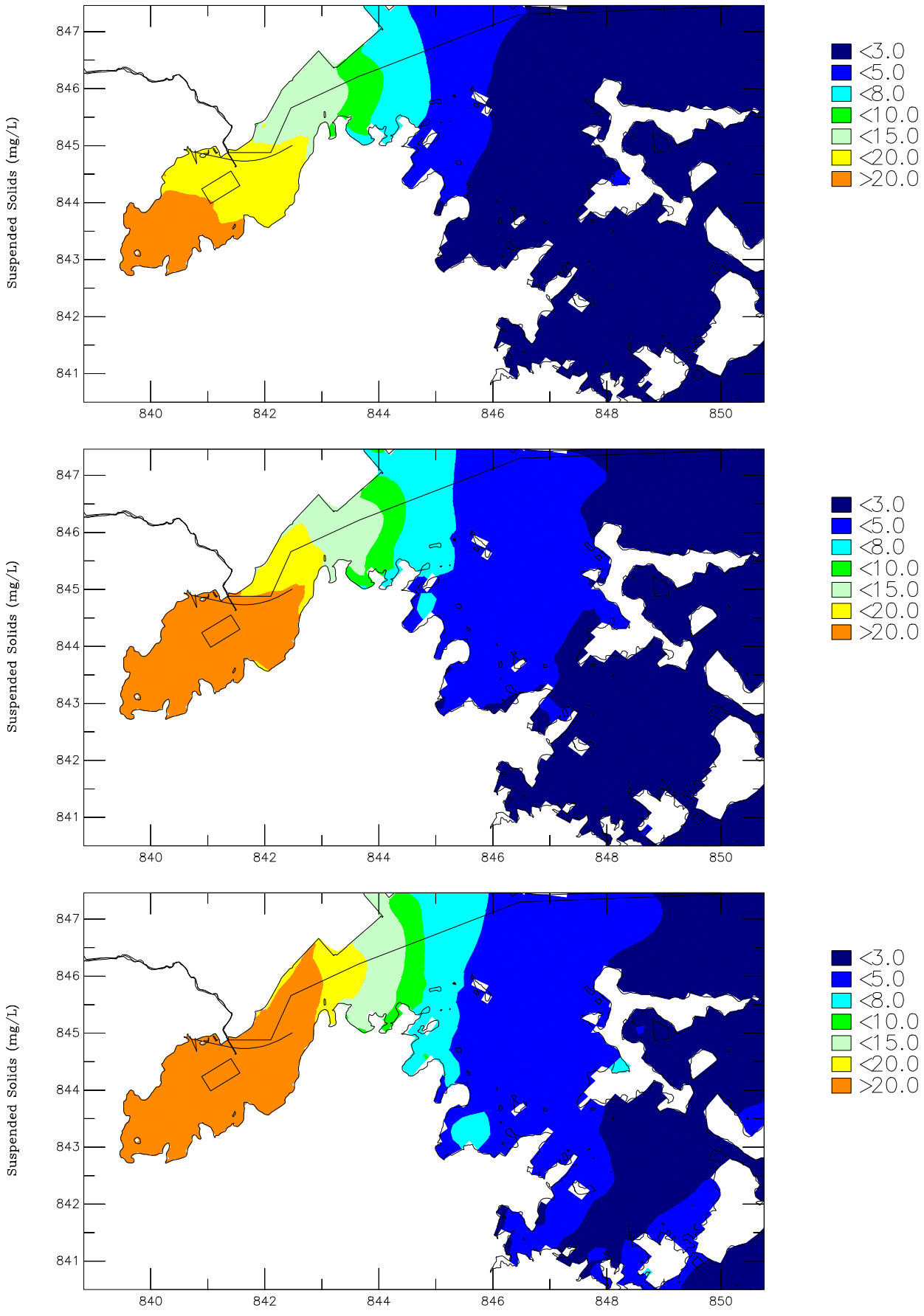
Expansion of Sha Tau Kok Sewage Treatment Works 2030 Baseline Operation of Existing STKSTW – Mean Unionized Ammonia (WQO: 0.021mg/L) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2030	Dry
	Annex5H-07	
ERM HK Limited	0211731/GPP	WQ.ssn



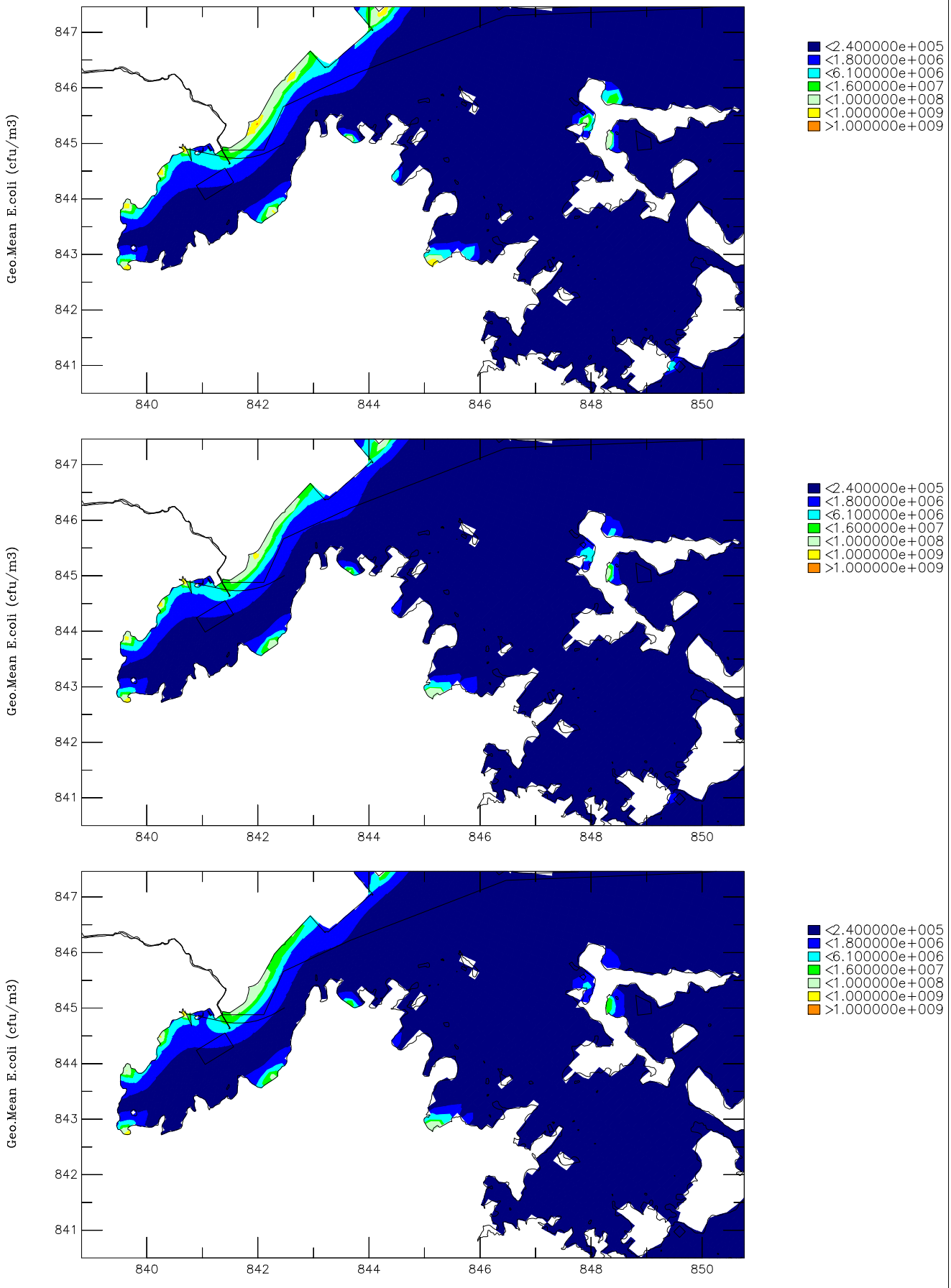
Expansion of Sha Tau Kok Sewage Treatment Works 2030 Operation of Expanded STKSTW – Mean Unionized Ammonia (WQO: 0.021mg/L) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2030	Dry
	Annex5H-08	
ERM HK Limited	0211731/GPP	WQ.ssn



Expansion of Sha Tau Kok Sewage Treatment Works 2030 Baseline Operation of Existing STKSTW – Mean Suspended Solids (WQO: increase < 30%) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2030	Dry
	Annex5H-09	
ERM HK Limited	0211731/GPP	WQ.ssn



Expansion of Sha Tau Kok Sewage Treatment Works 2030 Operation of Expanded STKSTW – Mean Suspended Solids (WQO: increase < 30%) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2030	Dry
	Annex5H-10	
ERM HK Limited	0211731/GPP	WQ.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

2030 Baseline Operation of Existing STKSTW – Geo.Mean E.coli (WQO: 6100000cfu/m3 at FCZ)

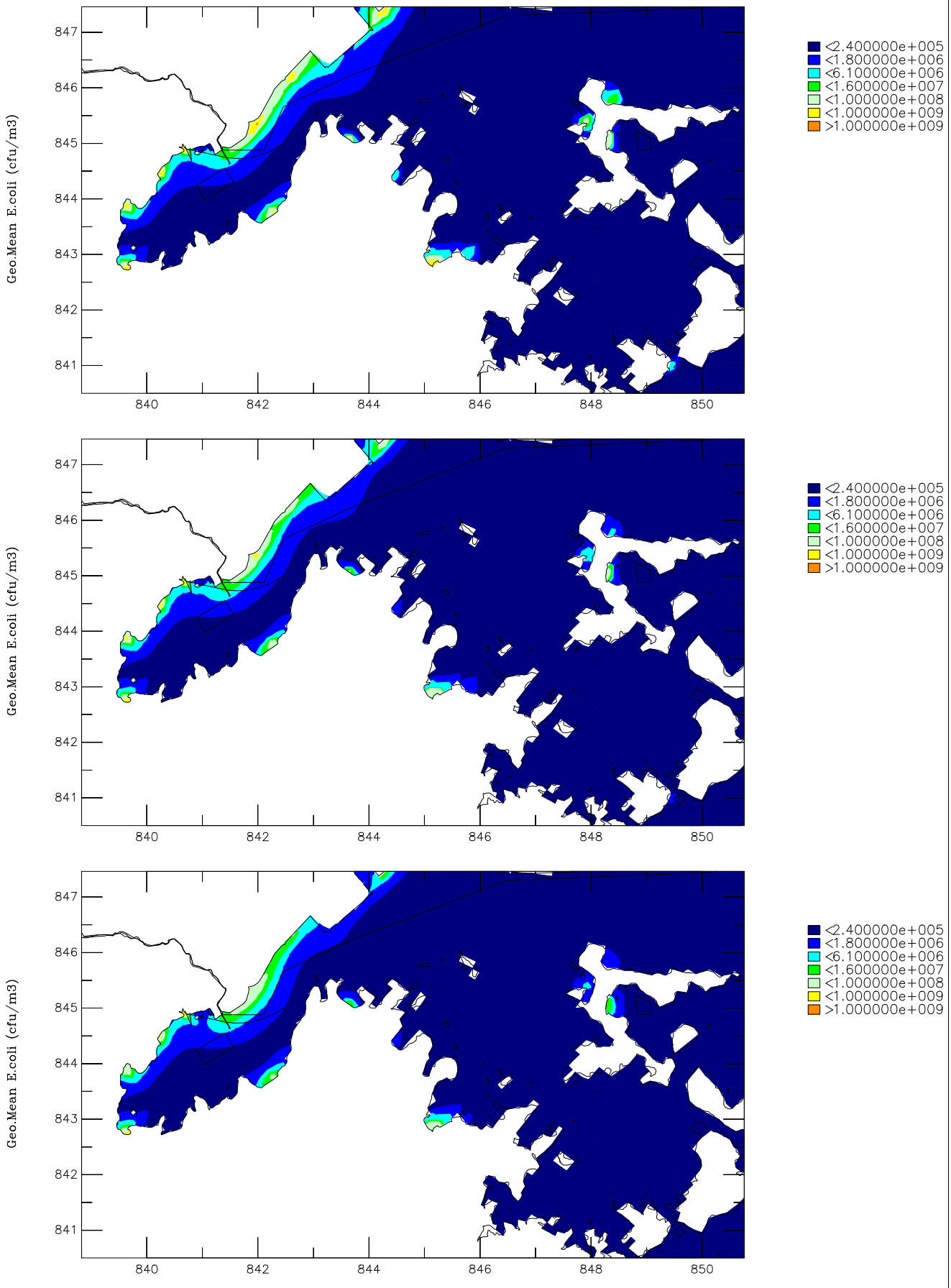
Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2030 | Dry

Annex5H-11

ERM HK Limited

0211731/GPP | WQ.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

2030 Operation of Expanded STKSTW – Geo.Mean E.coli (WQO: 6100000cfu/m3 at FCZ)

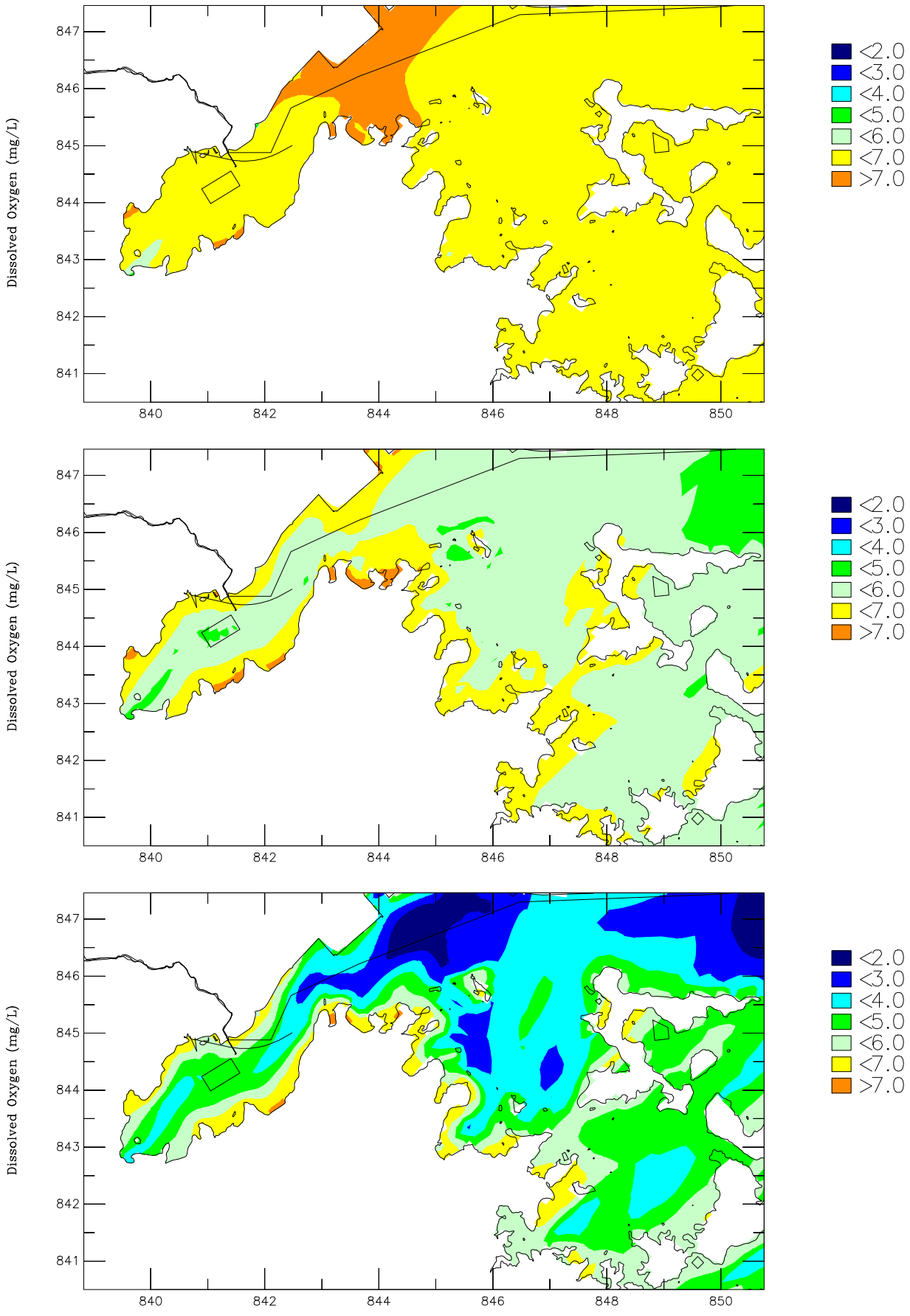
Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2030 | Dry

Annex5H-12

ERM HK Limited

0211731/GPP | WQ.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

2030 Baseline Operation of Existing STKSTW – Mean Dissolved Oxygen

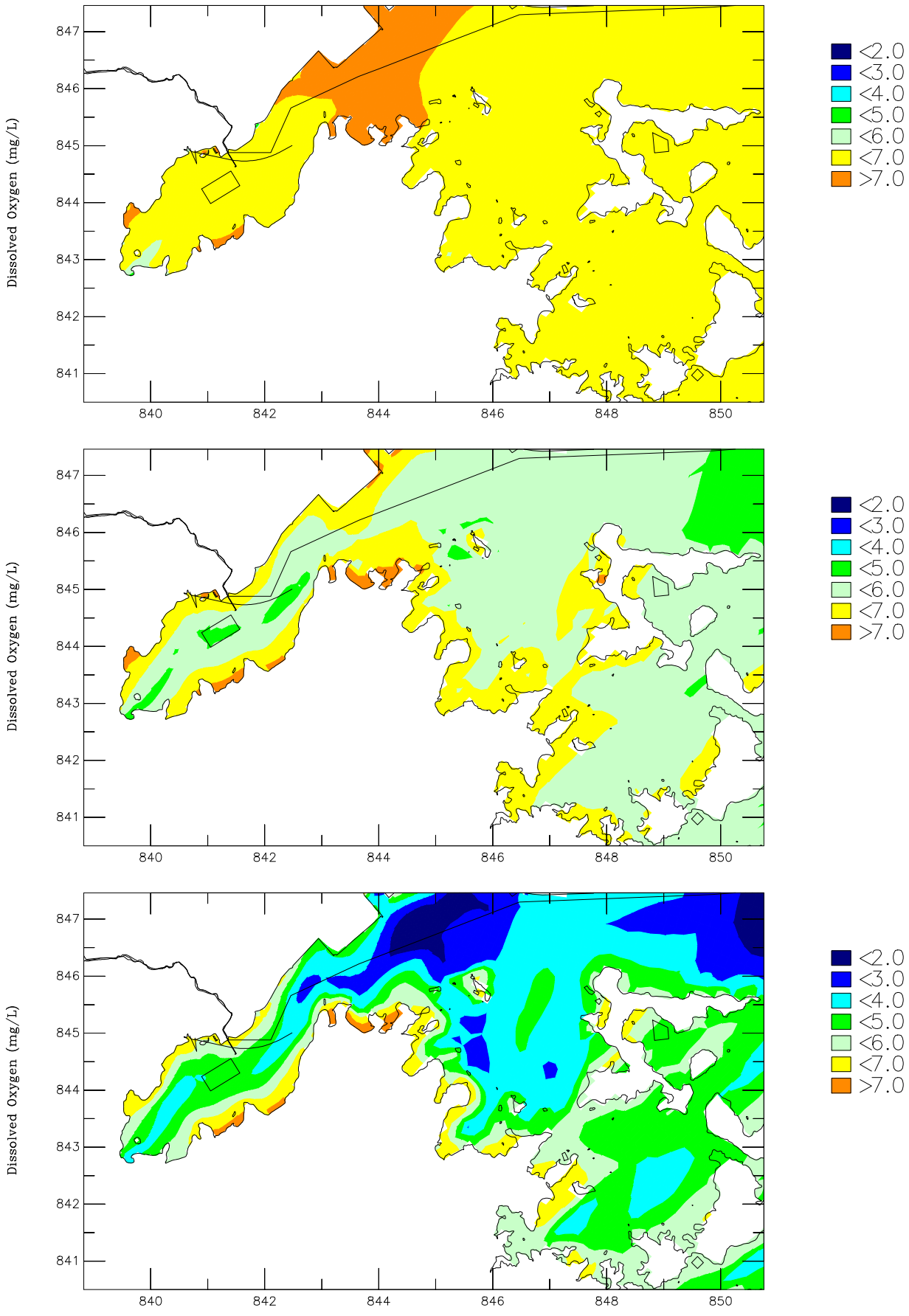
Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2030 | Wet

Annex5H-13

ERM HK Limited

0211731/GPP | WQ.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

2030 Operation of Expanded STKSTW – Mean Dissolved Oxygen

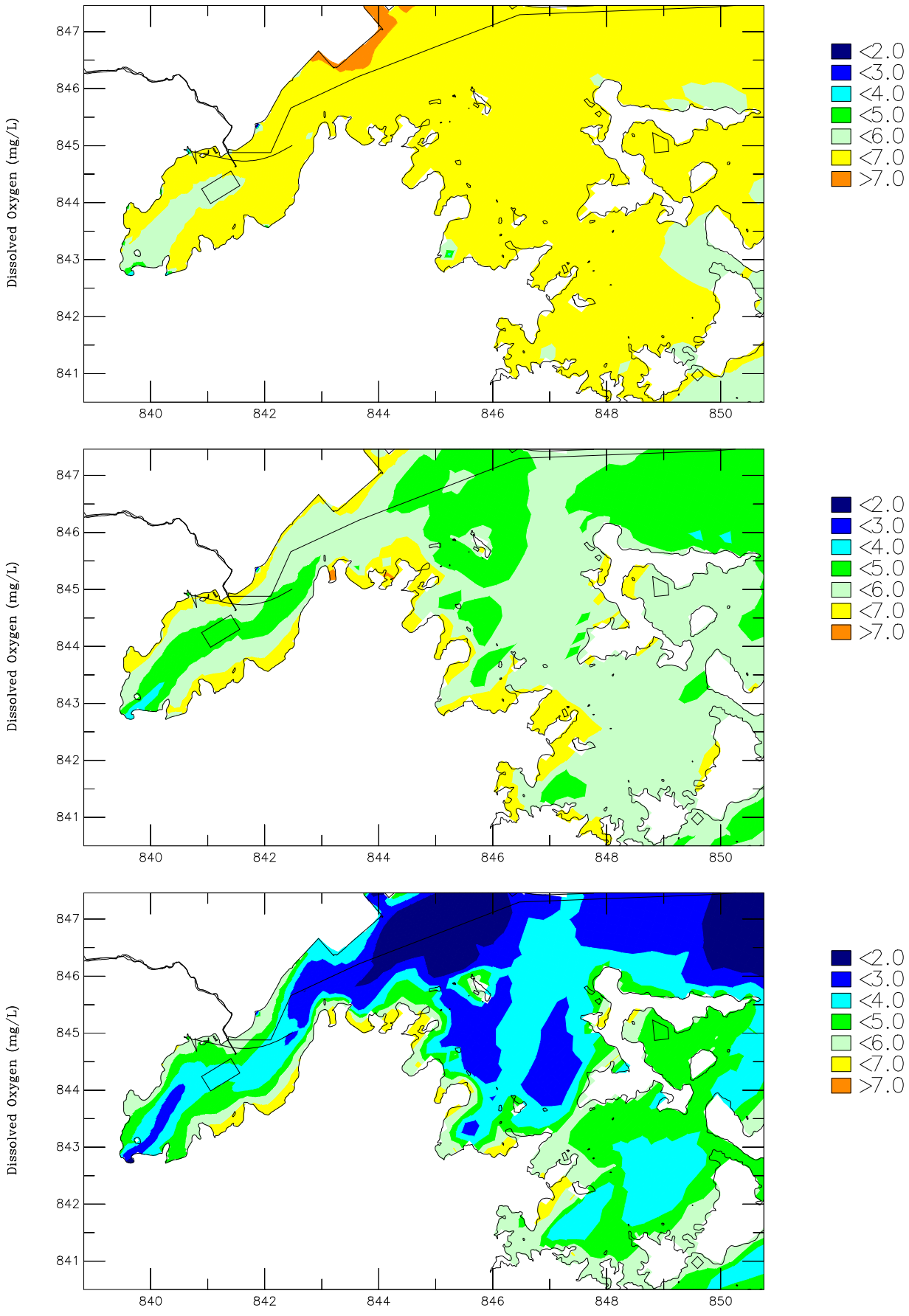
Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2030 | Wet

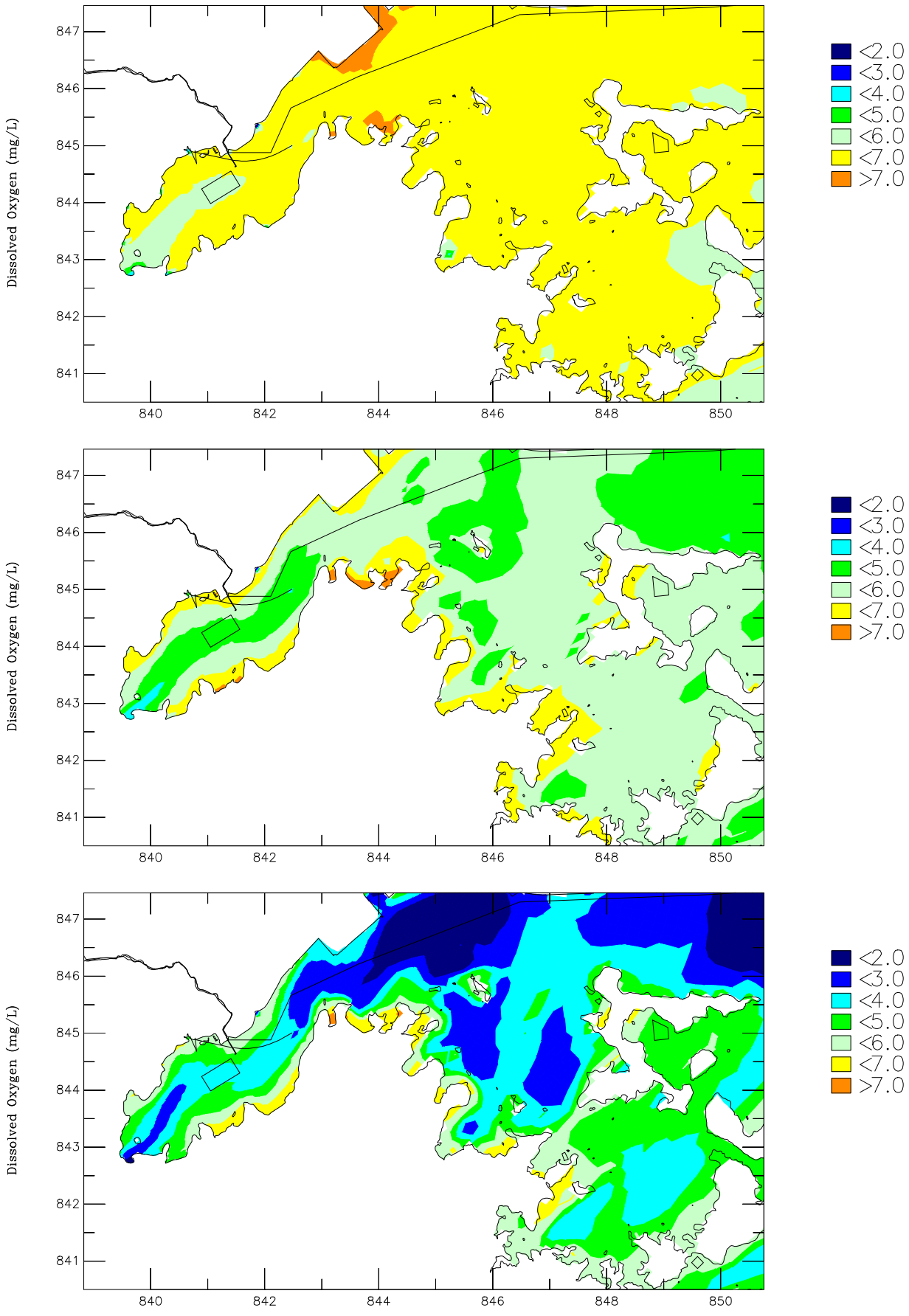
Annex5H-14

ERM HK Limited

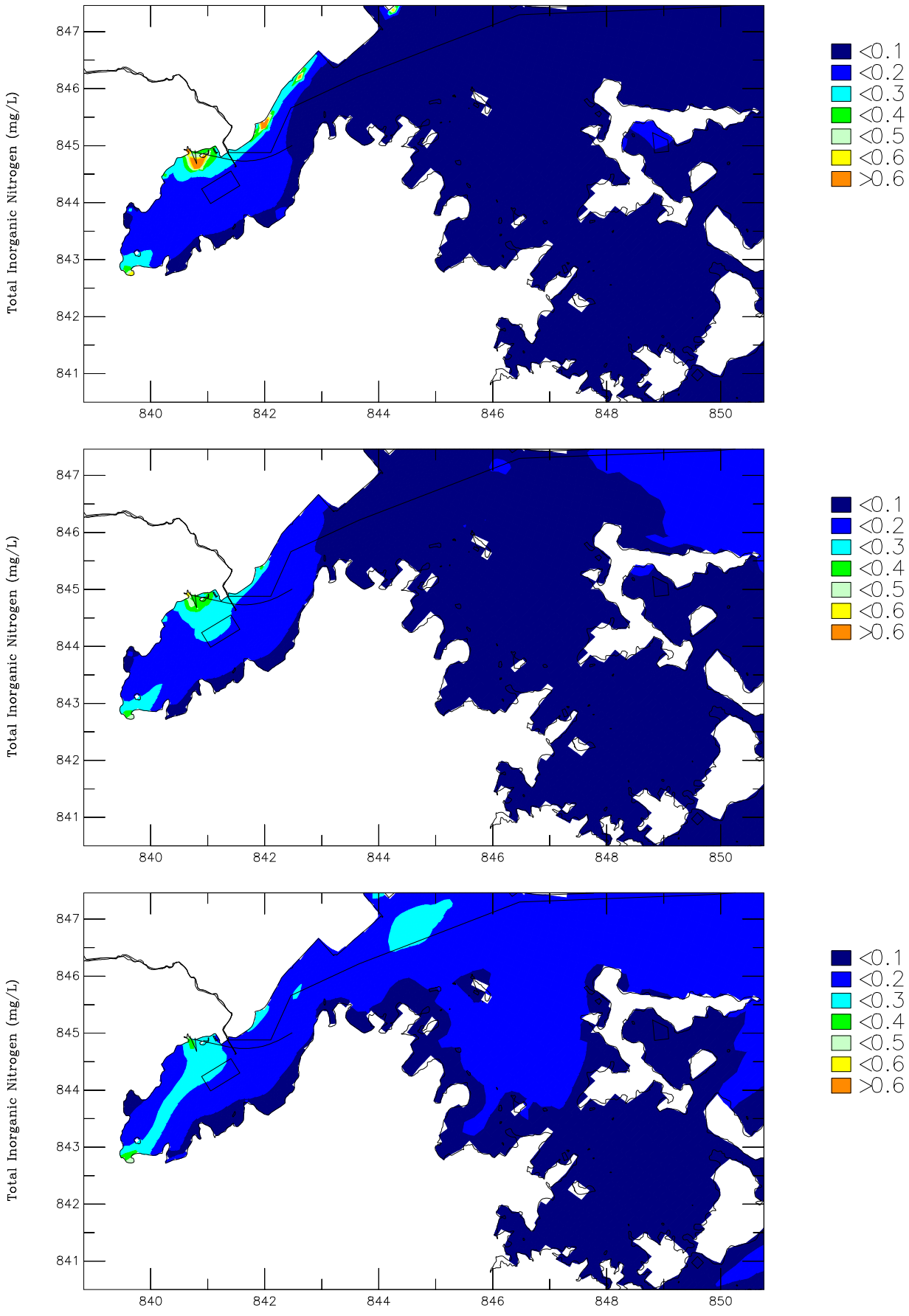
0211731/GPP | WQ.ssn



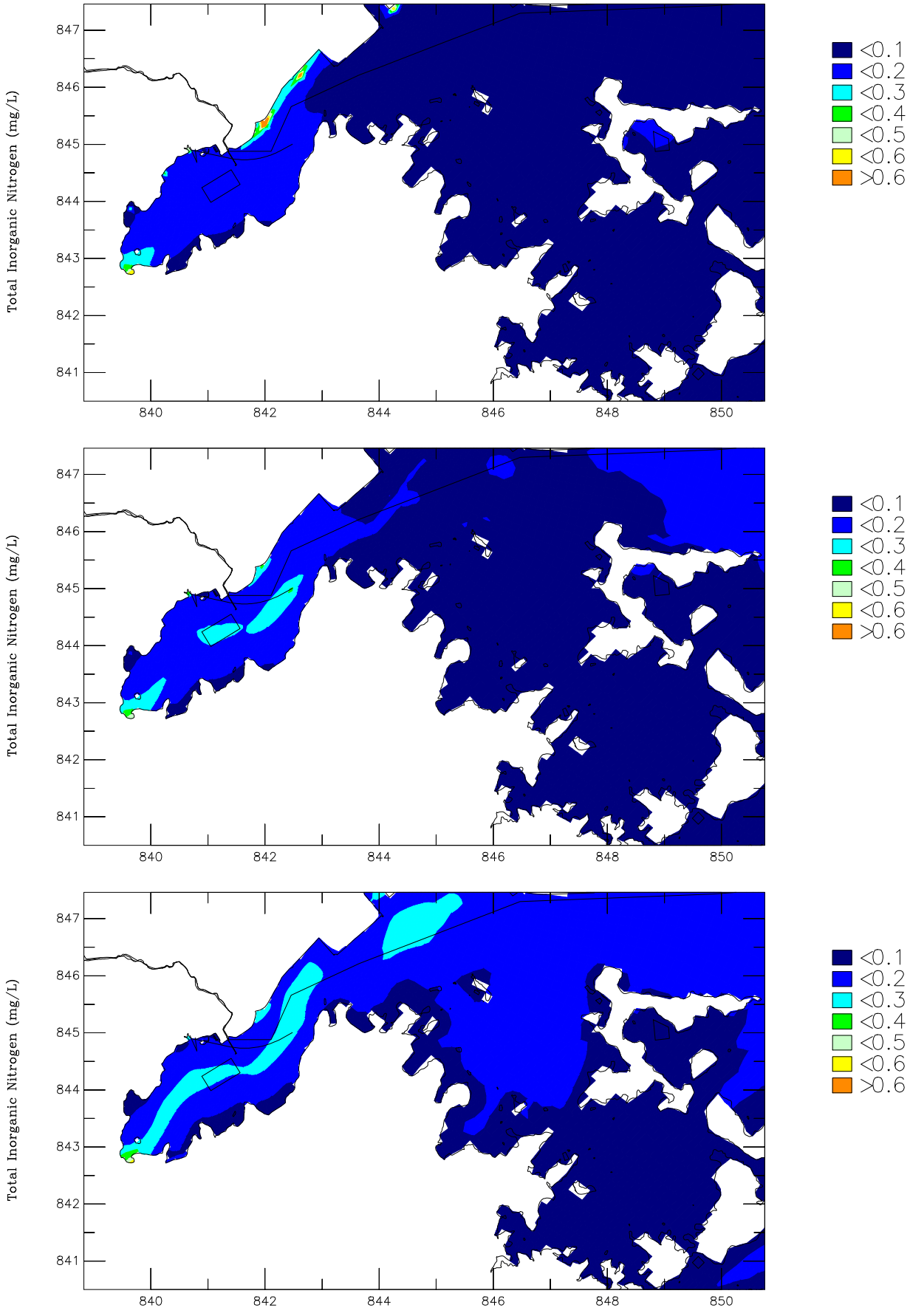
Expansion of Sha Tau Kok Sewage Treatment Works	Year 2030	Wet
2030 Baseline Operation of Existing STKSTW – 10th-Percentile Dissolved Oxygen (WQO: 4mg/L for depth-average; 2mg/L for bottom) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Annex5H-15	
ERM HK Limited	0211731/GPP	WQ.ssn



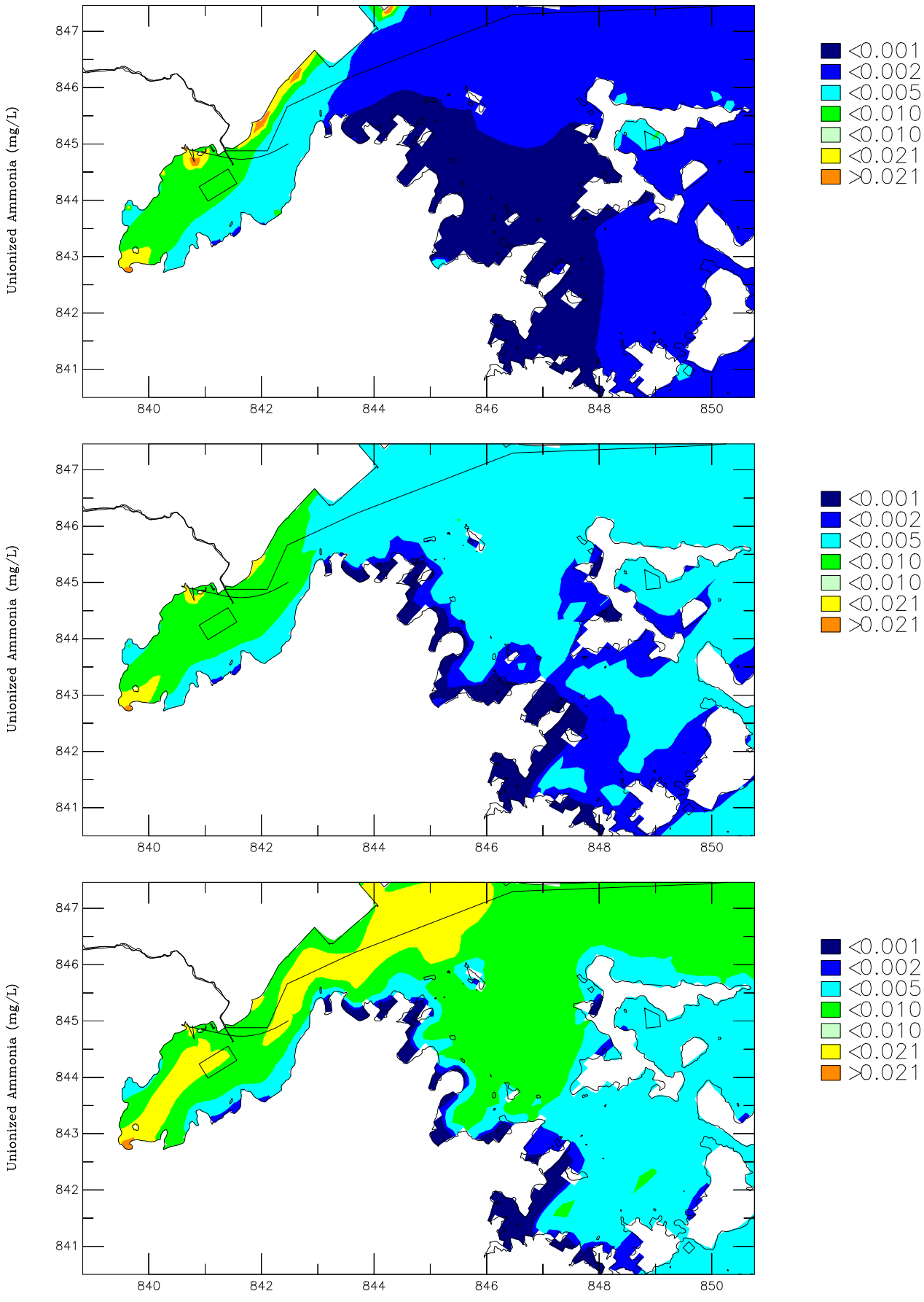
Expansion of Sha Tau Kok Sewage Treatment Works	Year 2030	Wet
2030 Operation of Expanded STKSTW – 10th–Percentile Dissolved Oxygen (WQO: 4mg/L for depth–average; 2mg/L for bottom) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Annex5H-16	
ERM HK Limited	0211731/GPP	WQ.ssn



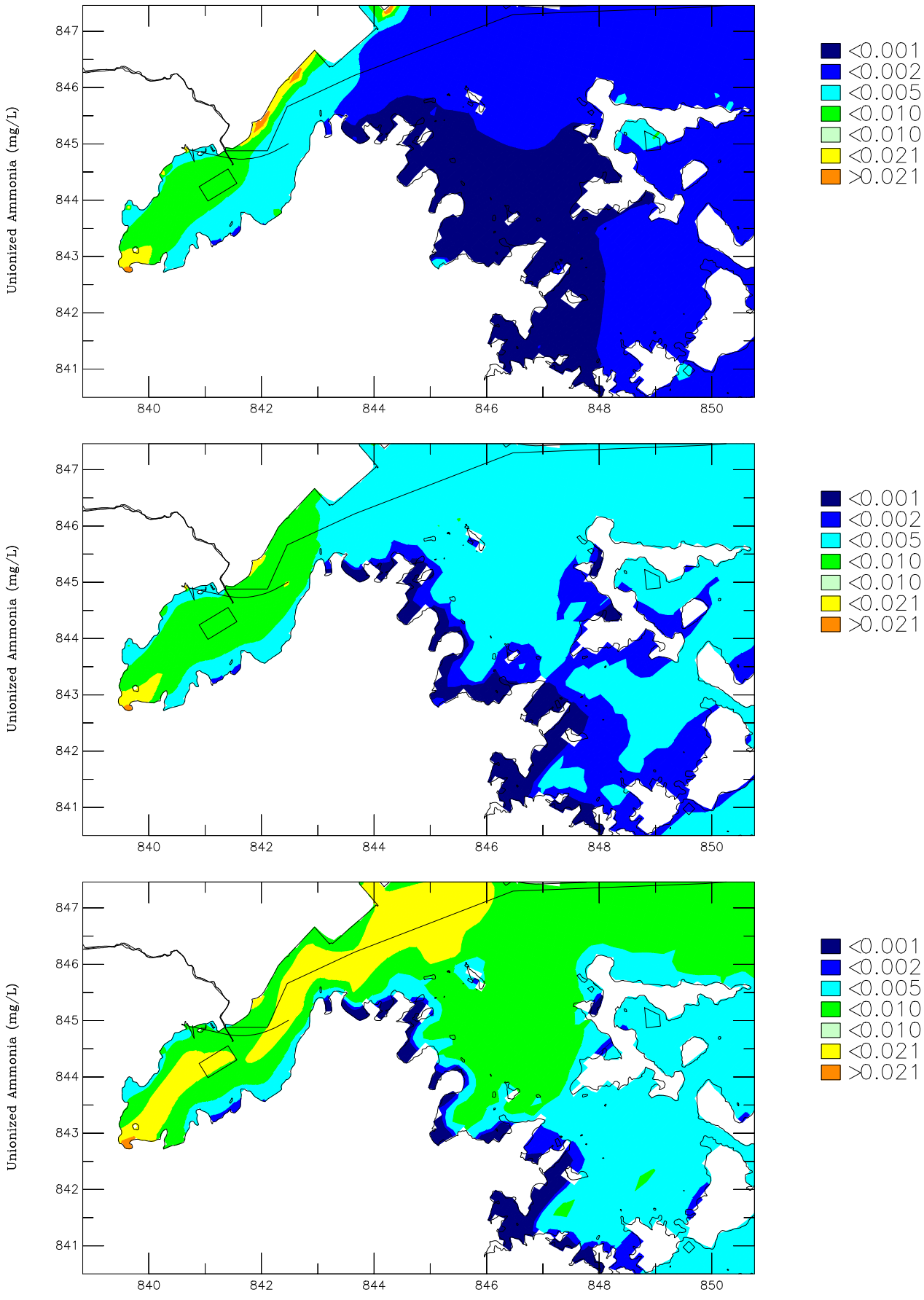
Expansion of Sha Tau Kok Sewage Treatment Works 2030 Baseline Operation of Existing STKSTW – Mean Total Inorganic Nitrogen (WQO: 0.3mg/L) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2030	Wet
	Annex5H-17	
ERM HK Limited	0211731/GPP	WQ.ssn



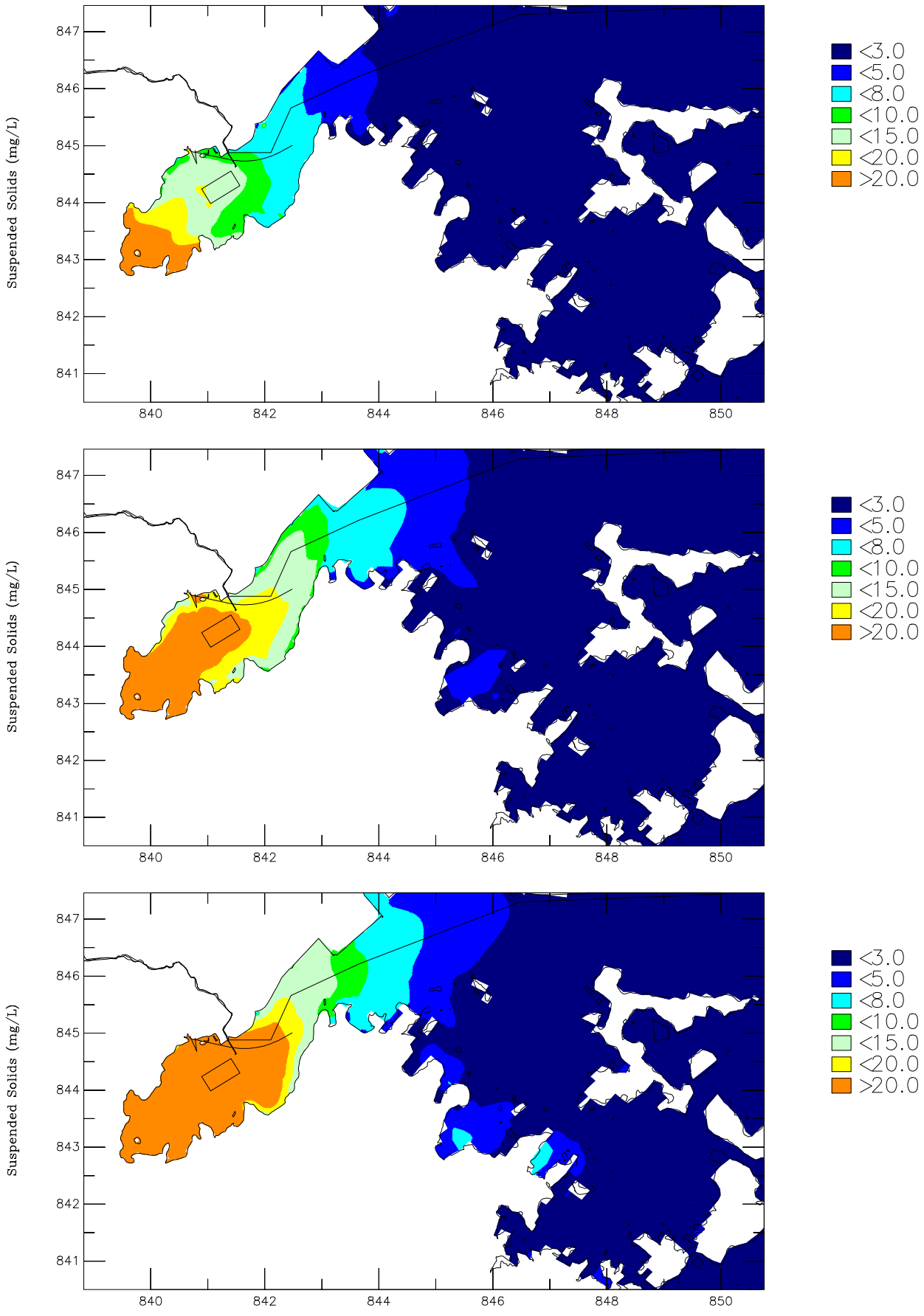
Expansion of Sha Tau Kok Sewage Treatment Works	Year 2030	Wet
2030 Operation of Expanded STKSTW – Mean Total Inorganic Nitrogen (WQO: 0.3mg/L) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Annex5H-18	
ERM HK Limited	0211731/GPP	WQ.ssn



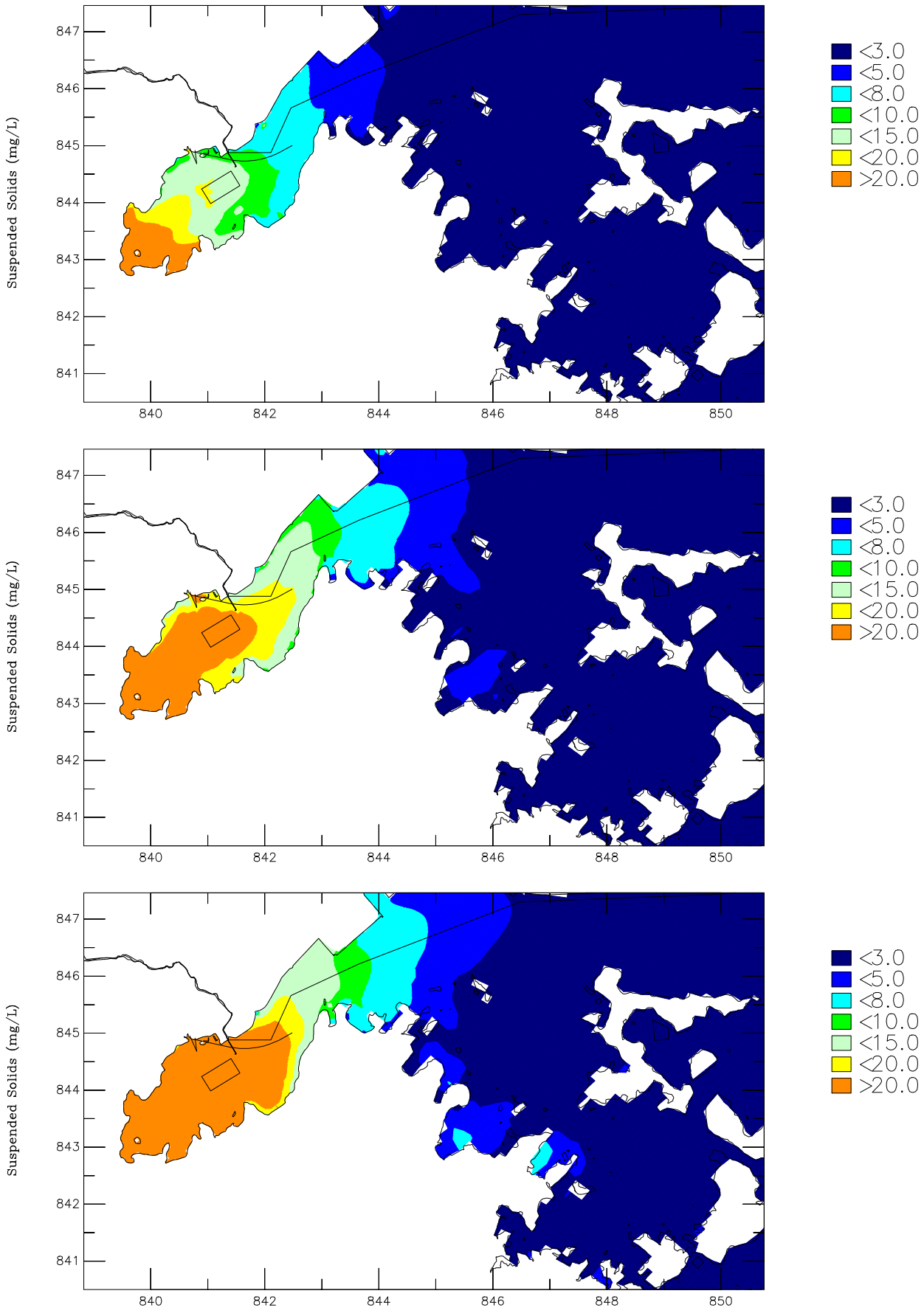
Expansion of Sha Tau Kok Sewage Treatment Works 2030 Baseline Operation of Existing STKSTW – Mean Unionized Ammonia (WQO: 0.021mg/L) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2030	Wet
	Annex5H-19	
ERM HK Limited	0211731/GPP	WQ.ssn



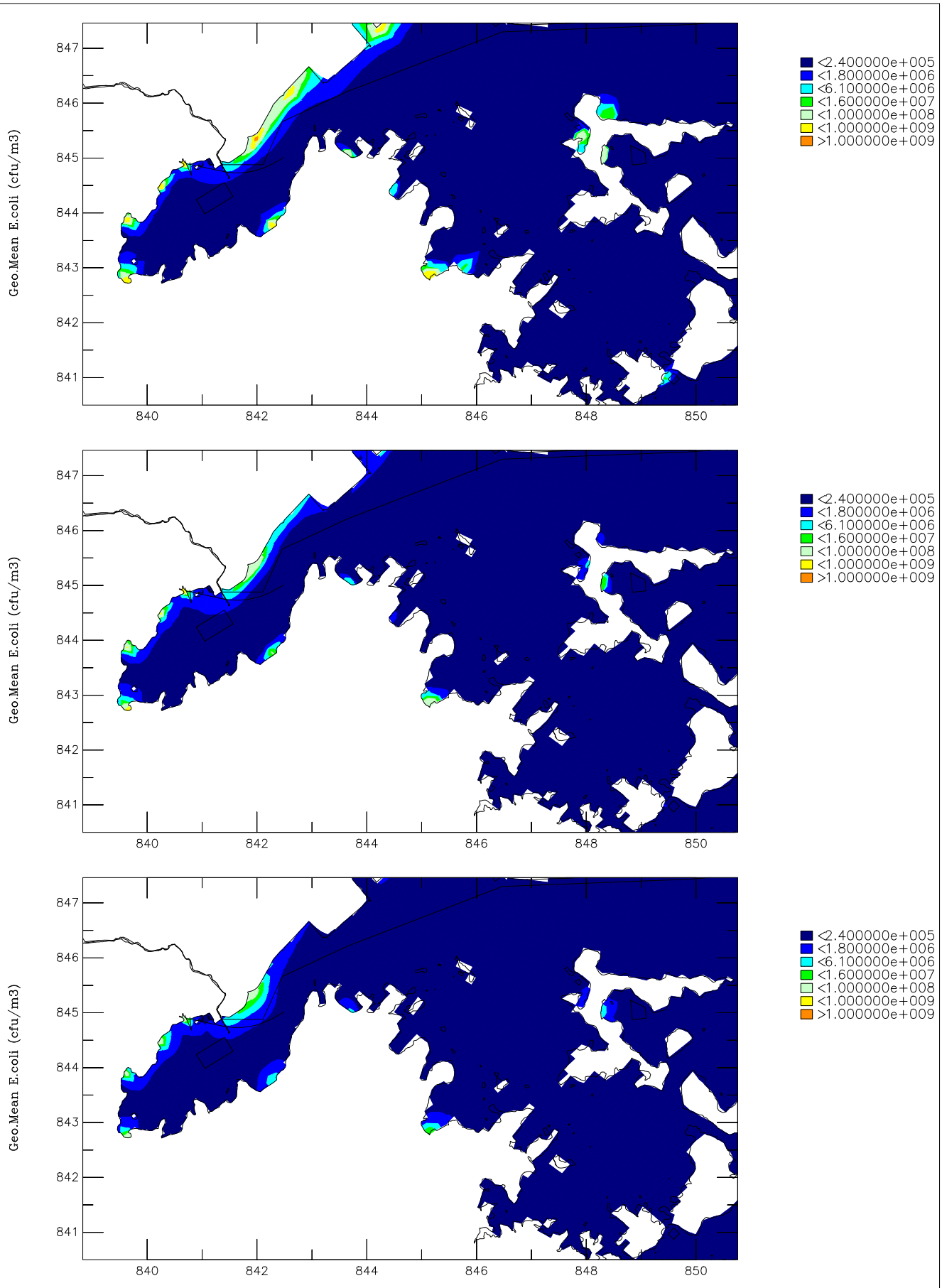
Expansion of Sha Tau Kok Sewage Treatment Works 2030 Operation of Expanded STKSTW – Mean Unionized Ammonia (WQO: 0.021mg/L) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2030	Wet
	Annex5H-20	
ERM HK Limited	0211731/GPP	WQ.ssn



Expansion of Sha Tau Kok Sewage Treatment Works 2030 Baseline Operation of Existing STKSTW – Mean Suspended Solids (WQO: increase < 30%) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2030	Wet
	Annex5H-21	
ERM HK Limited	0211731/GPP	WQ.ssn



Expansion of Sha Tau Kok Sewage Treatment Works 2030 Operation of Expanded STKSTW – Mean Suspended Solids (WQO: increase < 30%) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Year 2030	Wet
	Annex5H-22	
ERM HK Limited	0211731/GPP	WQ.ssn



Expansion of Sha Tau Kok Sewage Treatment Works

2030 Baseline Operation of Existing STKSTW – Geo.Mean E.coli (WQO: 6100000cfu/m3 at FCZ)

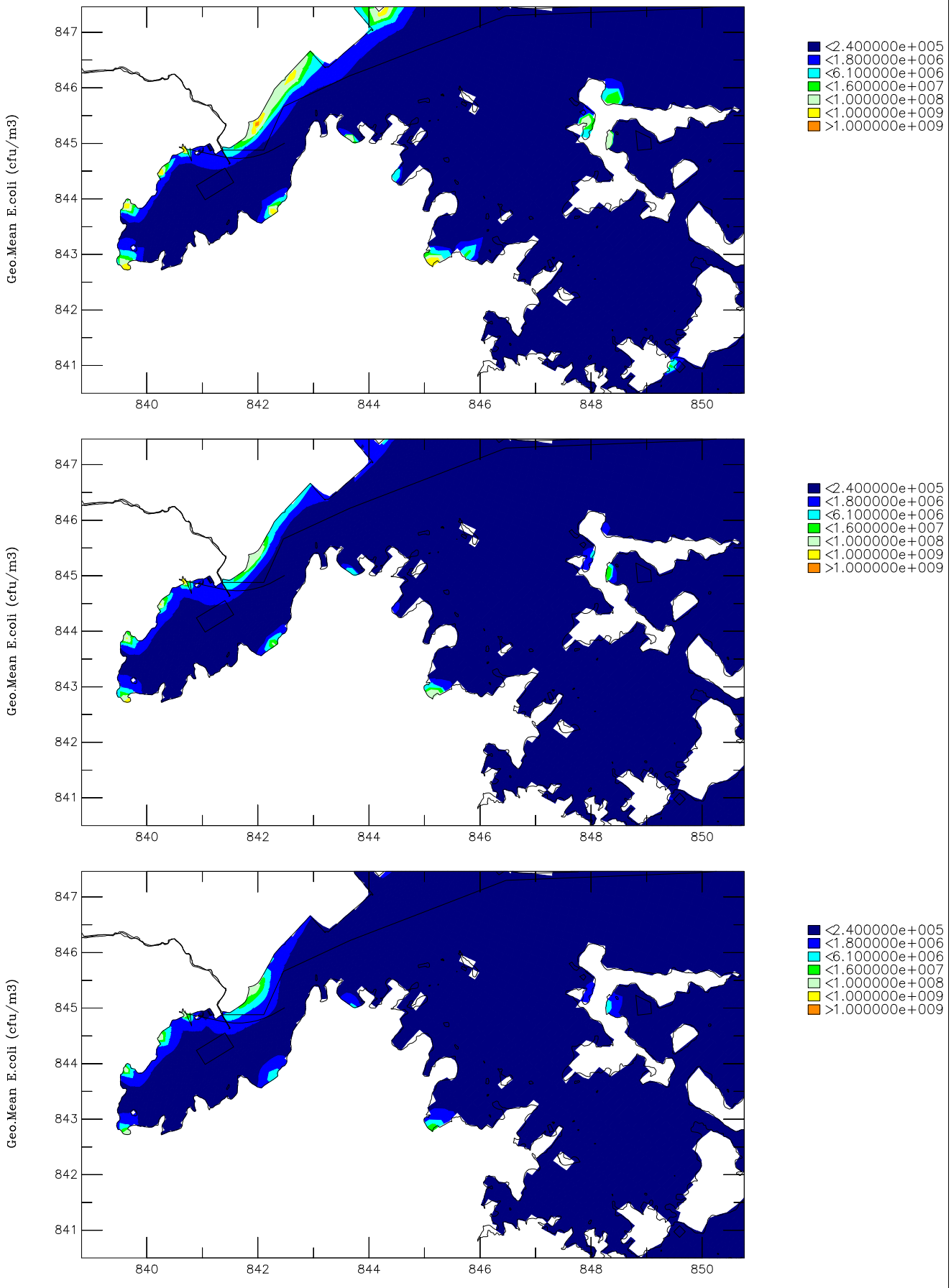
Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum

Year 2030 | Wet

Annex5H-23

ERM HK Limited

0211731/GPP | WQ.ssn



Expansion of Sha Tau Kok Sewage Treatment Works	Year 2030	Wet
2030 Operation of Expanded STKSTW – Geo.Mean E.coli (WQO: 6100000cfu/m3 at FCZ) Surface Layer; Top: Maximum; Middle: Mean; Bottom: Minimum	Annex5H-24	
ERM HK Limited	0211731/GPP	WQ.ssn

Results of water quality modelling in dry and wet seasons for relevant water quality parameters are summarized in Annex 5H-25 below.

Annex 5H-25 Predicted Water Quality at WSRs in Dry and Wet Seaon - 2030 Baseline and 2030 Operation

WSR Name (WSR ID)	Scenario	Mean DO (mg/L)	10th-Percentile DO (mg/L)	Mean TIN (mg/L)	Mean UIA (mg/L)	Mean SS (mg/L)	Geometric Mean *E.coli* (cfu./100 mL)
Fish Culture Zones							
Sha Tau Kok (FCZ1)	2030 Baseline-Dry	7.58	7.1	0.24	0.005	15.5	41
	2030 Operation-Dry	7.57	7.05	0.23	0.004	18.4	39
	2030 Baseline-Wet	5.18	4.54	0.19	0.008	12.6	7
	2030 Operation-Wet	5.15	4.52	0.19	0.008	12.8	7
Temporary Relocation Zone of Fish Raft for the Sha Tau Kok Fish Culture Zone 1 (FCZ7)	2030 Baseline-Dry	7.64	7.1	0.19	0.003	14.5	10
	2030 Operation-Dry	7.44	6.87	0.24	0.004	17.4	11
	2030 Baseline-Wet	6	5.24	0.11	0.005	9.2	3
	2030 Operation-Wet	5.89	5.15	0.15	0.005	9.3	3
Temporary Relocation Zone of Fish Raft for the Sha Tau Kok Fish Culture Zone 2 (FCZ8)	2030 Baseline-Dry	7.62	7.1	0.19	0.003	15.7	5
	2030 Operation-Dry	7.69	7.08	0.21	0.003	20.1	5
	2030 Baseline-Wet	5.93	5.27	0.12	0.005	11.7	1
	2030 Operation-Wet	5.91	5.23	0.14	0.005	12.1	1
Ap Chau (FCZ2)	2030 Baseline-Dry	7.08	6.2	0.15	0.002	7	1
	2030 Operation-Dry	6.96	6.18	0.16	0.003	6.6	1
	2030 Baseline-Wet	6.16	5.53	0.05	0.002	5.6	1
	2030 Operation-Wet	6.22	5.57	0.05	0.002	5.6	1
Kat O (FCZ3)	2030 Baseline-Dry	6.61	5.96	0.16	0.003	5.9	3
	2030 Operation-Dry	6.58	5.95	0.15	0.003	6	3
	2030 Baseline-Wet	5.73	5.18	0.06	0.003	3.8	1
	2030 Operation-Wet	5.79	5.29	0.06	0.003	3.8	1
O Pui Tong (FCZ4)	2030 Baseline-Dry	6.78	5.99	0.18	0.003	4.9	1
	2030 Operation-Dry	6.69	5.96	0.18	0.003	4.7	1
	2030 Baseline-Wet	5.47	5.1	0.1	0.003	1.1	1

WSR Name (WSR ID)	Scenario	Mean DO (mg/L)	10th-Percentile DO (mg/L)	Mean TIN (mg/L)	Mean UIA (mg/L)	Mean SS (mg/L)	Geometric Mean *E.coli* (cfu./100 mL)
	2030 Operation-Wet	5.5	5.11	0.11	0.003	1	1
Sai Lau Kong	2030 Baseline-Dry	7.96	7.24	0.07	0.002	8.8	1
(FCZ5)	2030 Operation-Dry	7.98	7.28	0.07	0.002	9.1	1
	2030 Baseline-Wet	6.43	5.9	0.02	0.001	5.7	1
	2030 Operation-Wet	6.48	5.9	0.02	0.001	5.7	1
Wong Wan	2030 Baseline-Dry	7.4	7.01	0.11	0.002	5.8	15
(FCZ6)	2030 Operation-Dry	7.34	6.96	0.1	0.002	5.8	15
	2030 Baseline-Wet	5.81	5.29	0.08	0.002	2.2	2
	2030 Operation-Wet	5.83	5.3	0.08	0.002	2.2	2
Spawning and Nursery Grounds of Commercial Fisheries Resources	2030 Baseline-Dry	7.08	6.2	0.15	0.002	7	1
	2030 Operation-Dry	6.96	6.18	0.16	0.003	6.6	1
	2030 Baseline-Wet	6.16	5.53	0.05	0.002	5.6	1
	2030 Operation-Wet	6.22	5.57	0.05	0.002	5.6	1
Seagrass							
Seagrass	2030 Baseline-Dry	7.73	7.11	0.3	0.005	19.1	208
(SG)	2030 Operation-Dry	7.89	7.16	0.21	0.003	20.5	206
	2030 Baseline-Wet	5.84	5.32	0.24	0.008	13.3	41
	2030 Operation-Wet	5.88	5.33	0.16	0.006	13.3	41
Mangrove stand							
Off STKSTW	2030 Baseline-Dry	7.57	7.06	0.41	0.008	19.4	3007
(M1)	2030 Operation-Dry	7.85	7.14	0.19	0.004	21.1	3076
	2030 Baseline-Wet	6.56	5.71	0.38	0.011	10.4	1941
	2030 Operation-Wet	6.67	5.8	0.13	0.005	10.1	1950
Off Wu Shek Kok	2030 Baseline-Dry	7.19	6.83	0.24	0.005	16.2	602
(M2)	2030 Operation-Dry	7.38	6.99	0.16	0.004	20.8	608
	2030 Baseline-Wet	6.81	6.01	0.1	0.004	18.7	308
	2030 Operation-Wet	6.91	6.1	0.09	0.004	19.8	311
Off Tai Wan	2030 Baseline-Dry	6.99	6.29	0.19	0.005	12.2	148

WSR Name (WSR ID)	Scenario	Mean DO (mg/L)	10th-Percentile DO (mg/L)	Mean TIN (mg/L)	Mean UIA (mg/L)	Mean SS (mg/L)	Geometric Mean *E.coli* (cfu./100 mL)
(M3)	2030 Operation-Dry	7.08	6.49	0.17	0.005	15.3	154
	2030 Baseline-Wet	5.91	5.03	0.25	0.014	38.2	150
	2030 Operation-Wet	5.94	5.01	0.25	0.014	39.9	151
Off Luk Keng	2030 Baseline-Dry	7.12	6.72	0.15	0.004	16	1
(M4)	2030 Operation-Dry	7.29	6.91	0.14	0.003	21.5	1
	2030 Baseline-Wet	6.28	5.59	0.09	0.004	36.8	1
	2030 Operation-Wet	6.39	5.65	0.08	0.004	39.8	1
Off Kuk Po	2030 Baseline-Dry	7.62	7.09	0.16	0.003	17.3	654
(M5)	2030 Operation-Dry	7.97	7.19	0.16	0.002	22	711
	2030 Baseline-Wet	7.04	6.29	0.06	0.002	9.2	85
	2030 Operation-Wet	7.09	6.31	0.08	0.003	9.9	88
Kei Shan Tsui	2030 Baseline-Dry	8.16	7.46	0.12	0.002	15.9	1
(M6)	2030 Operation-Dry	8.08	7.23	0.17	0.002	15.9	2
	2030 Baseline-Wet	7.18	6.63	0.02	0.001	8.6	1
	2030 Operation-Wet	7.44	7	0.03	0.001	10.4	1
Tai Sham Chung	2030 Baseline-Dry	8.33	8.08	0.09	0.002	14	1
(M7)	2030 Operation-Dry	8.3	7.65	0.13	0.002	14.3	1
	2030 Baseline-Wet	7.16	6.73	<0.01	<0.001	5.8	1
	2030 Operation-Wet	7.35	6.95	<0.01	<0.001	6.6	1
So Lo Pun	2030 Baseline-Dry	8.12	7.24	0.05	0.001	8	8
(M8)	2030 Operation-Dry	8.31	7.65	0.05	0.001	9.6	8
	2030 Baseline-Wet	6.56	6.07	<0.01	<0.001	3.3	3
	2030 Operation-Wet	6.63	6.09	<0.01	<0.001	3.5	3
Pak Kok Wan	2030 Baseline-Dry	8.06	7.23	0.05	0.001	7.3	1
(M9)	2030 Operation-Dry	8.2	7.39	0.05	0.001	8.2	1
	2030 Baseline-Wet	6.73	6.1	<0.01	<0.001	3	1
	2030 Operation-Wet	6.79	6.11	<0.01	<0.001	3.1	1
Yan Chau Tong Marine Park	2030 Baseline-Dry	7.68	7.03	0.06	0.002	6.7	508

WSR Name (WSR ID)	Scenario	Mean DO (mg/L)	10th-Percentile DO (mg/L)	Mean TIN (mg/L)	Mean UIA (mg/L)	Mean SS (mg/L)	Geometric Mean *E.coli* (cfu./100 mL)
(M10)	2030 Operation-Dry	7.74	7.09	0.05	0.002	7.1	512
	2030 Baseline-Wet	6.35	5.79	0.01	0.001	5	403
	2030 Operation-Wet	6.39	5.83	0.01	0.001	5	403
Yan Chau Tong Marine Park	2030 Baseline-Dry	7.91	7.17	0.06	0.002	8.1	94
(M11)	2030 Operation-Dry	7.97	7.22	0.06	0.002	8.6	95
	2030 Baseline-Wet	6.21	5.55	0.02	0.001	9.3	17
	2030 Operation-Wet	6.29	5.58	0.02	0.001	9.2	17
Ngau Shi Wu Wan	2030 Baseline-Dry	7.98	7.21	0.06	0.001	6.5	1
(M12)	2030 Operation-Dry	8.01	7.25	0.05	0.001	6.8	1
	2030 Baseline-Wet	6.57	6	0.01	<0.001	5	1
	2030 Operation-Wet	6.61	6.09	0.01	<0.001	5	1
Yan Chau Tong Marine Park	2030 Baseline-Dry	7.14	6.87	0.05	0.001	2.1	1
(M13)	2030 Operation-Dry	7.12	6.76	0.05	0.001	2.3	1
	2030 Baseline-Wet	6.2	5.79	0.01	<0.001	0.7	1
	2030 Operation-Wet	6.19	5.77	0.01	<0.001	0.7	1
Yan Chau Tong Marine Park	2030 Baseline-Dry	7.25	6.93	0.05	0.001	2.2	1
(M14)	2030 Operation-Dry	7.22	6.92	0.05	0.001	2.4	1
	2030 Baseline-Wet	6.16	5.77	0	<0.001	1.3	1
	2030 Operation-Wet	6.16	5.77	0	<0.001	1.3	1
Coral sites identified under this EIA							
Off Ah Kung Au	2030 Baseline-Dry	7.14	7.05	0.15	0.003	17.2	5
(T1)	2030 Operation-Dry	7.12	6.98	0.13	0.003	17.5	5
	2030 Baseline-Wet	5.89	5.39	0.07	0.004	11.4	1
	2030 Operation-Wet	5.87	5.37	0.07	0.004	11.9	1
Coral sites identified under this EIA (T2)	2030 Baseline-Dry	7.16	7.06	0.15	0.003	17.5	5
	2030 Operation-Dry	7.15	7.01	0.13	0.003	17.7	5
	2030 Baseline-Wet	5.89	5.41	0.08	0.004	11.5	1

WSR Name (WSR ID)	Scenario	Mean DO (mg/L)	10th-Percentile DO (mg/L)	Mean TIN (mg/L)	Mean UIA (mg/L)	Mean SS (mg/L)	Geometric Mean *E.coli* (cfu./100 mL)
	2030 Operation-Wet	5.87	5.37	0.07	0.004	12	1
Coral sites identified under this EIA (T3)	2030 Baseline-Dry	7.19	7.07	0.15	0.003	17.8	5
	2030 Operation-Dry	7.18	6.98	0.13	0.003	18	5
	2030 Baseline-Wet	5.87	5.39	0.1	0.004	11.5	1
	2030 Operation-Wet	5.85	5.35	0.09	0.003	12	1
Horseshoe crab							
Off Muk Min Tau (H1)	2030 Baseline-Dry	7.55	7.06	0.38	0.007	15.4	387
	2030 Operation-Dry	7.77	7.13	0.17	0.003	19.4	411
	2030 Baseline-Wet	6.39	5.74	0.18	0.006	12.2	143
	2030 Operation-Wet	6.46	5.77	0.13	0.005	12.3	143
Off Pak Hok Lam (H2)	2030 Baseline-Dry	7.45	7.08	0.33	0.006	14.2	378
	2030 Operation-Dry	7.68	7.12	0.17	0.003	18.1	337
	2030 Baseline-Wet	6.41	5.88	0.15	0.005	6.9	69
	2030 Operation-Wet	6.46	5.9	0.12	0.005	7.1	69
Off Nga Yiu Tau (H3)	2030 Baseline-Dry	7.19	6.83	0.24	0.005	16.2	602
	2030 Operation-Dry	7.38	6.99	0.16	0.004	20.8	608
	2030 Baseline-Wet	6.81	6.01	0.1	0.004	18.7	308
	2030 Operation-Wet	6.91	6.1	0.09	0.004	19.8	311
A Chau (H4)	2030 Baseline-Dry	7.02	6.52	0.2	0.006	14.4	940
	2030 Operation-Dry	7.13	6.77	0.18	0.005	18.3	963
	2030 Baseline-Wet	4.69	3.62	0.31	0.019	61.9	864
	2030 Operation-Wet	4.7	3.59	0.32	0.019	64.2	869
Off Luk Keng (H5)	2030 Baseline-Dry	7.12	6.72	0.15	0.004	16	1
	2030 Operation-Dry	7.29	6.91	0.14	0.003	21.5	1
	2030 Baseline-Wet	6.28	5.59	0.09	0.004	36.8	1
	2030 Operation-Wet	6.39	5.65	0.08	0.004	39.8	1
Marine Park							
Yan Chau Tong	2030 Baseline-Dry	7.35	6.64	0.11	0.002	6.7	1

WSR Name (WSR ID)	Scenario	Mean DO (mg/L)	10th-Percentile DO (mg/L)	Mean TIN (mg/L)	Mean UIA (mg/L)	Mean SS (mg/L)	Geometric Mean *E.coli* (cfu./100 mL)
(MP1)	2030 Operation-Dry	7.37	6.61	0.11	0.002	6.9	1
	2030 Baseline-Wet	5.54	4.92	0.05	0.003	6	1
	2030 Operation-Wet	5.61	4.94	0.05	0.003	6	1
Yan Chau Tong	2030 Baseline-Dry	7.33	6.9	0.1	0.002	6	1
(MP2)	2030 Operation-Dry	7.32	6.85	0.1	0.002	6.1	1
	2030 Baseline-Wet	5.85	5.32	0.04	0.002	4.4	1
	2030 Operation-Wet	5.9	5.34	0.04	0.002	4.5	1

A brief discussion on the predicted water quality at WSRs for 2030 baseline scenario and expanded STKSTW operation (stated as "2030 Operation" above) is provided below by dry and wet seasons. In view of the high number of WSRs and water quality parameters, description would be provided by category of WSRs, highlighting only changes and observable trends. The major difference between the 2030 Baseline and 2030 Operation scenarios are the difference of pollution loading and outfall location from the existing and expanded STKSTW, which are provided in Annex 5H-25 and contour plots provided above.

It should be highlighted that the mean / 10th-percentile DO, SS elevation, TIN and UIA predicted in the baseline scenario in this modelling exercise is not necessarily similar to the baseline data adopted for the construction phase SS elevation, DO depletion and nutrient release assessment shown in the main text. It is because the modelled STKSTW loading in the baseline scenario is based on the maximum average dry weather flow and the maximum effluent concentration for various pollutants. This assumption is very conservative and therefore represents a much worse water quality condition than the actual baseline from field measurements. Relevant discussion has been provided in section 5.8.53 of the main text and is not further discussed here.

CHANGE IN WATER QUALITY AT STKFCZ AND TWO POTENTIAL RELOCATIONS SITES

Under the baseline scenario of 2030, the predicted water quality within Starling Inlet is not very good as a result of weak material exchange with the outside waters and heavy loading discharge into the embayment. The mariculture activity at the STKFCZ (as well as all other FCZs within the Study area) is considered a major pollution source comparable to the discharge of the existing STKSTW. Fish feeding, excretion of fish and dead fish all contribute to release of organic loading as well as nitrogen nutrient to the water. The STKFCZ is one of the largest FCZ in Hong Kong and is one of the greatest sources of pollutants in Starling Inlet. A comparison on the estimated amount of varying pollutants within the Study area is provided in Annex 5H-26.

Annex 5H-26 **Comparison for Pollution Loads from Fish Culture Zones within the Study Area**

Loading Sources	WSR ID	SS (g/d)	BOD (g/d)	Org-N (g/d)	NH3-N (g/d)
Sha Tau Kok FCZ	FCZ1	124916	42806	10569	38075
Ap Chau FCZ	FCZ2	2915	999	247	888
Kat O FCZ	FCZ3	22485	7705	1902	6854
O Pui Tong FCZ	FCZ4	73284	25113	6200	22338
Sai Lau Kong FCZ	FCZ5	4997	1712	423	1523
Wong Wan FCZ	FCZ6	15615	5351	1321	4759
STKSTW (Baseline)	-	99600	66400	38069	38069
Total Rainfall Loading in STK Catchment (Dry Season)		46125	23975	1280	213
Total Rainfall Loading in STK Catchment (Wet Season)		505183	262578	14017	2336
Total Dry Weather Loading in STK Catchment		51653	56956	3803	4936

Since STKFCZ itself is a notable source of pollution and a water sensitive receiver at the same time, it would inevitably be affected by the pollutants from itself. As a result of this, water quality at STKFCZ is particularly bad when compared with other WSRs in Starling Inlet. 10th-percentile DO level is predicted to be 4.55 mg/L in wet season.

With the operation of the expanded STKSTW, treated effluent would be discharged at the proposed new submarine outfall. Moving the pollution source of the STKSTW from the inner Starling Inlet embayment to the opening of the embayment is generally consider favorable in terms of dispersion and material exchange. Yet the significant increase in total loading (refer to Table 5.20 of the main text) counteracted the effect of enhanced dispersion at the STKFCZ and the two relocation zones. Small decrease in DO level is predicted at both seasons under the operation scenario of the expanded STKSTW. The predicted 10th-percentile DO level decrease from 7.10 mg/L to 7.05 mg/L in the dry season and 4.54 mg/L to 4.52 mg/L in the wet season. Small decrease in mean and 10th-percentile DO level is also predicted at the two relocation zones for fish rafts. The decrease in DO level at FCZ7 is more significant than the STKFCZ and FCZ8 because of the shorter distance. Also, FCZ7 is located directly downstream to the proposed new outfall during flooding. This makes FCZ7 more directly affected by the effluent discharge under the operation of the expanded STKSTW.

Other water quality parameters are also affected by the operation of the expanded STKSTW. Small decrease in TIN level is predicted at the STKFCZ in the dry season. On the other hand, no observable change in TIN level is predicted at the STKFCZ in the wet season. For FCZ7 and FCZ8, small increase in TIN level is predicted at both seasons under the operation scenario for the STKSTW. Mean TIN level at FCZ7 increases from 0.19 mg/L to 0.24 mg/L in dry season and from 0.11 mg/L to 0.15 mg/L in the wet season. Mean TIN level at FCZ8 increases from 0.19 mg/L to 0.21 mg/L in dry season and from 0.12 mg/L to 0.14 mg/L in wet season. The case for UIA and E.coli is similar at these WSRs, with minimal reduction (or no observable change) predicted at the STKFCZ and minimal increase (or no observable change) predicted at the FCZ7 and FCZ8.

Increase in SS level is predicted at all three FCZ WSRs during the operation of the expanded plant. Predicted mean SS level increases from 15.5 mg/L to 18.4 mg/L in dry season (19% increase) and from 12.6 mg/L to 12.8 mg/L in wet season (2% increase). Both FCZ7 and FCZ8 are generally more affected by SS released from the outfall of the expanded STKSTW than the STKFCZ. The predicted mean SS level at FCZ7 increases from 14.5 mg/L to 17.4 mg/L in dry season (20% increase) and from 9.2 mg/L to 9.3 mg/L in wet season (1% increase). The predicted mean SS level at FCZ8 increases from 15.8 mg/L to 20.1 mg/L in dry season (28% increase) and from 11.7 mg/L to 12.1 mg/L in wet season (3% increase).

CHANGE IN WATER QUALITY AT OTHER FCZS AND FISHERIES RESOURCES OUTSIDE STARLING INLET

As shown in Annex 5H-25 above, the predicted WQ baseline is generally good at FCZs and spawning and nursery grounds of commercial fisheries resources outside Starling Inlet. It is because these FCZs and fisheries resources are generally away from the major pollution loading sources (refer to Annex 5H-26), which are mainly located within Starling Inlet. While the fish farming activities at these FCZs also generate water quality pollution, the scale of operation is quite small so the pollution loading is quite low. Also, these

FCZs are located at less sheltered water when compared with the STKFCZ, and this allows better material exchange and tidal flushing thus resulting in better water quality at these FCZs.

As shown in Annex 5H-25 above, the predicted change in water quality is minimal. Small decrease in DO is generally predicted in the dry season and small increase in DO is predicted in the wet season. Increase in TIN, UIA and E.coli is generally small or not observable in both seasons. Predicted change in SS level at these FCZ and fisheries resources WSRs is also small as well. Although some deterioration of water quality at the nearby FCZs (such as Ap Chau FCZ FCZ2) and spawning and nursery grounds of commercial fisheries resources at north Mirs Bay is expected as the operation of the expanded STKSTW increases the pollution load discharge from Starling Inlet and brings the pollution source of the STKSTW closer to the FCZ and fisheries resources WSRs..

CHANGE IN WATER QUALITY AT MARINE ECOLOGY WITHIN STARLING INLET

As shown in Annex 5H-25 above, the predicted water quality baseline at marine ecological WSRs within Starling Inlet are generally not very good, which is similar to the case of STKFCZ and the other two relocation sites. Particularly for certain WSRs which are located at or near the discharge of the nearby drainages / rivers, high level of pollutants (TIN, SS) at these WSRs are predicted at these WSRs. It is because runoff from the nearby drainages / rivers carries pollution loading from the catchment and enters the marine water of Starling Inlet at these locations, thus resulting in locally high level of pollution at these WSRs. It should be highlighted that some of the WSRs in Starling Inlet are highly affected by pollution sources other than the STKSTW (such as the STKFCZ and rainfall-related loadings). As shown in Annex 5I-3 and 5I-9, the tracer modelling exercise indicated that most of the marine ecological WSRs (M1-M3, H1-H4 as shown in Figure 5.1) are located at the western and northwestern side of Starling Inlet, which is poorly flushed and strongly affected by the discharge from local drainages and rivers. The runoff discharged could constituent most of the water at these receivers when the tide level is low, resulting in very high level of pollutants at these WSRs. Water quality at some of these WSRs, including SG, M1, H1, H2 and H4, is predicted to be above the 0.3 mg/L TIN criterion in the baseline scenario. As shown in Annex 5H-25 above, the predicted mean TIN level of only one of the WSRs (M1) is above 0.3 mg/L in both seasons. The predicted mean TIN level of M1 is 0.41 mg/L in the dry season and 0.37 mg/L in the wet season. The predicted mean levels of SS at these WSRs are also high in general (> 10 mg/L). It should be highlighted that the organisms at these mangrove and horseshoe crab habitats are particularly adapted to environment with high ambient SS level as a result of sand- or mud-burrowing behaviours (e.g. crab, horseshoe crab, snail and mudskipper, etc.) and therefore not sensitive SS. There are three small isolated colonies of coral recorded along the coastline off Ah Kung Au east of the proposed site. These coral sites are generally far away from pollution sources. These WSRs are located close to the opening of the Starling Inlet and the waters is well flushed when compared with other WSRs within the Starling Inlet. The water quality at these WSRs are in general better than other WSRs within the Starling Inlet, except for dissolved oxygen because these coral sites are located at the bottom level of the water column where gaseous exchange is generally weaker.

The operation of the expanded STKSTW exerts a mixed effect on water quality at marine ecological WSRs within Starling Inlet. As shown in Annex 5H-25

above, general improvement in DO, TIN and UIA level is predicted at these WSRs in both seasons. The increase in DO is generally small. For example, the predicted mean DO level at SG increases from 7.73 mg/L to 7.89 mg/L in dry season and from 5.84 mg/L to 5.88 mg/L in wet season. Small reductions in TIN and UIA level are also predicted at these WSRs under the 2030 operation scenario. Particularly for mangrove habitat M1 which is significantly affected by both local discharges and effluent discharge from the existing STKSTW, significant reduction of TIN level is predicted under the operation scenario of the expanded STWSTK at M1. The mean TIN level decreases from 0.41 mg/L to 0.19 mg/L in dry season and from 0.38 mg/L to 0.13 mg/L in wet season. On the other hand, the coral sites T1, T2 and T3 identified under the dive survey conducted under this Study, which are the three WSRs nearest to the proposed new outfall and far from the existing outfall, experienced no beneficial effect due to the enhanced dispersion of pollutants due to relocated effluent discharge location from the expanded STKSTW. Due to their short distance from the new outfall location, a minor reduction of water quality experienced at these WSRs is predicted. The mean and 10th-percentile levels of DO decreased slightly at these WSRs in both seasons while the mean level of TIN, UIA, SS and E.coli all increased slightly upon the operation of the expanded STKSTW. Horseshoe crab site H4 is also somewhat affected by the operation of the expanded STKSTW. The predicted TIN level decreases from 0.2 mg/L to 0.18 mg/L in dry season and increases from 0.31 mg/L to 0.32 mg/L. It should be highlighted that H4 is only one of the selected modelling output points of the horseshoe crab habitats within the Starling Inlet (which are represented by WSRs H1 to H5). Despite the relatively small increase in TIN level at H4 in wet season, the overall TIN level at this whole horseshoe crab habitat H1 to H5 is predicted to be lower with the operation of the expanded STKSTW in both seasons and annually. Same observation could be made for DO level at these horseshoe crab sites. Other WSRs are less affected by the discharge from the existing STKSTW outfall and therefore less benefitted from the decommissioning of the existing outfall.

Increase in SS is predicted most of the marine ecology WSRs within Starling Inlet, with the exceptions of M1 in wet season which are very close to the existing STKFCZ and benefit more by the removal of the nearby source from the existing outfall. The increase in SS level at the sensitive SG is small. Mean SS level increases from 19.1 mg/L to 20.5 mg/L in dry season and remains at 13.3 mg/L in wet season. The increase in SS level at some WSRs along the southern side of Starling Inlet is predicted to be more significant. For instance, the predicted mean SS level off Luk Keng (M4) increases from 16.0 mg/L to 21.5 mg/L in dry season and from 36.8 mg/L to 39.8 mg/L in wet season. Yet mangrove and horseshoe crab WSRs are both not consider sensitive to SS (as discussed in section 5.8.80 of the main text) and the potential change from the operation of the expanded STKSTW in not considered an issue.

In short, the operation of the expanded STKSTW would result in a general improvement in DO, TIN and UIA levels for marine ecological WSRs within Starling Inlet in both seasons. Slight increase in SS is predicted yet the potential change in very limited at WSRs that are sensitive to SS.

CHANGE IN WATER QUALITY AT MARINE ECOLOGY OUTSIDE STARLING INLET

Under the baseline scenario, the water quality at these WSRs (including M6-M14, MP1 and MP2) is predicted to be generally good. Predicted level of DO

is generally high (10th-percentile DO > 5 mg/L in both seasons). Level of TIN (mean level around or below 0.1 mg/L in both seasons) and UIA (mean level consistently < 0.005 mg/L in both seasons) is generally low as well. The predicted levels of SS and E.coli vary among WSRs as a result of local discharges from rural areas. Yet the predicted level is still low when compared with that predicted level within Starling Inlet.

Similar to the case of FCZs outside Starling Inlet, the predicted water quality at marine ecological WSRs outside Starling Inlet is generally only minimally affected by the operation of the expanded STKSTW except for M6 and M7 which are located close to the proposed new submarine outfall. The predicted change on water quality parameters at other marine ecological WSRs outside Starling Inlet is generally only a few percent of the baseline level. For M6 (mangrove habitat at Kei Shan Tsui, which is only about 1 km from the proposed submarine outfall by sea), a small decrease in mean and 10th-percentile DO level is predicted in dry season and a small increase in mean and 10th-percentile DO level is predicted in wet season. Similar prediction is observed from M7 (mangrove habitat at Tai Shan Chung, which is about 2 km from the proposed submarine outfall by sea). The predicted levels of TIN and UIA at other marine ecological WSRs outside Starling Inlet is generally quite low and the potential change from the operation of the expanded STKSTW is generally minimal or not observable. Similar prediction is also observed for *E.coli* at all marine ecological WSRs outside Starling Inlet.

The predicted change in SS at marine ecological WSRs outside Starling Inlet is slightly more observable and widespread. Observable increase in SS is predicted at M6, M7 and M8 (mangrove habitat at So Lo Pun). The percentage increase in SS at M8 is the highest (20% increase) among all marine ecological WSRs in dry season, with an increase of mean SS level from 8.0 mg/L to 9.6 mg/L under the operation of the expanded STKSTW. On the other hand, the percentage increase in SS at M6 is the most significant in wet season. The predicted mean SS level increase from 8.6 mg/L to 10.4 mg/L (21% increase) under the operation scenario in wet season. The predicted changes in SS level at other marine ecological WSRs are much less significant and are all below 30% of the ambient level. It should be also highlighted that the mangrove habitats are generally considered not sensitive to SS. The increase in SS level predicted at the Yang Chau Tong Marine Park is very small. The predicted mean SS level increases slightly from 6.7 mg/L to 6.9 mg/L in dry season and remains at 6.0 mg/L in wet season at MP1 (the section of the marine park closer to Starling Inlet and the proposed new outfall). For the section of the marine park further away from Starling Inlet (MP2), the predicted mean SS level increases slightly from 6.0 mg/L to 6.1 mg/L in the dry season and from 4.4 mg/L to 4.5 mg/L in the wet season.

In short, the operation of the expanded STKSTW slightly affects the water quality at marine ecological sensitive receivers which are close to the proposed submarine outfall. The most affected WSRs are M6 to M8, yet the level of change in water quality is limited.

SUMMARY

The operation of the expanded STKSTW benefits the WSRs which are close to the existing STKSTW outfall. For other WSRs within Starling Inlet, except coral sites T1, T2 and T3 which are at short distance from the proposed new outfall, general improvement in DO, TIN and UIA level and small increase in SS level at WSRs is predicted. Since mangrove and horseshoe crab WSRs are

not considered sensitive to SS, the change in SS is not considered an issue. The predicted change in SS for other WSRs that are sensitive to SS (FCZ1, FCZ7, FCZ8, SG, T1, T2 and T3), the predicted change in water quality from the operation of the expanded STKSTW would be limited.

For FCZ and marine ecological WSRs outside Starling Inlet, the baseline water quality predicted to be good in general. The potential change in water quality from the operation of the expanded STKSTW is generally small and highly localized.

The modelling exercise conservatively assumes maximum allowed concentration are discharged continuously at the maximum average dry weather flow of the corresponding plants, resulting in water quality prediction that is significantly more stressed, particularly for the WSRs within Starling Inlet. It is therefore expected that the actual water quality at the WSRs would be better than the predictions under both the baseline and operation scenarios.